

**UNIVERSITY OF KWAZULU NATAL**



**The effect of economic uncertainty on exchange traded fund performance  
and volatility in South Africa**

**By**

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**A dissertation submitted in fulfilment of the requirements for the degree of  
Master of Commerce in Finance**

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**2024**

## DECLARATION

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## **ACKNOWLEDGEMENTS**

The highest praise is owed to God. Without His guidance and blessings, this degree would not have been possible.

A heartfelt and sincere thank you goes to my supervisors, Dr. Faezah Peerbhai and Prof. Paul-Francois Muzindutsi, whose unparalleled advice, wisdom, and unwavering support have been instrumental in this journey. I am deeply grateful for both of you. Your guidance went far beyond academia; you provided encouragement during the toughest of times and inspired me to push through every challenge. The dedication you have shown as mentors is truly exceptional, and I could not have asked for better academic advisors.

I would also like to express my gratitude to Dr. Damien Kunjal and Dr. Lorraine Muguto. Although you were not my official supervisors, your willingness to offer detailed feedback and valuable insights has been deeply appreciated.

My heartfelt thanks go to my parents for their unwavering love and support. To my mother, Noosha Singh—this degree would not have been possible without your relentless encouragement. You have always believed in me and pushed me to pursue my academic aspirations, helping me break free from traditional expectations of what a woman's role should be. Your support has meant the world to me.

To my faithful French Poodle, Harley—words cannot express how much your silent companionship has meant to me. You have been there through the long nights and the lowest of lows, offering a sense of peace and comfort. In many ways, I attribute a third of this degree to you, for your steadfast presence has made all the difference.

Finally, I want to express my deepest gratitude to my husband, Asheel Deeplaul. The sacrifices you have made throughout this journey have not gone unnoticed, and I am beyond grateful for your constant love, support, and encouragement. Thank you for always stepping in and stepping up when I couldn't, and for being my unwavering partner through it all. I am truly blessed to have you by my side.

## **ABSTRACT**

Global economic uncertainty (EU) is at unprecedented levels due to technological advancements, globalization, political divisions, and growing government intervention. Economic Policy Uncertainty (EPU) exacerbates this by creating ambiguity about future outcomes, leading to cautious investment, increased volatility, and difficulties in decision-making. This uncertainty also weakens investor confidence and complicates risk management, with emotional factors during crises further influencing decisions and expectations, making accurate forecasting even harder for both investors and firms.

Given the rapid growth in the popularity of exchange-traded funds (ETFs), this study investigates the effect of EU on ETF returns under both bullish and bearish market conditions in South Africa, while also assessing how EU influences ETF volatility. Specifically, the research examines bond and equity ETFs over the period from 2006 to 2023. The sample consists of 40 ETFs, categorized into four distinct portfolios of bond and equity ETFs tracking domestic benchmarks, and bond and equity ETFs tracking international benchmarks.

EU is proxied using the Rand Merchant Bank (RMB) Bureau of Economic Research (BER) Business Confidence Index (BCI). The Markov Switching Regime (MSM) model is used to capture the effect of EU on ETF returns under varying market conditions, utilizing monthly data. In addition, Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models are used to examine the relationship between EU and ETF return volatility.

The MSM results indicate that EU has a statistically significant positive effect on equity ETF returns under bullish market conditions, reflecting investor optimism in perceived recovery phases. However, this effect diminishes in bearish market conditions. The international equity ETFs portfolio did not exhibit a significant relationship with EU, reinforcing the view that global diversification helps mitigate South African-specific risks. For bond ETFs, a “flight to safety” phenomenon is observed, consistent with global patterns during periods of heightened uncertainty. The GARCH analysis reveals limited evidence that EU significantly influences ETF volatility across any of the portfolios.

This research highlights the importance of behavioural finance in shaping market reactions during periods of heightened EU. The observed asymmetry in market responses to EU under different market conditions presents an opportunity for investors to exploit these differences for potential diversification benefits.

The study encourages further exploration of ETF performance, particularly in emerging markets, to expand the existing body of literature on the topic. Additionally, future research should focus on addressing the current limitations and leveraging more sophisticated data and methodologies. By doing so, studies can uncover deeper insights into the behavioural and systemic drivers of ETF performance, especially in the context of EPU, helping to advance our understanding of these investment vehicles in complex financial landscapes.

**Key words:** Business Confidence Index, Economic Uncertainty, Exchange Traded Funds, Generalized Autoregressive Conditional Heteroskedasticity, Markov Switching Regression Model.

## **GLOSSARY OF ACRONYMS**

ADF	-	Augmented Dickey – Fuller
AIC	-	Akaike Information Criteria
ALSI	-	All Share Index
AMH	-	Adaptive Market Hypothesis
ANC	-	African National Congress
AR	-	Autoregressive
ARCH	-	Autoregressive Conditional Heteroskedasticity
AUM	-	Assets Under Management
BCI	-	Business Confidence Index
BER	-	Bureau of Economic Research
BSE	-	Bombay Stock Exchange
CAPM	-	Capital Asset Pricing Model
CPI	-	Consumer Price Index
CWT	-	Continuous Wavelet Transform
EGARCH	-	Exponential Generalised Autoregressive Conditional Heteroskedasticity
EMH	-	Efficient Market Hypothesis
EMV	-	Equity Market Volatility
EPU	-	Economic Policy Uncertainty
ETF	-	Exchange Traded Fund
EU	-	Economic Uncertainty
FFR	-	Federal Funds Rate
GARCH	-	Generalised Autoregressive Conditional Heteroskedasticity
GARCH-M	-	Generalised Autoregressive Conditional Heteroskedasticity in Mean
ICAPM	-	Intertemporal Capital Asset Pricing Model

IMF	-	International Monetary Fund
IPO	-	Initial Public Offering
IRF	-	Impulse Response Function
JSE	-	Johannesburg Stock Exchange
KPSS	-	Kwiatkowski, Phillips, Schmidt & Shine
MA	-	Moving Average
MSVAR	-	Markov Switching Vector Autoregression
NARDL	-	Nonlinear Distributed Lag
NAV	-	Net Asset Value
NYSE	-	New York Stock Exchange
OLS	-	Ordinary Least Squares
PU	-	Political Uncertainty
REER	-	Real Effective Exchange Rate
REIT	-	Real Estate Investment Trust
RMB	-	Rand Merchant Bank
SARB	-	South African Reserve Bank
SBIC	-	Schwarz's Bayesian Information Criterion
SOE	-	State Owned Enterprise
SVB	-	Silicon Valley Bank
TGARCH	-	Threshold Generalised Autoregressive Conditional Heteroskedasticity
UK	-	United Kingdom
US	-	United States
VAR	-	Vector Autoregressive
VIX	-	Volatility Index

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## **CHAPTER 1: INTRODUCTION**

### **1.1. Background and Problem Definition**

The finance field has historically been built on the concept of "efficient markets." Though this concept can be understood in different ways, the Efficient Market Hypothesis (EMH) is a key element of traditional financial theory. It suggests that, at any point in time, the prices of all assets and securities in the market fully reflect all available information. In recent decades, finance has developed with the assumption that people make rational choices and have unbiased expectations about the future. Individual investors are seen as rational decision-makers who thoughtfully evaluate economic factors when making investment choices. A rational investor can be defined as someone who promptly updates their beliefs in response to new information and makes choices that align with normative standards (Nofsinger, 2017; Marschner, Ceretta & Ambrozini, 2024). According to EMH, investors make rational decisions when buying and selling securities based on all publicly available information, resulting in asset prices that accurately reflect the true fundamental value of the underlying assets.

The EMH has been subject to significant criticism over time, with many pointing out its inability to explain real-world phenomena. A key point of contention is that anomalies such as the price-earnings ratio anomaly, herding behaviour, and noise trading challenge the assumption that asset prices always reflect all available information accurately (Qiu & Yang, 2022). Critics argue that these anomalies highlight market inefficiencies that the EMH fails to account for. Furthermore, experts in behavioural finance emphasize that predictable irrational behaviours, such as overreaction and overconfidence among investors, can lead to market distortions, contradicting the EMH's premise of rational behaviour (Kim, Shamsuddin & Lim, 2011). These psychological factors often create market inefficiencies and mispricing, which the EMH does not explain.

Critics also blame the belief in the EMH for contributing to the global financial crisis, arguing that the assumption of self-correcting markets led to insufficient regulatory oversight, playing a role in the crisis (Kim et al., 2011). The EMH's reliance on the Random Walk Theory—suggesting that stock prices follow an unpredictable path—adds to the criticism. Researchers point out that emotions and psychological factors can influence market prices, creating inefficiencies that contradict the EMH's assertion of randomness in price movements (Daniel, Neves & Horta, 2017). Additionally, studies such as the one by Rounaghi & Nassir Zadeh (2016) have found patterns in financial data that challenge the idea of market efficiency.

Historical events like the dot-com bubble of the late 1990s and the 2008 global financial crisis further demonstrate that markets can behave in ways that significantly deviate from the predictions of the EMH. The presence of market bubbles, crashes, and the surprising profitability of basic technical strategies suggest that markets are not always efficient, highlighting the limitations of the hypothesis, particularly in explaining market anomalies and the role of irrational investor behaviour in shaping market outcomes (Maloumian, 2022).

Additionally, emerging markets, including South Africa, are often considered less efficient than developed markets. Factors such as lax insider trading regulations, lower liquidity, and non-normal distribution of market returns contribute to this lower efficiency. While the EMH suggests that it is difficult to consistently achieve above-average risk-adjusted returns, the lower efficiency in emerging markets implies that there may be more opportunities for active management to outperform the market (Wagner & Margaritis, 2017; Wang & Zhang, 2024).

These anomalies highlighted the shortcomings of the EMH and the field of behavioural finance emerged in the 1980s and 1990s, challenging the assumption of fully rational investors. Behavioural finance combines insights from psychology and cognitive science to understand why investors frequently make irrational decisions, leading to market inefficiencies. This is particularly relevant in emerging markets where economic and political uncertainties are higher (Lo, 2005). The work of Tversky and Kahneman (1974) on cognitive biases was instrumental in shaping this field. They identified systematic errors in judgment, such as overconfidence, loss aversion, and anchoring, that affect decision-making. These biases lead investors to make decisions that are not entirely rational, causing them to deviate from optimal investment strategies. Mullainathan & Thaler (2000) further developed the concept of bounded willpower, suggesting that investors are more influenced by short-term concerns and emotions than by long-term considerations. This inconsistency between short-term motivations and long-term goals can lead to suboptimal investment decisions, especially when investors are swayed by temporary market trends or behavioural biases. Emerging markets like as South Africa are prone to higher levels of uncertainty due to less diversified economies, political shocks, and less effective stabilization policies (Binge & Boshoff, 2020). This uncertainty can lead to greater volatility in financial markets affecting assets such as stocks, bonds and Exchange Traded Fund (ETF) performance as investors react to global and local economic events (Glebocki & Saha, 2024).

. As a result, investors may become overenthusiastic during bull markets, chasing stocks based on recent performance rather than fundamental value, or they may panic during downturns, selling off assets in response to short-term volatility. These behaviours contribute to the creation of asset bubbles and market crashes, which cannot be fully explained by traditional financial models. The growing recognition of these factors has led to the development of new strategies in asset management and market analysis, incorporating behavioural insights to better understand and predict investor behaviour. Furthermore, the rise of behavioural finance has prompted policymakers and financial institutions to consider how cognitive biases might influence regulation and market stability, sparking an ongoing dialogue about how to improve decision-making processes in the face of human limitations. However, while behavioural finance provides valuable insights into market anomalies, it too faces limitations. It tends to focus heavily on irrational behaviour, but does not fully account for the role of rationality in shaping market outcomes. Additionally, it lacks a coherent framework to explain how markets evolve and how investor behaviour changes over time. This is where the Adaptive Market Hypothesis (AMH) offers a more comprehensive approach.

The AMH incorporates the role of cognitive biases in investor behaviour, acknowledging that these biases are not only present but are also adaptive in nature. According to the AMH, cognitive biases such as overconfidence, self-attribution, loss aversion, and herding behaviour influence the decisions of investors, leading to market inefficiencies. However, these biases are not permanent; they evolve as market participants adapt to changing conditions (Lo, 2005). However, during periods of economic uncertainty (EU), crisis, or market bubbles, investor psychology becomes more influential, leading to greater inefficiencies in the market. In such times, return predictability may increase, as market prices deviate from their fundamental values and exhibit trends that can be exploited by savvy investors. The AMH suggests that return predictability is therefore not a fixed feature of financial markets, but rather a dynamic characteristic that depends on the broader market environment (Mushinada, 2020b).

Since the publication of John Kenneth Galbraith's influential book, *The Age of Uncertainty*, in 1977, uncertainty has been increasingly recognized as a critical issue in finance, drawing attention both in media coverage and academic discussions (Galbraith, 1977). Over the years, numerous significant events have underscored the pervasive nature of uncertainty, particularly in the context of financial markets and economic outcomes. One of the most prominent and consistent drivers of economic instability has been policy uncertainty, which continues to shape

the economic landscape in profound ways. This is evident in the recent periods of sluggish economic growth experienced by countries struggling with ambiguous or unpredictable policy directions. The challenges posed by policy uncertainty are far from new, but they have become more acute in recent years, with rising volatility in both domestic and global markets.

In today's world, uncertainty has become more pronounced and impactful than ever before, largely due to the rapid pace of technological advancements and the increasing interconnectedness brought about by globalization. These forces have dramatically reshaped not only the global economy but also the ways in which individuals, businesses, and governments operate. In addition to technological and economic changes, social and political factors have also contributed significantly to the rising levels of uncertainty. The deepening political divisions and polarization, particularly in major economies, have amplified feelings of instability, as has the growing prominence of government spending and intervention in the economy. These factors, in combination, have created an environment where uncertainty is a central concern for financial markets, businesses, and policymakers alike, making it a pivotal issue in contemporary economic and financial analysis. (Baker & Bloom, 2013; Al-Thaqeb & Algharabali, 2019). The global interconnectedness means that events in one area can influence others, and the complexity of today's world naturally heightens uncertainty. Owing to the increasing popularity of Exchange Traded Funds (ETFs), this study seeks to explore the impact of EU on financial markets, specifically examining its effect on returns and volatility within the South African ETF market. This chapter discusses how EU affects financial markets and the rising prominence of ETFs in South Africa.

### **1.1.1. An Overview of Economic Uncertainty**

Literature has identified three broad reasons to explain why uncertainty plays such a crucial role in financial markets. These reasons can be explained through the real options, risk aversion, and the growth options effect (Bloom, 2014). The real options approach views firms as facing multiple projects that may need to be halted if prospects diminish (Bernanke, 1983). For this to impact the macroeconomy, several preconditions are necessary: firms must face partial irreversibility in investment, they should not be engaged in a patent race, and they must operate in an environment where today's decisions affect future actions (Redl, 2015). Under these conditions, uncertainty can reduce productivity by impeding the expansion of productive firms and limiting the contraction of unproductive ones, as both await greater clarity. This effect can create pro-cyclical productivity, linking these shocks to the business cycle (de Andrés, de la Fuente & Velasco, 2021).

Uncertainty also influences the financial system by increasing investors' demand for a higher risk premium and raising default risk, which subsequently elevates the default risk premium (Redl, 2015). Additionally, uncertainty can create and amplify financial stress (Arellano, Bai & Kehoe, 2012; Christiano, Motto & Rostagno, 2014; Al-Thaqeb & Algharabali, 2019). Risk-averse households may engage in precautionary saving, which might contract economic activity in the short term but foster long-term growth.

Despite these factors, uncertainty is often viewed negatively and linked to unfavourable outcomes. Growth options are situations where investors face the risk of losing their investment but have the potential for unlimited gains, creating a call option effect (de Andrés *et al.*, 2021). However, empirical studies consistently show a negative macroeconomic response to uncertainty (Redl, 2015). One reason for this negative view is that individuals may be "ambiguity averse," meaning they struggle to assign accurate probabilities to future events and, as a result, focus on the worst-case scenarios within their range of possibilities (Ilut & Schneider, 2014). As a result, any expansion in the range of potential outcomes typically worsens future expectations.

Uncertainty has reached unprecedented heights due to the transformative impact of technology and globalization. Political divisions, along with the increasing role of government spending in the global economy, have played a significant part in this rise (Al-Thaqeb & Algharabali, 2019). In a world that is more interconnected than ever, events in one region can have a cascading effect on others, adding to the complexity and amplifying uncertainty. Recent shocks to the global economy have established a new normal of turbulence, often driven by political fragmentation between nations. These disruptions have pushed uncertainty to extraordinary levels. Ahir, Bloom, & Furceri (2023) identify several key factors contributing to this, such as trade tensions, the pandemic, and Russia's war in Ukraine, as shown in Figure 1.1. Notable spikes in uncertainty occurred after the United Kingdom's (UK) Brexit vote and the unexpected outcome of the 2016 United States (US) presidential election. US-China trade tensions, the COVID-19 pandemic in 2020, and Russia's invasion of Ukraine further intensified global uncertainty.

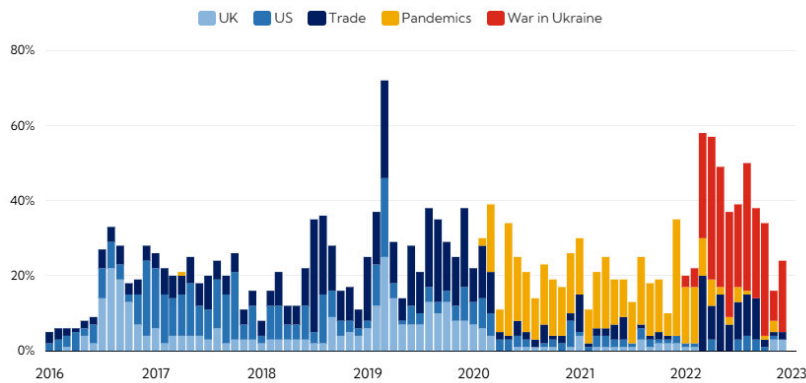


Figure 1.1. Uncertainty Drivers

Source: Ahir, Bloom, & Furceri (2023)

The impact of Brexit on the South African economy was forecasted to be marginal given the scale of South African exports to the UK scaled at 4 percent (Gibb, 2016) however, the broader consequences of this event still impacted global financial markets and, by extension, the South African market. Brexit led to heightened uncertainty in European markets, causing increased volatility in global equities, currencies, and commodities and ETFs. Faced with one of the largest global economic shocks in history, the COVID-19 pandemic has had a detrimental impact on the global economy due to the various national state of disaster measures implemented such as lockdowns and quarantining. Amidst these significant global shifts, the onset of the COVID-19 pandemic marked a new era of financial volatility, exacerbating existing economic uncertainties and challenging nations worldwide. An initial sharp decline in stock market returns was observed due to panic selling by investors. This negative impact was particularly pronounced in emerging markets, which are generally more sensitive to global shocks (Shabir, Jiang, Wang & Işik, 2023).

A PwC (2020) report highlighted that the volatility of major asset classes, such as interest rates, equities, foreign exchange, and trade credit, serves as one of the key risk indicators for market participants. In contrast to previous health crises like the 2003 SARS epidemic and the 2015 Ebola outbreak, which resulted in brief periods of volatility, the COVID-19 pandemic exposed financial markets to unprecedented levels of volatility, marking some of the highest fluctuations observed in the past century (PwC, 2020).

The impact of uncertainty varies from one country to another (Li, Balcilar, Gupta, & Chang, 2016). However, there is no consensus on the direction or strength of the relationship between the economic policy uncertainty (EPU) index and stock markets in developing economies. The

EPU index was introduced by Baker, Bloom, and Davis (2016) to measure EPU by combining various indicators from news, policy, markets, and economic data. The index, referred to as the EPU index, is derived by averaging three distinct components: the frequency of newspaper articles addressing policy-related EU, the number of federal tax code provisions set to expire soon, and the extent of disagreement among economic forecasters. The authors highlight that monitoring policy-related EU in major newspapers offers valuable insights into the prevailing trends of economic policy uncertainty, making it an important tool for understanding fluctuations in EPU. This measurement involves analysing articles that include terms such as “economic,” “economy,” “uncertainty,” or “uncertain,” combined with references to “regulation,” “legislation,” or terms like “congress,” “white house,” “federal reserve,” or “deficit” (Al-Thaqeb & Algharabali, 2019). Some studies suggest that the EPU index has a substantial effect on emerging markets due to credit constraints (Carrière-Swallow & Céspedes, 2013), while others argue that its impact is less significant in various emerging markets (Das & Kumar, 2018).

South Africa's EU is deeply intertwined with its political and social history, particularly the legacy of apartheid, which led to international sanctions and economic isolation. Following the end of apartheid, the country faced a mix of hope and significant challenges, such as high unemployment, inequality, and ongoing political uncertainty (PU) (Tabash, Al-Absy, Albzour & Mahmoud, 2023). PU has been recognized as a major factor hindering economic growth in South Africa. This observation aligns with findings in both developed and emerging markets, where economic and PU shocks have long-lasting negative effects on economic activity (Binge & Boshoff, 2020). The relationship between economic and PU and lower investment rates is particularly evident in South Africa, where multiple studies highlight that political instability and EPU undermine investment levels and erode business confidence (Fielding, 2002; Fedderke & Szalontai, 2009; Hossain, Voumik, Ahmed, Alam & Tasmim, 2024). There is a clear link between EPU and PU in South Africa, with political dysfunction post-2014 significantly contributing to rising EPU, which in turn affects both businesses and capital holders (Fasanya & Makanda, 2024). The escalating uncertainty has far-reaching consequences across various economic sectors, including investment, credit markets, capital flows, and consumption. Ultimately, these factors result in slower economic growth and higher unemployment rates (Nguyen & Nguyen, 2023).

Studies by Karnizova & Li (2014), Xiong, Bian, & Shen (2018), and Wen, Xiao, & Wu (2019) demonstrate that EPU tends to increase stock market volatility and results in declining stock

returns. Ghani & Ghani (2024) specifically examine the effects of EPU on emerging markets, focusing on the Pakistani economy, which, like South Africa, has experienced significant economic and political fluctuations. Analysing emerging markets is crucial due to the role of developing economies in the global landscape, characterized by rapid growth, expanding populations, and international business expansion (Ghani & Ghani, 2024).

EPU affects stock market volatility in multiple ways. It generates uncertainty about future economic conditions, leading investors to adopt a more cautious approach and become uncertain about the economy's future direction. This heightened uncertainty can erode investor confidence and lead to increased volatility as investors grapple with unpredictable investment returns. Moreover, EPU raises the risk associated with investments, complicating risk management and mitigation strategies. Uncertainty can also reduce capital flows, further contributing to market volatility. This environment of unpredictability not only affects overall market performance but also hampers managerial decision-making, making it challenging for leaders to develop effective strategies (Mishra, Nakhate, Singh & Kar, 2023).

EPU has a substantial negative correlation not only with stock market performance but also with bond prices, production levels, and investment activities (Pastor & Veronesi, 2013; Gilchrist, Sim, & Zakrajsek, 2014). One key way EPU affects the economy is by significantly influencing bond markets. Specifically, it raises risk premiums, leading to higher borrowing costs and reduced productivity (Balcilar, Usman, Gungor, Roubaud, & Wohar, 2021). Additionally, the non-diversifiable nature of policy uncertainty has a notable impact on bond liquidity, affecting both investors' return expectations and corporations' cost of capital (Black, Das, & Leal, 2025). During times of high EPU, the bond market exhibits greater co-movement with other financial markets, a reflection of cross-market hedging demands (Sakemoto, 2018). Furthermore, stock market volatility during periods of uncertainty can enhance diversification benefits in the bond market as investors seek safer assets (Bahmani-Oskooee, Ghodsi, & Hadzic, 2020).

In the context of the US market, Li, Zhang, and Gao (2015) demonstrate how the EPU index influences the relationship between the stock and bond markets, while Fang, Yu, and Li (2017) underline its long-term correlation with US equity markets. Additionally, Holmes and Maghrebi (2016) suggest that stock market volatility could indirectly contribute to rising unemployment rates, indicating that policy uncertainty may also lead to job losses in the broader economy. As EPU continues to shape global financial dynamics, understanding how

individuals and markets respond to such unpredictable conditions becomes increasingly critical. This is where behavioural finance plays a crucial role, offering valuable insights into the psychological and emotional factors that drive financial decision-making during times of economic instability.

Behavioural finance provides an alternative viewpoint on the EMH, built on three fundamental assumptions. First, it asserts that investors are rational and aim to maximize their utility. Second, if investors are deemed irrational, their trades are considered random, effectively negating any impact on market prices. Lastly, it assumes that rational arbitrageurs can counterbalance the effects of irrational investors on market pricing (Ibenrissoul, 2022). While rational investors rely on logic and economic principles, "smart" investors make informed, strategic decisions while adapting to market changes and understanding the details of risk and opportunity. However, research by Jain, Jain, and Jain (2015) emphasize that human decision-making often exhibits incompetence, inconsistency, and irrationality when confronted with uncertainty.

Understanding the intricacy of investor behaviour makes information analysis vital for decision-making, particularly in stock market transactions where having access to current information is very important. External factors, including media coverage, broker and friend advice, and ratings from financial magazines, can result in less-than-ideal choices, according to Shanmugasundaram & Jansirani (2012). Moreover, Jain *et al.*, (2015) contended that investors usually exhibit emotional and cognitive biases, a lack of self-control, overconfidence, misjudgement of information, overreaction, and herd behaviour, which diverge from the logical presumptions of established finance theories. Emotional expectations can significantly impact investment decisions, influencing managements' expectations within firms, particularly during crises and periods of EU when accurate forecasts become increasingly challenging (Ben-David, Graham, & Harvey, 2010; Fateye, Peiser & Ajayi, 2024).

The role of noise traders adds complexity to the financial market dynamics. These traders, influenced more by misinformation than by fundamental analysis, can significantly impact market conditions, particularly during turbulent periods. Black (1986) describes these participants, who operate without insider knowledge and react irrationally to noise in pursuit of abnormal returns, as "noise traders". Traditional financial theory posits that rational investors can eliminate the effects of noise traders through arbitrage (Rupande, Muguto & Muzindutsi, 2019). However, Akbas, Boehmer, Jiang, & Koch (2019) argue that rational

investors only engage with these noise traders when the potential premium is sufficiently attractive. Furthermore, a number of restrictions on financial market arbitrage frequently make it difficult for experienced investors to successfully combat the illogical actions of noise traders (Chu, Hirshleifer, & Ma, 2017). These restrictions include legal prohibitions on short sales as well as the dangers of short sales, such as the growing expense of stock loans and the possibility of recalls (Engelberg, Reed, & Ringgenberg, 2018).

The trading behaviour of noise traders has been linked to overall market sentiment (Brown, 1999). Sentiment represents the collective attitudes of investors toward particular assets or markets, regardless of fundamental information (Xiang & Borjigin, 2024; Pantzalis, Park, & Wang, 2025). Noise traders tend to be more active during periods of elevated sentiment, often mistaking this optimism for reliable fundamental signals rather than recognizing it as a mere indicator (Shen, Yu, & Zhao, 2017). Their dependence on recent non-fundamental data leads to flawed assumptions about return distributions, which contributes to mispricing (Miwa, 2016). In contrast, during low sentiment periods characterized by pessimistic outlooks, noise traders are less active as they generally avoid short positions (Uygur & Taş, 2014). As a result, mispricing is more likely to occur during high sentiment periods than during low sentiment phases.

The mispricing that occurs during periods of heightened sentiment, largely driven by the actions of noise traders, contributes to an increase in market volatility (Bahloul & Bouri, 2016). According to Devault, Sias, and Starks (2019), as sentiment intensifies, sentiment-driven traders often transition from safer, more stable investments to riskier, higher-return assets. This shift in behaviour, characterized by herd mentality among noise traders, leads to a significant surge in trading volumes, which in turn exacerbates market volatility (Blasco, Corredor, & Ferrer, 2018; Economou, Hassapis, & Philippas, 2018; Hudson, Yan, & Zhang, 2018). With the growing presence of sentiment traders, mispricing becomes more pronounced, creating opportunities for rational arbitrageurs to take advantage of these distortions and profit from them. However, their actions are often constrained by factors such as noise trader risk and short-selling restrictions. Consequently, sentiment traders' tendency to underestimate risk, coupled with limited arbitrage activity, leads to overvaluation and the formation of price bubbles (Taffler, Agarwal, & Wang, 2017). When sentiment declines and expectations shift, these bubbles can collapse, prompting widespread portfolio liquidations by sentiment traders and triggering further market volatility (Shu & Chang, 2015).

The influence of noise traders adds significant complexity to financial markets, particularly during periods of heightened sentiment despite traditional theories suggesting that rational investors could counteract these effects. Literature has explored both the individual and overall effect of EPU on sectors such as exchange rate expectations (Beckmann & Czundaj, 2017) and the co-movement of stock markets (Li & Peng, 2017) with little insight into ETF markets which creates a gap in research which this paper aims to fill.

### **1.1.2. An Overview of Exchange Traded Funds**

The failure of actively managed funds to consistently outperform market returns led to the emergence of passively managed funds as a financial innovation (Kaur, Singh & Seth, 2021; Rajabi, Linnenluecke & Smith, 2024). Over the years, investors have become increasingly disillusioned with the ability of traditional mutual funds to generate superior returns, particularly after accounting for management fees and other costs. This dissatisfaction provided fertile ground for the rise of passive investing strategies, of which ETFs have become a dominant force.

An ETF is a pooled investment vehicle created to mirror the risk and return profile of a particular index by holding a carefully chosen portfolio of securities (Strydom, Charteris & McCullough, 2015). Unlike actively managed funds, ETFs are primarily passively managed, striving to closely follow their benchmarks (Itzhak, Franzoni & Moussawi, 2017). This means that there is no fund manager continuously adjusting the portfolio based on market conditions; instead, the index determines the fund's composition. Consequently, the management fees for ETFs are typically lower than those for actively managed funds. Lower fees make ETFs an attractive option for cost-conscious investors who seek market exposure without incurring excessive charges.

When purchasing shares in an ETF on the stock exchange, investors only incur transaction costs without additional issuance fees. This characteristic enhances liquidity and accessibility, making ETFs a popular choice among retail and institutional investors alike. Because ETFs are designed to mirror their benchmark indices, they cannot exceed the performance of the index they track (Barker & Chiu, 2017). However, this does not mean that ETFs are without risks or limitations. The replication process may introduce tracking errors, which can cause the ETF to deviate slightly from its intended benchmark. Additionally, ETFs that track less liquid indices may experience issues related to price discovery and execution efficiency.

The success of ETFs can be attributed to several key factors. ETFs provide easy access to diverse investment opportunities, enabling portfolio construction regardless of the investor's size or time horizon (Chen, Lee & Hsu, 2017). They allow for efficient asset allocation, risk diversification, and exposure to a wide range of asset classes, including equities, fixed income, commodities, and real estate. The versatility of ETFs extends beyond their broad market indices to include sector-specific, thematic, and factor-based ETFs, providing investors with tailored investment solutions.

Additionally, ETFs generally offer higher after-tax returns compared to mutual funds, primarily due to their lower portfolio turnover and the use of in-kind redemptions, both of which help minimize the distribution of capital gains (Poterba & Shoven, 2012). On the other hand, mutual funds are obligated to distribute capital gains to their shareholders on an annual basis, which can lead to tax inefficiencies for investors. The in-kind creation and redemption process employed by ETFs helps to address this issue by enabling large institutional investors, known as authorized participants (APs), to exchange ETF shares for the underlying securities. This mechanism reduces the occurrence of taxable events, thus contributing to greater tax efficiency.

Furthermore, ETFs facilitate tax loss harvesting, allowing investors to sell securities at a loss to offset capital gains taxes (Nyukorong, 2020). This strategy can be particularly advantageous in volatile markets, where investors can take advantage of short-term declines to optimize their tax liabilities. Collectively, these characteristics make ETFs an attractive option for a wide range of investors, from retail traders to sophisticated institutional investors. However, while ETFs provide investors the opportunity to diversify their risk-return profiles, they can also pose certain challenges if not fully understood.

New investors may struggle with the unfamiliar asset classes and strategies that ETFs involve, resulting in limited understanding of the underlying assets, key return drivers, and associated risks (Blitz, Huij & Swinkels, 2012). Even investors with significant experience in international equities may not have a complete understanding of the unique risks associated with international corporate bonds, direct currency investments, or small-cap stocks in emerging markets. Additionally, ETFs that track alternative assets, such as commodities or leveraged indices, can introduce complexities that are difficult to navigate for inexperienced investors.

The ability to trade ETFs on exchanges brings additional costs, including commissions, bid-ask spreads, and possible premiums or discounts relative to the net asset value (NAV), all of

which can diminish overall returns (Barker & Chiu, 2017). Unlike mutual funds, which trade at their NAV at the end of the trading day, ETFs trade throughout the day at market prices, which may diverge from the underlying NAV. This feature, while advantageous for liquidity and flexibility, can sometimes lead to unfavourable trading conditions, particularly in volatile markets.

Although ETFs are an appealing option for novice investors, it is essential to consider their potential drawbacks and risks. Some ETFs, particularly those employing derivatives or leverage, carry higher risk levels than traditional index-tracking ETFs. Leveraged ETFs, for instance, aim to amplify returns by using financial derivatives, but they can also magnify losses, making them unsuitable for long-term investors who are unaware of the compounding effects.

In 2023, ETFs celebrated their 30th anniversary worldwide. These funds have played a key role in making investing more accessible, now amassing an impressive \$10 trillion in assets under management (AUM). Satrix introduced its flagship Satrix 40 ETF in November 2000, marking the launch of the first South African ETF, coinciding with the product's debut in Europe. The introduction of ETFs in South Africa revolutionized the investment landscape by providing local investors with cost-effective exposure to the Johannesburg Stock Exchange (JSE) and global markets.

In South Africa, ETFs have attracted significant inflows due to their resilience, positioning them as an appealing choice for investors navigating the challenges of the pandemic and the current economic climate. As at 2023, ETFs in South Africa hold an AUM of R129 billion (Mbhokota, 2023). This figure reflects the increasing popularity of ETFs among retail and institutional investors, as well as the growing awareness of their benefits.

The integration of South Africa's financial markets with global markets means that shocks from major economies can increase return and volatility in South African markets. This interdependence is particularly evident during periods of high uncertainty (Boakye, Mensah, Kang & Osei, 2023). South Africa's economy is also sensitive to internal factors such as political instability, frequent electricity load shedding, and significant foreign investment outflows. These factors further exacerbate the impact of EU on ETFs (Tita, French, Gurdgiev & Obalade, 2025).

Ben-David, Franzoni & Moussawi, (2018) and Da & Shive, (2018) found evidence of noise traders within the market. This suggests that investor decisions may not always be based on rational analysis. It is crucial for investors to fully understand any investment product before

committing their funds. Unfortunately, many individuals, both young and old, seem to be inadequately informed about these innovative investment vehicles (Box, Davis, Evans & Lynch, 2021). There are also concerns that certain investors, such as "mattress stuffers" and "bargain hunters," are making hasty decisions that are not aligned with their long-term financial goals.

In this scenario, access to fundamental information can play a crucial role in shaping investment decisions (Nyukorong, 2020). Given these dynamics, it is crucial to understand how ETF returns can vary significantly across different market conditions, impacting the potential risks and rewards of uninformed investors. This understanding is vital because if a fund's performance fluctuates with changing market conditions, relying on its overall performance may result in misleading conclusions about the fund manager's market-timing and security selection abilities. This issue arises when no consideration is given to the increased risk exposure associated with a fund's consistent performance throughout the sample period (Kunjal, Peerbhai & Muzindutsi, 2021).

Therefore, understanding the manner in which EU impacts South African ETF volatility as well as the returns under changing market conditions is of paramount importance to this study. Future research should also explore the evolving role of ETFs in emerging markets, their potential impact on market stability, and how regulatory frameworks can be improved to mitigate risks associated with excessive speculation and liquidity mismatches. As South African investors continue to embrace ETFs as a core component of their portfolios, education and awareness will play a crucial role in ensuring informed decision-making and sustainable investment outcomes.

## **1.2.Problem Statement**

The impact of economic and political uncertainty EU on financial markets has been extensively studied, particularly in relation to stock and bond markets. However, research on how EU influences the performance and volatility of ETFs, especially in emerging markets like South Africa, remains limited. Emerging markets are particularly vulnerable to volatility due to a combination of domestic political instability, external economic shocks, and socio-economic challenges. South Africa, as one of the largest emerging markets in Africa, offers a unique opportunity to explore the relationship between EU and ETFs, particularly as it faces a turbulent political and economic environment.

Since its transition to democracy in 1994, South Africa has encountered significant political, economic, and social challenges. Corruption, weak governance, and mismanagement of key state-owned enterprises (SOEs), such as Eskom and Transnet, have contributed to an unstable economic landscape. In 2017, the IMF revised South Africa's growth forecast downward, citing both internal political instability and external global economic shocks. These uncertainties have deepened investor hesitation, creating an environment where market participants demand higher returns to compensate for the elevated risks. This has led to increasing market volatility, especially within the ETF sector, which has grown substantially in recent years.

The South African ETF market expanded from R16.4 billion in 2008 to R178.2 billion in early 2024 (Kunjil *et al.*, 2021; Brown, 2024), indicating growing interest from local and international investors seeking portfolio diversification. ETFs have become an attractive option due to their lower fees, liquidity, and diversification benefits. Despite this growth, the South African ETF market remains exposed to both domestic and international uncertainties. For example, in 2023, the South African Rand traded between R18 and R19 to the US Dollar (Reuters, 2023), experiencing significant fluctuations exacerbated by political instability, the ongoing energy crisis, and global market disruptions.

While existing literature has explored the effects of EU on stock returns (Binge & Boshoff, 2020) and market volatility, few studies have focused on the implications for ETF performance in South Africa. ETFs are particularly interesting because they combine both equity and bond market components, making them an important asset class for studying how EU affects investor behaviour and market dynamics across multiple asset types. Moreover, uncertainty often leads to irrational investor behaviour, such as the rise of "noise traders" who act on emotional impulses rather than fundamentals, amplifying volatility and complicating risk assessment.

Understanding how EU influences ETF returns and volatility is crucial for both local and international investors who increasingly look to diversify their portfolios in emerging markets. In times of heightened uncertainty, such as political instability or economic crises, investors often shift towards safer assets like government bonds, causing fluctuations in bond prices and yields. Similarly, the impact of uncertainty on equity ETFs can vary across sectors and industries, influenced by investor sentiment, earnings expectations, and broader economic conditions. By focusing on South Africa, this study aims to provide valuable insights into how EU affects the returns of bond and equity ETFs in a market that is vulnerable to both domestic and global uncertainties.

Furthermore, understanding how EU influences ETF volatility is critical for effective risk management and investment decision-making. ETF volatility serves as an important indicator of market risk, and heightened uncertainty typically leads to increased volatility, as risk-averse investors demand higher premiums or engage in precautionary saving. Portfolio managers and institutional investors must understand the dynamic between EU and ETF volatility to develop strategies to hedge against market downturns or capitalize on opportunities arising from market inefficiencies.

Despite the growing importance of the South African ETF market, research specifically addressing how EU affects ETF performance and volatility is sparse. This study seeks to fill this gap by empirically analysing the impact of EU on bond and equity ETF returns and volatility in South Africa. The findings will provide valuable insights for investors, policymakers, and financial analysts, helping them navigate the complexities of the South African market, which remains susceptible to both domestic political instability and global economic risks.

While there is an established body of research on the effects of EU on financial markets, the specific impact on South African ETFs has been largely overlooked. Given South Africa's unique challenges, including political instability, economic crises, and global uncertainty, this study aims to provide much-needed insights into how EU influences ETF returns and volatility. This research will contribute to the literature on market uncertainty in emerging markets and offer practical guidance for investors looking to navigate the South African ETF market.

### **1.3. Research Aim and Objective**

Based on the preceding problem statement, this study's primary aim is to examine the effects of EU on ETF return and volatility in the South African market.

The research objectives to achieve this central aim are as follows:

1. To determine how EU influences bond and equity ETFs returns in South Africa under bullish and bearish market conditions; and
2. To determine the effect of EU on volatility in the bond and equity ETFs in South Africa.

The objectives of this study are achieved by answering the following questions:

1. How does EU influence the bond and equity ETF returns in South Africa under bullish and bearish market conditions?

2. How does EU affect volatility in the South African bond and equity ETF market?

#### **1.4. Scope and Method of this Study**

The subsequent sections outline the scope and methodology of this study, focusing on the analysis of the South African bond and equity ETF market. Section 1.4.1 presents the scope of the study, detailing the specific ETFs examined, the classification of these ETFs into portfolios and the period of the analysis. It also highlights the data used for assessing volatility and returns across different ETF portfolios. Section 1.4.2 further elaborates on the methodology employed in the study, explaining the models used to assess the impact of EU on ETF returns and volatility. These models include the Markov Switching Regime Model (MSM) and various Generalised Autoregressive Conditional Heteroskedasticity (GARCH) models. Together, these sections provide a comprehensive overview of the study's approach to examining the effect of EU on returns and volatility of the South African ETF market.

##### **1.4.1. Scope of this Study**

This study specifically examines South African bond and equity ETFs, highlighting the diversification benefits these asset classes offer to investors. South African ETFs can be classified into two categories: those that track domestic benchmarks and those that track international benchmarks. The sample consists of 40 South African ETFs (see Appendix A for the full list). Following the methodology of Kunjal and Peerbhai (2021), the ETFs are organized into four portfolios: bond and equity ETFs tracking domestic benchmarks and bond and equity ETFs tracking international benchmarks.

The analysis covers the period from 2006 to 2023 for both equity ETF portfolios. For bond ETFs, those tracking domestic benchmarks are included from 2009 onward, while those tracking international benchmarks are included from 2018. To facilitate comparison, the bond ETF portfolios are analysed from 2018 to 2023. To assess volatility, high-frequency data is required; thus, weekly data is utilized, as supported by Carriere-Swallow & Cespedes (2013), and Kunjal & Peerbhai (2021). Monthly data is also maintained to examine how ETF portfolio returns are affected by changing market conditions.

##### **1.4.2. Methodological Scope**

The study examines the impact of EU, which is proxied by the Bureau of Economic Research (BER) Business Confidence Index (BCI), on South African bond and equity ETF returns and volatility which are segmented into four different portfolios.

To explore the effect of EU on bond and equity ETF returns in South Africa under bullish and bearish market conditions a MSM is utilised. The standard deviation is examined for each portfolio to determine which regime exudes a bull market and which exudes a bear market.

The impact of EU on the volatility of South African bond and equity ETF returns is examined using a GARCH model. Specifically, the study applies the Exponential Generalised Autoregressive Conditional Heteroskedasticity (EGARCH), GARCH, and Threshold Generalised Autoregressive Conditional Heteroskedasticity (TGARCH) models. These models consist of two equations—mean and variance—with the mean equation being used to explore the risk-return relationship. A significant positive coefficient for the risk premium would align with financial theory, which suggests that higher risk is compensated with higher returns. To assess the risk premium in ETF portfolio returns, the mean equation is estimated with a GARCH-in-mean (GARCH-M) specification. The study then compares the information criteria of each model to identify the one that best fits each portfolio. Before applying the empirical models, preliminary data analysis, including unit root tests and descriptive statistics, are performed to ensure the time series data is suitable for estimation. Additionally, diagnostic tests for serial correlation and heteroskedasticity are conducted after model estimation to ensure the reliability of the results.

### **1.5. Structure of this Thesis**

This thesis is organized into six chapters, each serving a distinct purpose in the overall structure of the study. Chapter 1, the introduction, provides a background and outlines the problem statement that justifies the current research, while also presenting the study's objectives, scope, and methodology. In Chapter 2, the theoretical framework is established by comparing traditional finance and behavioural finance, with a particular focus on the role of uncertainty and volatility. This chapter also provides an in-depth examination of ETFs as a unique asset class. Chapter 3 offers a comprehensive review of empirical studies, beginning with the impact of EU on volatility across various asset classes in the stock market. The chapter then explores the effects of uncertainty on both bond and stock ETF markets, before focusing specifically on how uncertainty influences ETF volatility and returns in South Africa. Chapter 4 details the data and methodology used in the study, covering the ETF sample, sample period, and data types, along with a discussion of how each variable is computed. The chapter concludes with an explanation of the empirical models employed to assess the effect of EU on ETF returns and volatility. In Chapter 5, the data analysis and results are presented, including a review of preliminary data and an in-depth discussion of the findings derived from the estimated models.

Finally, Chapter 6 provides a conclusion by summarizing the results and addressing the research questions. It also discusses the implications of the study's findings for investors and offers recommendations for future research in this field.

## **1.6. Summary and Conclusion**

This chapter has explored the significant impact of EU on financial markets, focusing specifically on ETFs in South Africa. The discussion began with a broad examination of financial market uncertainty, emphasizing how unpredictable economic conditions, policy decisions, and geopolitical events shape investor behaviour. The theoretical underpinnings were reviewed, drawing from the EMH and behavioural finance, which provide contrasting perspectives on investor rationality and decision-making. While traditional finance theories suggest that investors act rationally based on all available information, behavioural finance highlights the importance of sentiment, cognitive biases, and psychological factors in driving financial market forces.

A key theme of this chapter was the profound impact of uncertainty on asset pricing, investment decisions, and market volatility. Empirical studies reviewed indicate that increased EU negatively correlates with asset prices, exacerbating volatility and reducing liquidity. This aligns with the findings of Pastor and Veronesi (2012), who highlight how heightened uncertainty leads to wider bid-ask spreads, lower trading volumes, and greater price fluctuations. The mechanism through which uncertainty affects financial markets was explored, particularly in relation to investor sentiment. Noise traders—those who react impulsively to market noise rather than fundamental analysis—become more active during periods of elevated uncertainty, increasing speculative trading and amplifying market inefficiencies.

EPU was identified as a critical factor contributing to stock market volatility, reducing investor confidence, and complicating risk management strategies. The relationship between EPU and financial markets is complex, with evidence suggesting a significant negative correlation with stock and bond prices, production levels, and investment. Several studies, including those by Li, Zhang, & Gao (2015) and Fang, Yu, & Li (2017), indicate that heightened policy uncertainty can trigger increased risk aversion among investors, causing capital outflows and asset price declines. Furthermore, Holmes & Maghrebi (2016) link stock market volatility to rising unemployment rates, underscoring the broader economic implications of uncertainty.

The chapter also examined behavioural finance as an alternative to EMH, offering insights into the psychological and emotional factors influencing investment decisions. Investors often deviate from rational decision-making due to cognitive biases such as overconfidence, herding behaviour, and loss aversion. Jain *et al.* (2015) highlighted how emotional expectations and cognitive distortions lead to suboptimal investment choices, particularly during periods of uncertainty. Moreover, the role of noise traders in exacerbating market inefficiencies was discussed, illustrating how irrational trading activity can distort price signals and contribute to increased volatility.

Given the growing prominence of ETFs in South African financial markets, this chapter reviewed the evolution, advantages, and risks associated with these investment vehicles. ETFs provide a cost-effective and diversified way to gain exposure to a wide range of asset classes, often with lower management fees in comparison to actively managed funds. Their passive management structure ensures that they closely track benchmark indices, reducing the need for frequent portfolio adjustments. However, ETFs are not without risks. Tracking errors, liquidity constraints, and additional transaction costs (such as bid-ask spreads and potential price deviations from NAV) can affect overall returns. Leveraged and inverse ETFs, in particular, introduce complexity and heightened risk, making them less suitable for inexperienced investors.

Despite these challenges, ETFs have gained considerable traction in South Africa. The introduction of the Satrix 40 ETF in 2000 marked a significant milestone, paving the way for increased investor participation in the ETF market. By 2023, the South African ETF market had amassed AUM totalling R129 billion, reflecting growing investor confidence in these financial instruments. However, studies suggest that noise traders play a substantial role in ETF market activity, indicating that some investors may not fully understand the risks associated with these products.

A critical issue raised in this chapter is the impact of EU on South African ETFs, particularly in relation to return volatility. The presence of noise traders and speculative investment behaviour can exacerbate price fluctuations, making it difficult for investors to accurately assess risk-return profiles. Moreover, policy uncertainty, such as the South African government's fiscal policies and regulatory decisions, contributes to market instability, affecting both local and international investor sentiment. Grasping these dynamics is essential

for investors, fund managers, and policymakers who aim to effectively navigate the complexities of ETF markets, especially during periods of uncertainty.

In conclusion, this chapter has provided a comprehensive analysis of financial market uncertainty, its implications for investor behaviour, and the role of ETFs in the South African market. The findings suggest that EU significantly influences ETF returns and volatility, shaping market dynamics in both predictable and unpredictable ways. Given the rapid expansion of the ETF market, further research is needed to explore the evolving role of ETFs in emerging markets, their impact on financial stability, and potential regulatory measures to mitigate risks associated with excessive speculation. As South African investors continue to incorporate ETFs into their portfolios, enhanced financial education and access to reliable market information will be essential in promoting informed investment decisions and sustainable market growth.

## **CHAPTER 2: THEORETICAL FRAMEWORK**

### **2.1. Overview**

Traditional finance theories, including Expected Utility Theory, the Markowitz Portfolio Model, the Capital Asset Pricing Model (CAPM), and the EMH, provide foundational insights into market behaviour, highlighting concepts such as rational decision-making and market efficiency (Aranha, Azevedo & Iba, 2012; Seong & Nam, 2021). According to EMH, stock prices fully incorporate all available information, making it challenging for investors to consistently outperform the market. In contrast, behavioural finance incorporates human emotions and cognitive biases into market analysis, challenging traditional assumptions (Seong & Nam, 2021). While classical finance provides a framework for long-term market behaviour, behavioural finance highlights short to medium-term inefficiencies caused by human behaviour. While EMH asserts that markets are efficient even under uncertainty, behavioural finance illustrates how irrational behaviours can lead to inefficiencies (Thaler, 2016). EU can lead to increased volatility and price swings, which behavioural finance helps explain through investor psychology. In contrast, EMH would argue that such swings are temporary and ultimately revert to reflect true value. Understanding the interplay between EMH and behavioural finance can help investors better navigate EU, recognizing both the potential for efficiency in the long term and the psychological factors that can drive short-term market movements.

Before attempting to understand the driving elements of uncertainty, a review of the theoretical framework of traditional finance is carried out. Thereafter, various theories underpinning behavioural finance are reviewed to determine how uncertainty impacts on investor decisions and impacts on ETF returns and volatility. Chapter 2 concludes by describing the theoretical aspects of ETFs since this study focuses on the ETF asset class.

### **2.2. Traditional Finance**

The EMH asserts that in an efficient market, security prices reflect all available information (Fama, 1970), meaning it is impossible to consistently outperform the market and achieve abnormal returns. Capital market efficiency is defined by three key conditions: zero transaction costs, unrestricted access to market information, and uniformity in market participants' beliefs about the implications of that information (Fama, 1970). There are three levels of market efficiency: weak form, which incorporates all past price data; semi-strong form, which includes all publicly available information; and strong form, which also considers private information (Fama, 1991). Fama (1970) describes an efficient market as one where many investors,

equipped with comprehensive information, actively pursue profit-maximizing opportunities. In these markets, the swift incorporation of new information ensures that stocks are accurately priced (Malkiel, 2003).

The Random Walk Theory underpins EMH and was pioneered by Malkiel (1973). It asserts that the stock price today is unrelated to its past prices. Therefore, this theory posits that past price information cannot be used by investors to earn abnormal returns (Oluwafemi, Famakinwa & Balogun, 2024). As a result, the stock price accurately represents the asset's intrinsic value at any moment, incorporating all accessible information. The Random Walk Theory suggests that the introduction of new information to the market causes random fluctuations (Malkiel, 1973). This implies that actively managed portfolios are ineffective, and investors should consider passive investment strategies instead.

Thus, passive investing is based on the EMH and involves tracking a market-weighted index as an investment strategy (Sharpe, 1964). It is accomplished through investment assets such as index funds and ETFs (Malhotra, 2024). Passively managed funds have gained momentum in their appeal to investors owing to their relatively low costs in comparison to actively managed funds. Behavioural finance examines how psychological factors and emotional biases influence investor behaviour and decision-making in financial markets. Lo (2004, 2005) combined EMH with concepts from behavioural finance, resulting in the development of the AMH. According to the AMH, investors who are typically rational can act irrationally when faced with heightened market volatility. This suggests that periods of increased market volatility may reduce the effectiveness of passive investment strategies. When investors become irrational during such times of EU, the prices of the underlying assets may move away from their true intrinsic values, leading to more significant fluctuations in ETF prices. Therefore, although passive funds are designed to maintain stability, they can still experience considerable volatility, particularly during turbulent market conditions.

### **2.3. Behavioural Finance**

Behavioural finance challenges the foundational assumptions of traditional finance, including perfect information, zero transaction costs, and market efficiency. It emphasizes the significant impact of human behaviour and psychological factors on market anomalies and inefficiencies (Thaler, 2016). Kahneman and Tversky (1979) contest the traditional view of rational utility maximization through their prospect theory, demonstrating that market participants often make decisions influenced by the options available to them (Kamoune & Ibenrissoul, 2022). As a

result, behavioural finance and investor psychology emerge as crucial determinants in financial markets, shaping market outcomes and stability. This field provides valuable insights into how cognitive biases and emotions influence investor decisions. Psychological biases, including overconfidence, herd behaviour, and loss aversion, can play a significant role in creating market anomalies such as bubbles and crashes, which are challenging for traditional financial theories to explain. (Thaler, 2016).

Prospect theory highlights how individuals tend to maximize their profits by comparing against a reference point, making them more sensitive to changes in overall wealth rather than absolute levels. Additionally, individuals have a tendency to take greater risks when facing losses, such as attempting to "recover" losses at a casino, compared to when experiencing gains, indicating a risk aversion in profitable scenarios. Decision-making is also often constrained by a narrow frame of reference, suggesting a need for broader contextual considerations (Kapoor & Prosad, 2017).

These insights from prospect theory highlight how psychological factors shape investor behaviour, which directly ties into the concept of market confidence—a critical factor in the functioning of financial markets. Market confidence influences investment behaviour, market stability, and economic outcomes. It pertains to the overall sentiment and level of trust that investors hold regarding the stability and future prospects of a market or economy. When confidence is high, it typically promotes investment and economic stability, whereas a lack of confidence can result in increased volatility and potential economic downturns (Guo & He, 2020). This can also be applied to bond market pricing, liquidity, and credit risk perception. High confidence leads to lower yields and tighter bid-ask spreads, while low confidence results in higher yields, liquidity shortages, and increased risk premiums, impacting bond issuance and investment (Guo & He, 2020).

Investor sentiment has also been linked to stock return performance during periods of high information uncertainty (Kim, Ryu & Yang, 2021). The information gap between corporate managers and investors poses a challenge, hindering accurate firm valuation. Investors resort to estimating asset prices using perceived values of cash flows and discount rates, resulting in deviations from intrinsic value. Stocks with pronounced information asymmetry become more prone to speculation due to the subjective nature of investor valuations. Furthermore, irrational investors are susceptible to mis-valuations in the face of limited information (Hirshleifer,

2001). Notably, psychological biases such as overconfidence become more pronounced in the presence of higher information asymmetry (Bouteska, 2019; Chen & Lien, 2017).

Zhang & Zhang (2023) investigate how information asymmetry influences investor sentiment by looking at both individual and institutional investors. Institutional investors typically have an advantage due to their access to private information, while individual investors are primarily influenced by their sentiments. In their model, once institutional investors obtain private information, some irrational ones begin trading based on sentiment, which individual investors perceive as meaningful information. This leads to a spill over effect of sentiment, causing both positive and negative news to spread. Individual investors, influenced by institutional sentiment, might incorrectly interpret this sentiment as valuable information, which can distort the way institutional private information affects asset prices. Additionally, the emotional responses of investors can also impact how sensitive asset prices are to new information.

Derrien & Kecskes (2013) demonstrate that information asymmetry leads to inefficient economic and financial decisions. Kelly & Ljungqvist (2012) find that stock prices fall as asymmetry increases with these falls being larger when investors are uninformed. Li (2020) presents two important observations: First, the effect of information asymmetry on equity valuations can differ depending on market conditions. In expanding financial markets, the demand for corporate information to address undervaluation tends to be lower. However, during market downturns, heightened uncertainty leads investors to seek more information, and analyst coverage plays a significant role in reducing undervaluation. Secondly, Li (2020) emphasizes that the availability of information channels is crucial in shaping uncertainty. When access to accurate information is limited, it can amplify psychological biases, particularly in uncertain market conditions. By examining the complex interactions within financial markets, it becomes clear that information asymmetry which refers to the unequal access to crucial data among market participants, is closely tied to investor sentiment. This connection has a profound impact on market behaviour and investment decisions, influencing how markets respond to various economic factors.

Investor sentiment, which refers to the overall optimism or pessimism about future stock price movements (Baker & Wurgler, 2006), is shaped by a variety of factors, including discussions on social media, media coverage, and psychological biases (Thirumala, Verma, Dhanya, Mate & Hota, 2023). It has a significant impact on stock market activity, primarily by influencing asset valuations (Brown & Cliff, 2005). A high level of investor sentiment is typically

associated with a bullish market (Liu, 2015), which can attract noise traders (Renault, 2017) and may reflect investor overconfidence. On the other hand, low investor sentiment is often connected with over-reactions in the market (Piccoli & Chaudhury, 2018). Sentiment within social networks has also been found to predict market movements (Asur & Huberman, 2010) and can affect stock price changes (Oh & Sheng, 2011). In the realm of behavioural finance, it is recognized that investor sentiment can lead to irrational market behaviour due to uncertainty, which stands in contrast to traditional financial theory. Extended periods of either optimism or pessimism can contribute to the formation of market bubbles or crashes, intensifying stock market volatility (Thirumala *et al.*, 2023).

The COVID-19 pandemic had a profound effect on global investor sentiment, primarily driven by the initial uncertainties surrounding the potential economic and business repercussions of the crisis. In addition, the military conflict between Russia and Ukraine, which began in early February 2022, intensified negative market sentiment both regionally and globally. This geopolitical instability led to heightened levels of EPU, investor panic, and increased risk aversion (Mohammed, Obeid, Oueslati & Kaabia, 2023). A year later, in March 2023, the collapse of Silicon Valley Bank (SVB), a major US investment bank, disrupted central banks' efforts to manage inflation and raised concerns about their ability to regulate the financial sector effectively. This event triggered widespread fear throughout financial markets, exacerbating EU and further undermining investor confidence on a global scale. Overall, investor sentiment is influenced by a variety of factors, such as macroeconomic indicators, political events, periods of EU, and trends in financial markets. From the perspective of behavioural finance, investor sentiment—shaped by bounded rationality—can have a substantial impact on financial asset prices. Behavioural biases are often evident in the decision-making processes within financial markets, highlighting the crucial role uncertainty plays in driving market behaviour (Wang, Ma, Niu & Liang, 2021). This concept aligns with the AMH, which posits that market participants adapt their strategies based on evolving conditions, such as uncertainty and psychological biases, further shaping investor sentiment and market dynamics.

#### **2.4. Adaptive Market Hypothesis (AMH)**

Lo (2004) introduced the AMH as a framework intended to provide a more comprehensive explanation of the variations in market efficiency observed over time. This hypothesis incorporates the notion of bounded rationality, originally conceptualized by Simon (1955), alongside the principles of evolutionary theory. From this standpoint, investors who exhibit

bounded rationality do not necessarily seek to maximize their returns but instead aim for outcomes that are sufficiently satisfactory. This tendency arises because the process of optimization can be resource-intensive, both in terms of time and cognitive effort. Moreover, a large proportion of market participants either have limited access to critical information or lack the analytical capacity required to process it thoroughly. Consequently, these individuals prioritize achieving "acceptable" returns rather than striving for the absolute best possible outcomes.

Lo (2004) contended that rather than being the result of purely analytical decision-making, the attainment of satisfactory investment results emerges through an evolutionary mechanism. This process, which involves both trial and error and a form of natural selection, helps to determine which market participants and trading strategies endure over time. Those that prove effective are more likely to persist, while less successful approaches eventually diminish. Within this ever-evolving market environment, investors must continuously adapt, often relying on heuristics as a means of making investment decisions. One of the fundamental implications of the AMH is that market return predictability may appear at certain points, influenced by changing conditions. As a result, market efficiency does not follow a simple, linear improvement over time, as suggested by the EMH. Instead, it exhibits a cyclical nature, fluctuating in response to prevailing market dynamics and proving to be "highly context dependent and dynamic" (Lo, 2004). The AMH framework has been tested in a variety of financial contexts, extending beyond well-established, developed markets (Boya, 2019) to also encompass emerging market economies (Shahid, Coronado & Sattar, 2019; Kilic, 2020). Additionally, its application is not limited to equities, as research has demonstrated its relevance in the bond market as well (Charfeddine, Khediri, Aye & Gupta, 2018).

## **2.5. Uncertainty Conceptualised**

While uncertainty differs from risk, as the latter involves known probability distributions derived from past experiences (Binge & Boshoff, 2020), the terms are often used interchangeably. The CAPM model is considered, a foundational element in financial theory, quantifies systematic or non-diversifiable risk, measured by an asset's beta against its returns (Bodie, Kane & Marcus, 2024). Noteworthy studies by Sharpe (1964) and Jensen, Black & Scholes (1972) demonstrate the significant relationship between risk and return, reinforcing the importance of diversification (Reilly & Brown, 2003). Applying CAPM to financial markets corroborates the assumption that greater risk is associated with higher returns in the long-run (Corelli, 2023).

### **2.5.1. Economic Uncertainty, Returns and Volatility**

The impact of EPU varies by a country's development status, stock market size, and overall economic stability (Christou, Cunado, Gupta & Hassapis, 2017). Pastor & Veronesi (2012, 2013) present models which depict the effect of government policy uncertainty on stock prices. The results of their study reveal that stock prices are influenced not only by EU but also by PU, which is independent of EU. PU is defined as the uncertainty surrounding the potential future policy decisions of the government. To measure PU, the study utilizes the EPU index as a proxy. Their findings indicate that PU carries its own risk premium, and this premium tends to be more pronounced during periods of weaker economic conditions. This observation aligns with the work of Gilchrist *et al.*, (2014), who also highlight that, in addition to increasing the risk premium, EPU also raises borrowing costs, which in turn negatively impacts economic prospects. Therefore, PU is not only a source of risk but also contributes to financial and economic challenges, especially in times of economic fragility. Building on the understanding that EPU and PU exert distinct yet interconnected influences on financial markets, further research has delved into how EPU specifically impacts stock returns and investor behaviour.

Brogaard & Detzel (2015) show that EPU is different from general EU, though they are related. They discovered that EPU affects stock returns in the US, showing a negative EPU premium: stocks that perform well when EPU is high (positive EPU beta stocks) tend to underperform compared to those that do well when EPU is low (negative EPU beta stocks). This happens because investors favour positive EPU beta stocks as a hedge, causing them to overpay for these stocks and resulting in lower returns. Bali, Brown & Tang (2017) observe a similar trend with general EU, identifying a negative uncertainty premium that arises when investors withdraw from the market during high uncertainty periods, leaving optimistic investors to dominate trading in positive uncertainty beta stocks. The demand for these stocks fluctuates with investor sentiment, resulting in lower expected returns following high-sentiment periods.

Emerging markets, including South Africa, are especially susceptible to heightened risk and uncertainty as they often experience recurrent economic and political disruptions. For example, the IMF (2017) noted a rise in PU and a decline in confidence following the downward revision of South Africa's growth forecast for 2018. The years after the COVID-19 pandemic were particularly turbulent for South Africa. In the first half of 2023, the National Index measuring consumer sentiment fell by more than six points, reflecting growing concerns about the economy. Contributing to this decline was a dramatic rise in unemployment, which surged from 23% in the second quarter of 2020 to 32% by 2023 (Sawyer, 2023). Persistent power

shortages, dating back to 2007, further undermined consumer confidence, as evidenced by a 1.3% contraction in the economy during the fourth quarter of 2022.

During periods of heightened uncertainty, investment typically declines alongside disposable income (Pastor & Veronesi, 2012). This decline is especially pronounced during recessions when investor hesitancy increases, reducing their responsiveness to price signals and amplifying the effects of EPU on the broader economy (Binge & Boshoff, 2020). Indeed, the relationship between EU and the business cycle is inverse, with uncertainty peaking during recessions and receding during economic expansions (Bloom, 2014).

Uncertainty about economic conditions is magnified during election periods, whether at national or local levels, leading to delays in policy analysis and production across various sectors, subsequently impacting the long-term economic standing of the country (Pastor & Veronesi, 2013). The effects of EPU are detrimental, as both investors and governments adopt a risk-averse stance during uncertain times. This underscores the necessity for governments to enforce sound financial regulations regarding bank borrowing, interest rates, and maintain strict policy frameworks for budget deficits, government capital spending, and debt management to mitigate economic volatility (Mian, Sufi & Khoshkhoh, 2015).

Su, Yuan, Umar, & Chang (2023) agree with Pastor & Veronesi's (2012,2013) view that political events impact market performance and investment decisions. Political risk is seen to cause an upset to the economy through share price fluctuations in equity markets. Negative shocks are passed through to corporate and government bonds in the fixed income market. Government's popularity is seen to affect financial markets with the stock price reflecting investors' political sentiment. An intertemporal capital asset pricing model (ICAPM) is employed to examine how investor sentiment responds to political events and influences stock prices in the US. The study's findings indicate that during periods of PU, investors tend to shift their assets toward more liquid and secure investments, such as the US dollar, to mitigate potential risks. To counteract the turbulence in asset prices caused by diminished government credibility, it is crucial for the government to maintain a stable and predictable investment environment. EPU generally has a negative impact on stock returns across different market conditions particularly under bear market conditions (Ahmed, Gurdgiev, Sohag, Islam & Zeqiraj, 2024). During periods of high uncertainty, investors tend to postpone equity investments, leading to decreased liquidity and lower stock market returns (Rehman, Asghar

& Hussain, 2019). Given that ETFs track the performance of the underlying assets, the fluctuations and volatility experienced by these assets should feed into the ETFs market.

PU not only affects investor sentiment but also contributes to heightened volatility in stock markets and oil prices. This instability can undermine public confidence in the administration, diminishing the president's approval and credibility. To address these issues, governments should integrate investor sentiment considerations into macroeconomic models and design policies that reflect the dynamics of asset markets. Furthermore, it is essential for policymakers to prioritize consistency and stability in the policy environment. By minimizing the frequency of policy adjustments, the government can help investors and businesses establish clear and reasonable expectations, thereby reducing the likelihood of adverse reactions to shifts in economic policy.

Bali, Subrahmanyam & Quan (2018) conduct a thorough literature review on the pricing of EU in the corporate bond market, shedding light on its far-reaching implications for financial markets. Their work provides valuable insights into how uncertainty influences the returns and volatility of both stock and bond ETFs, underlining the interconnected nature of market dynamics across various asset classes. By examining the cross-sectional pricing of EU in corporate bonds, the study delves into how uncertainty shapes the risk and return profiles of these securities. The authors explore key mechanisms through which EU impacts corporate bond markets, such as by increasing the required risk premium and affecting investors' confidence. This, in turn, has cascading effects on broader financial instruments, including ETFs, by amplifying volatility and reshaping return expectations. Their findings underscore the importance of understanding the role of uncertainty in asset pricing, particularly for investors seeking to optimize portfolio strategies across different asset classes. Additionally, the study emphasizes the critical need for accurate risk assessment and management strategies, given the interconnected and systemic effects of EU on financial markets. The authors hypothesise that EU affects both equity and bond returns through market leverage and credit risk. Firms with higher exposure to EU exhibit lower operating profitability and net income, suggesting the need for firms to hedge against macroeconomic risk to mitigate potential losses during periods of high EU. The results indicate that bonds with a low uncertainty beta outperform those with a high uncertainty beta in both raw and risk-adjusted returns, a phenomenon persisting even after controlling for systematic risk, liquidity, and various bond characteristics.

The expectations theory suggests that long-term bond interest rates are influenced by market participants' expectations of future short-term interest rates. EPU can disrupt these expectations, causing volatility in long-term bond prices. Studies by Shiller & Campbell (1991) illustrate how uncertainty affects bond pricing dynamics, suggesting that EPU significantly influences market expectations, thus impacting long-term bond valuations (Nanayakkara, 2024).

EPU can increase the perceived risks tied to government bonds, influencing risk premiums and subsequently affecting bond prices. During periods of significant uncertainty, investors frequently turn to safe-haven assets like government bonds, driving up demand and causing fluctuations in their prices. The flight-to-quality theory posits that EPU can trigger such behaviour, which can, paradoxically, depress bond prices due to heightened market uncertainty. Empirical evidence from Baele, Bekaert, Inghelbrecht & Wei (2004) supports these phenomena during periods of EU.

Under the Risk Premium Theory, bond yields are composed of a risk premium that compensates investors for credit and liquidity risks. Term structure models, which consider bond yields and maturity, highlight that an increase in EPU can lead to heightened uncertainty regarding future interest rates, thereby affecting yield volatility. Diebold and Li (2006) further demonstrate how macro EU shapes yield curve dynamics.

Dumas, Kurshev, and Uppal (2009) develop a general-equilibrium model focused on sentiment. In their model, there are two types of agents, and stock prices are excessively volatile due to one group's overconfidence regarding a public signal. This overconfident group frequently adjusts its expectations, swinging between extreme optimism and extreme pessimism. The authors demonstrate that the presence of these overconfident traders introduces an extra source of risk, leading rational investors to reduce their equity holdings, except when they are highly optimistic about future growth. Additionally, these rational investors' optimal portfolio strategies are not only based on current price discrepancies but also on their expectations of future sentiment and their predictions regarding the speed of price convergence. As a result, their portfolio strategy includes safeguards in case their predictions are wrong. This makes long-maturity bonds a crucial complement to equity investments, as they serve as a hedge against "sentiment risk." While this study highlights the behavioural effects of overconfident traders on stock price volatility and investment approaches, Baker, Bloom, Davis

& Kost (2019) build on this insight by providing empirical methods to measure and monitor equity market volatility during times of substantial uncertainty.

Baker, *et al.* (2019) provide valuable insights into the volatility of equity returns, drawing on both rational and behavioural interpretations. Their study constructs an Equity Market Volatility (EMV) tracker by analysing newspaper articles that reference stock market volatility in the US. In comparison to the Volatility Index (VIX), the EMV shows a strong correlation with both the VIX and the realized volatility of daily returns on the S&P 500, with particularly high correlations observed in monthly and quarterly data. The authors go on to refine an EMV specifically designed to track macroeconomic news, especially during times of major uncertainty, such as the 9/11 terrorist attacks, the March 2003 invasion of Iraq, and the Global Financial Crisis. Their results indicate that these EMV indicators successfully capture the primary factors influencing changes in equity market volatility.

Aye, Balcilar, Demirer, and Gupta (2018) demonstrate that an EPU can be used as a predictive tool for market shocks, which then influence stock returns and volatility. Expanding on this idea, Kundu and Paul (2022) analyse the effects of EPU on stock returns and volatility under varying market conditions, specifically in bull and bear markets. Their findings show that the impact of EPU is significantly stronger during bear markets, whereas its influence is largely insignificant in bull markets. They argue that an increase in EPU tends to raise the volatility of an asset's stochastic discount factor, which results in heightened overall market volatility and, as a consequence, reduces market returns. However, they also note that investors holding these assets might demand higher prices in the future due to the opportunity cost of maintaining investments in uncertain, high-risk conditions. This increased demand for risky assets ultimately leads to a rise in stock prices and returns. Additionally, their study underscores the growing importance of examining the effect of EPU on ETF returns and volatility, given the increasing popularity and use of ETFs in the financial markets over time.

## **2.6. Economic Uncertainty and Exchange Traded Fund Returns and Volatility**

The preference for ETFs can be attributed to their unique trading mechanisms compared to traditional index funds. In contrast to mutual funds, ETFs can be easily bought and sold on the market and allow investors to sell them short, facilitating price discovery and improving market informational efficiency (Dias, Galvao, Irfan, Alexandre, Goncalves & Almeida, 2024). ETFs provide public investors with a shared interest in a collection of securities, and their shares are traded on exchanges through broker-dealers, similar to stock transactions. Additionally, ETFs

involve APs—investment managers who manage portfolios to track an index or benchmark, with flexibility in how that tracking is achieved, whether through full replication or representative sampling (Nyukorong, 2020; Abner, 2016).

Another distinctive feature of ETFs is their liquidity. Shares trade continuously on international stock exchanges, providing constant pricing and liquidity throughout the day. This allows for opportunities such as shorting, lending, and margining, appealing to innovative equity investors (Hill, Nadig & Hougan, 2015).

The performance of ETFs is closely linked to their underlying assets (Wu, Sun, Shi & Lin, 2022). When the underlying assets perform favourably, investors typically raise their investment in the ETF, resulting in positive inflows. Conversely, poor performance can prompt withdrawals, particularly in the context of increased bearish sentiment. As market outlooks turn negative, investors may withdraw funds from ETFs exposed to EPU, resulting in heightened selling pressure. This sentiment can be quantified through measures such as put/call option trading volume and short interest.

Moreover, Ben-David, Franzoni & Moussawi (2017) show that ETFs attract noise traders, whose trades may not always be rational (Da & Shive, 2018). Behavioural biases, such as investor overreaction and herd behaviour, have been reported in ETF markets (Ma, Ho, Yang & Chu, 2018; Bahadar, Mahmood & Zaman, 2019). These biases can result in irrational investment choices, often marked by poor timing in the market and overly aggressive trading strategies (Ma, Ho, Yang, & Chu, 2018). Such behaviour can contribute to heightened volatility in ETF returns and trading volumes, which, in turn, can have a negative effect on overall market efficiency. The presence of these biases may lead investors to make decisions that do not reflect the true value of the assets, causing erratic fluctuations in prices and disrupting the normal functioning of the market. This results in an environment where price signals become distorted, further impairing the ability of the market to allocate resources efficiently.

The rapid expansion of ETF markets has raised significant concerns about the potential risks they pose to global financial systems. These funds provide investors with access to a broad array of asset classes, such as real estate, bonds, commodities, stocks, and currencies (Kunjal & Peerbhai, 2021). This exposure to various markets means that heightened volatility and shifts in investor sentiment can lead to swift inflows or outflows from ETFs. Such movements can exacerbate market fluctuations, potentially destabilizing the broader financial system. In

regions like South Africa, where EU is a prevalent concern, understanding the complexities and dynamics of ETFs becomes even more important. This understanding is essential for accurately assessing the risks these financial instruments might pose to the stability of the local and global financial systems.

## **2.7. Summary and Conclusion**

Chapter 2 provides a comprehensive overview of traditional financial theories and their contrasts with behavioural finance, particularly in the context of EU and its effects on investor behaviour and ETF performance. Traditional finance theories, like the EMH, operate on the assumption of rationality and market efficiency, proposing that security prices always incorporate all available information. The EMH distinguishes three levels of market efficiency—weak, semi-strong, and strong—and highlights the Random Walk Theory. According to this theory, past price movements do not have any bearing on future price changes, implying that market prices evolve randomly without predictable patterns. This theoretical framework supports passive investment strategies, highlighting the appeal of ETFs due to their lower costs compared to actively managed funds.

In contrast, behavioural finance accounts for human emotions and cognitive biases, revealing how irrational behaviours can lead to market anomalies. The chapter discusses key concepts such as prospect theory, which emphasizes that investor decisions are often influenced by psychological factors, leading to market inefficiencies. Factors like information asymmetry and investor sentiment are explored, showing how they affect asset pricing and market stability, especially during periods of EU.

The chapter also analyses the relationship between EPU and financial market dynamics, particularly focusing on how heightened uncertainty impacts stock returns and volatility. Studies indicate that EPU raises risk premiums and alters investment decisions, with implications for both equity and bond markets. The unique trading mechanisms and liquidity of ETFs are highlighted, illustrating how they can amplify the effects of EU due to their exposure to various asset classes.

This chapter underscores the complex interplay between traditional finance and behavioural finance, particularly in understanding market behaviour under conditions of EU. While traditional financial theories provide a foundation for long-term market analysis, they often fall short in explaining short- to medium-term market anomalies driven by investor psychology.

Behavioural finance complements this perspective, emphasizing the role of emotions, biases, and information asymmetries in shaping market outcomes.

The insights gained from this chapter are crucial for investors navigating volatile markets, especially in emerging economies like South Africa, where economic and political uncertainties are prevalent. Understanding how these factors influence ETF performance and investor sentiment is vital for assessing potential risks to financial stability. As ETFs continue to grow in popularity, recognizing their role in amplifying market movements amid uncertainty will be essential for developing robust investment strategies.

## **CHAPTER 3: REVIEW OF EMPIRICAL STUDIES**

### **3.1. Overview**

Chapter 3 delves deeper into how investor sentiment and EU affect financial markets, building on the theoretical insights presented in the previous chapter. By examining a range of empirical studies from various global markets, the chapter explores the intricate relationships between market participants' emotional responses and the broader economic context in which they operate. Specifically, it highlights how investor sentiment—shaped by psychological factors such as optimism, fear, or herd behaviour—can drive market trends, leading to fluctuations in asset prices that are often disconnected from underlying economic fundamentals. Additionally, the chapter investigates the role of EU, including factors such as geopolitical events, economic crises, and regulatory changes, in amplifying market volatility and influencing decision-making processes of investors. These empirical findings suggest that markets are not purely driven by rational decision-making, but also by emotional and psychological factors that can cause mispricing and overreaction. By integrating these insights with traditional economic indicators, the chapter argues for a more comprehensive framework to understand market behaviour, one that accounts for both the quantitative data of financial metrics and the qualitative dimensions of investor psychology. This approach provides a richer understanding of market dynamics and underscores the importance of incorporating behavioural considerations into economic models to better predict and manage financial market outcomes.

### **3.2. Economic Uncertainty, Sentiment and Financial Markets: International Evidence**

Research highlights that investor sentiment plays a key role in shaping how investors respond to extreme events. Mushinada and Veluri (2018) conducted an empirical analysis of how investor overconfidence affects stock market volatility in the Bombay Stock Exchange (BSE), examining 1,290 stocks between April 2004 and March 2012. They employ a bivariate vector autoregression model (VAR), impulse response functions (IRF), and the EGARCH model to explore the presence of the self-attribution bias and overconfident behaviour among investors. Their findings provide empirical support for the investor overconfidence hypothesis, showing that overconfident investors tend to overreact to both private and public information. Using the EGARCH model, the study reveals that excessive trading driven by overconfidence contributes to higher stock market volatility between April 2004 and September 2008. Furthermore, the examination of the link between return volatility and trading volume suggests that excessive trading is a primary driver of the observed excess volatility.

As the second-largest stock market globally, China's market holds a significant position in global resource allocation. Studies by Qiang & Shu-e (2009) and Liu & Ma (2024) explore how sentiment-induced volatility in stock markets, particularly in response to EU, exhibits asymmetric effects. Qiang & Shu-e (2009) utilize a GARCH (1,1) model to analyse the effect of investor sentiment on stock prices in the Chinese market from May 1998 to December 2006, based on the noise trading theory of De Long, Shleifer, Summers & Waldmann (1990). Their findings show that investor sentiment is a systematic factor influencing stock prices, with the effects of sentiment increases and decreases being asymmetric. The volatility induced by sentiment introduces systematic risk, for which investors are compensated. The study's results, concerning the asymmetric impacts of sentiment fluctuations and the recognition of sentiment-driven volatility as a systematic risk, contribute to the broader understanding of how EU affects stock market returns and volatility.

To further explore the role of investor sentiment in market fluctuations, particularly in relation to policy uncertainty and its effects on stock market volatility, Liu & Ma (2024) provide additional insights into the influence of sentiment divergence. The study recognizes that policy decisions significantly impact market fluctuations due to regulations in monetary and fiscal policies. Due to the significant presence of retail investors in the market, shifts in policy can cause disruptions in investor expectations, ultimately contributing to increased market volatility. This idea is supported by research that expands upon the theoretical framework established by Dumas *et al.* (2009). Their model suggests that market volatility tends to escalate when investor overconfidence is widespread, whereas volatility is comparatively lower when a more balanced mix of overconfident and rational investors exists. Given that the Chinese market is characterized by an abundance of low-quality public information and a high degree of speculative trading, it is reasonable to anticipate a substantial divergence in investor sentiment. Using daily data from 2018 to 2021, the study shows that sentiment divergence—referring to differences in investor opinions or emotions, where some investors are optimistic while others are pessimistic (Siganos, Vagenas-Nanos & Verwijmeran, 2017)—plays a moderating role, reducing the positive relationship between policy uncertainty and stock volatility. This finding contrasts with Qiang & Shu-e (2009), as Liu & Ma (2024) suggest that investor sentiment can mitigate the negative impact of policy uncertainty on market fluctuations. At certain times, the impact of policy uncertainty on stock volatility may be less pronounced, making it insufficient to counteract the adverse effects of sentiment divergence.

This research contributes to a better understanding of why, during specific periods, an inverse relationship can be observed between policy uncertainty and stock market volatility in China.

Piccoli & Chaudhury (2018) investigate a similar hypothesis in the US market and present evidence that supports the findings of Qiang & Shu-e (2009). They analyse daily returns of the S&P 500 index and the returns of the 500 individual stocks that make up the index, using data from 1962 to 2010. Investor sentiment is measured using Baker & Wurgler's Sentiment Index. The study compares how individual stocks react to extreme movements in the broader US market during periods of both low and high investor sentiment. Extreme market movements are considered low-probability events that surprise investors, causing them to overreact by exaggerating the significance of these events. Low sentiment periods are assumed to lead to stronger overreactions, as investors become more disturbed by unusually large market fluctuations, leading them to believe their previous assumptions were significantly incorrect. Given the widespread presence of ETFs that track the S&P 500 index, the study finds that economic downturns lead to increased volatility in the ETF markets as well.

Huang & Liu (2022) and Kundu & Paul (2022) also explore the asymmetric effects of EPU on stock returns across the G7 countries (Germany, Italy, France, the UK, the US, Japan, and Canada). Huang & Liu (2022) use monthly data from 1997 to 2020 and apply quantile regression models, developed by Koenker & Bassett (1978), to analyse the conditional heterogeneity of factors that influence stock returns. The study includes variables such as lagged returns, changes in stock return variance, changes in the yield spread between 10-year and 3-month Treasury bonds, shifts in industrial production, variations in unemployment, changes in implied volatility from the S&P 100 index, and fluctuations in the yield of three-month Treasury bills relative to their 12-month rolling average. The results show that all control variables have expected signs—for example, higher unemployment rates lead to lower stock returns, while higher industrial output tends to attract investor confidence. Similarly, a large yield spread between the 10-year and 3-month Treasury bonds is associated with a stronger economy and higher stock returns. The study finds that EPU changes, whether positive or negative, resemble good or bad news, respectively, and have asymmetric effects on stock returns. Specifically, the effects of EPU increases are more pronounced than those of decreases. The impact of EPU changes on stock returns in the US, Canada, the UK, and Japan are asymmetric during bearish markets, while no such effects are found in Germany, suggesting that EPU increases tend to have a larger impact than decreases.

Similarly, Kundu & Paul (2022) also examine the G7 countries from 1998 to 2018, using similar proxies to represent stock prices in each country. They follow the methodology of Baker, Bloom & Davis (2013) to construct the EPU index, which is broken down into three components: the frequency of terms such as “uncertainty,” “economy,” and “policy” in ten major newspapers, the number of tax code provisions set to expire, and the disagreement among professional forecasters about future government spending and Consumer Price Index (CPI) levels. To account for statistical biases, the study controls for cross-sectional dependence due to globalization and the interconnectedness of the countries involved. The researchers use the Markov Switching Vector Autoregression (MSVAR) model to capture market movements during bull and bear periods. The results reveal that the response of stock returns and volatility to EPU shocks is highly asymmetric, with a more pronounced reaction during bearish periods compared to minimal effects observed during bullish periods. The study reflects an immediate surge in stock market volatility in response to heightened policy uncertainty, causing a subsequent decline in stock market returns. However, over time, those holding stocks during this risky period will seek an additional premium for bearing the risk, resulting in an increase in both price and return.

Similarly, Bao and Li (2020) analysed the impact of investor overconfidence in six Asia-Pacific REIT (Real Estate Investment Trust) markets—Australia, Hong Kong, Japan, Singapore, South Korea, and Taiwan—over the period from 1994 to 2015. They employ a VAR model to examine return dynamics and use IRFs to assess how past return shocks influence market turnover. Their findings reveal a significant and positive effect of investor overconfidence on market turnover in Japan, Singapore, South Korea, and Taiwan, with the strongest effects observed in markets that are less efficient, such as South Korea and Taiwan, characterized by short-selling restrictions and low market transparency. When re-estimating the VAR model for bull and bear market periods, they find that the effect of overconfidence is even stronger in bull markets, particularly in Japan, South Korea, and Singapore. This suggests that overconfidence is more pronounced during market booms and in inefficient market conditions, aligning with the AMH, which asserts that market behaviours shift in response to changing conditions. Simulation analysis further confirms that overconfidence could lead to excessive trading volumes in certain markets.

In a related context, Mushinada (2020a) contends that as market conditions shift, investors often become irrational but gradually adjust to the changing environment and reach an equilibrium. However, Namouri, Jawadi, Ftiti & Hachicha (2018) argue that stock return

dynamics exhibit curvilinear effects that vary over time, with investor confidence playing a significant role in influencing stock returns. This relationship evolves as market conditions change. Kumar & Prince (2022) explore investor overconfidence in India during various market periods (pre-crash, crisis, and post-crash) from 2006 to 2021. Their analysis using econometric techniques such as VAR, IRF, Granger Causality tests, and VAR/Block Exogeneity Wald Tests find that overconfidence was present in the pre-crisis period (2006-2008) and the post-crisis period from 2015 to 2020, but absent during the crisis and immediate post-crisis periods (2008-2015, 2020-2021).

Batabyal & Killins (2021) reflect similar findings to Kundu & Paul (2022). They use a nonlinear distributed lag (NARDL) model to investigate the asymmetric relationships between stock market EPU, building on traditional ARDL models to capture both short-run and long-run effects. By utilizing the Baker *et al.* (2013) EPU index alongside data from the Toronto Stock Exchange (S&P/TSX), industrial production, inflation rates, credit spreads, and the USD/CAD exchange rate, the study reveals that EPU significantly predicts stock market returns in Canada, with a predominantly negative impact. The findings indicate that the effects of EPU are absorbed by the stock markets in both time frames, but the NARDL model highlights important asymmetries: during periods of rising uncertainty, investors shift towards safer assets, such as high-grade bonds and gold, to mitigate risk. Conversely, as uncertainty diminishes, there is a tendency for investors to seek higher returns by reallocating funds from low-yield, safe-haven assets to riskier investments. These insights underscore the necessity for investors to adapt their strategies in response to fluctuations in policy uncertainty, taking into account the asymmetric nature of its impact when forecasting market behaviour.

The detrimental effects of EPU on stock markets have been empirically established in various regions, including the US (Arouri, Estay, Rault & Roubaud, 2016), Europe (Sum, 2012), and China (Zhenghui & Junhao, 2020). However, the effect is also seen in the bond market. Nanayakkara (2024) investigates how various dimensions of EPU, including fiscal, monetary, trade, and inflation policy uncertainty, influence government bond prices, with a focus on the US bond market, particularly the 10-year yield. A VAR model is employed to analyse the effects of various policy uncertainties on bond prices. The data sample extends from 2000 to 2023, encompassing key economic events such as the 2008 financial crisis and the COVID-19 pandemic. Fiscal policy uncertainty shows a moderate positive relationship with bond prices, indicating that increased uncertainty in fiscal policies leads to higher bond prices. Similarly, monetary policy uncertainty also has a positive influence on bond prices, though its effect is

not as strong as fiscal uncertainty. Trade policy uncertainty exhibits a weaker, yet still positive, impact on bond prices. In contrast, inflation uncertainty demonstrates a strong positive correlation, suggesting that higher inflation uncertainty significantly raises bond prices. In line with the suggestions of Batabyal & Killins (2021), this study highlights the importance for investors to implement risk-adaptive strategies in order to reduce the impact of policy uncertainty on financial markets. However, although the influence of EU on financial markets is well-documented globally, there is a relative lack of evidence regarding its effects in the South African context.

### **3.3. Economic Uncertainty, Sentiment and Financial Markets: South African Evidence**

Rupande, Muguto, and Muzindutsi (2019) investigate the connection between investor sentiment and market volatility on the JSE by employing the GARCH-M specification alongside daily data covering the years 2002 to 2018. Their analysis provides strong evidence supporting a positive risk-return relationship within the JSE, suggesting that volatility is a key factor priced into the market. Additionally, the study highlights notable findings related to the persistence of volatility and the presence of leverage effects. In terms of investor sentiment, the results emphasize its significant role in explaining both market returns and conditional variance on the JSE. Among the various models assessed, the GJR-GARCH-M model incorporating an investor sentiment factor is identified as the most effective for capturing volatility in the JSE ALSI (All Share Index) series. This finding reinforces the crucial influence of investor sentiment on the overall market dynamics of the JSE.

Kunjai and Peerbhai (2021) investigate behavioural finance and its influence on the South African ETF market, dividing their analysis into ETFs tracking international benchmarks and those tracking domestic benchmarks. This division is based on the premise that overconfidence is more prevalent among investors in ETFs tracking domestic benchmarks due to their higher tracking efficiency. This research analyses data spanning from 2000 to 2019, utilizing VAR models along with IRFs to evaluate the connection between lagged market returns and current market turnover. The results reveal a significant positive correlation between historical market returns and present market turnover, a pattern observed in both overall market-wide turnover and the turnover of individual ETFs. The evidence suggests that the ETF market predominantly attracts noise traders, whose investment decisions may be influenced by emotions rather than logic. This behaviour could lead to heightened volatility in ETF returns. Consequently, the study highlights overconfidence as a key behavioural bias in the South African ETF market, suggesting that investors may benefit from avoiding highly traded ETFs to mitigate the impact

of overconfident trading. The findings also indicate that, as uncertainty continues to influence market dynamics, the presence of overconfidence among traders could exacerbate volatility and complicate decision-making processes.

Asafo-Adjei, Agyapong, Agyei, Frimpong, Djimatey, and Adam (2020) analyse the relationship between global EPU and stock returns in eight African countries—Botswana, Ghana, Kenya, Morocco, Namibia, Nigeria, South Africa, and Zambia—over the period 2010 to 2019 using wavelet coherence analysis. This method enables the examination of co-movements between global EPU and stock returns over time and at different frequencies. The study finds weak co-movement between global EPU and African stock returns in the short term (0–16 days), suggesting that African markets are relatively insulated from global policy uncertainty in the short run, making them attractive as short-term hedges. However, in the long term (50–256 days), the co-movements strengthen, particularly from 2011 to 2019, with significant correlations in countries such as Botswana, Ghana, Kenya, Namibia, Nigeria, and South Africa. These results highlight the long-term vulnerability of African stock markets to global uncertainty, which parallels the overconfidence-driven volatility observed in South African ETFs, as noted by Kunjal and Peerbhai (2021). This emphasizes the broader implications of uncertainty for market behaviour and financial stability.

Kisten (2020) investigates how EPU influences key macroeconomic variables in South Africa, with particular emphasis on its effects on risk premia, borrowing costs, and overall economic growth. The study suggests that rising uncertainty prompts risk-averse investors to seek higher returns, which in turn drives up risk premia, elevates borrowing costs, and increases the probability of defaults. This sequence of events intensifies financial distress, exerting adverse impacts on both microeconomic and macroeconomic growth. Utilizing quarterly time-series data spanning from 1990 to 2015, the study incorporates a range of variables, including industrial production growth, consumer price inflation, 10-year government bond yields, the real effective exchange rate (REER), and a constructed EPU index. Impulse response analyses derived from the constant parameter VAR model indicate that upward shocks to the uncertainty index contribute to declines in industrial production and REER, while simultaneously pushing up price levels and bond yields. These results align with the findings of Asafo-Adjei *et al.* (2020), who highlight the long-term risks that EPU poses to African stock markets. Similarly, the study's conclusions are consistent with the observations of Kunjal and Peerbhai (2021) regarding increased volatility in South Africa's ETF market. Both studies underscore the role

of uncertainty in magnifying financial risk, destabilizing markets, and generating broader consequences for investment returns and economic performance.

Redl (2015) introduces a novel EU index for South Africa covering the period 1990–2014. Following the methodology of Dendy, Mumtaz, and Silver (2013), the index is derived from three sources: disagreements among professional forecasters about macroeconomic conditions in forecasting competitions hosted by a national newspaper, the frequency of uncertainty mentions in local and national newspapers, and mentions of uncertainty in the South African Reserve Bank (SARB) quarterly review. The index correlates positively with other uncertainty proxies, such as realized and implied stock market volatility, and highlights key events, including the transition from apartheid (1992–1994), the steep ZAR decline in 2001, and the 2008 financial crisis. Using a structural VAR model, the study finds that uncertainty serves as a leading indicator of economic recessions in South Africa, with unexpected peaks in uncertainty causing declines in GDP, investment, industrial production, foreign direct investment, and private sector employment. Additionally, uncertainty shocks are shown to be inflationary in South Africa, contrasting with results from developed markets like the US and UK. Collectively, these studies reveal how behavioural biases, global EPU, and local uncertainties interact to shape market dynamics and economic outcomes in South Africa and beyond.

### **3.4. Summary and Conclusion**

The body of literature investigating EU, investor sentiment, and their influence on financial markets provides a wealth of international evidence. Several studies, including those examining the Chinese, US, and G7 markets, illustrate how EU and investor sentiment shape market volatility and returns. Qiang & Shu-e (2009) and Liu & Ma (2024) examine the influence of investor sentiment on China's stock market, focusing on the asymmetric effects of sentiment-induced volatility linked to EU. Qiang & Shu-e (2009) find that investor sentiment exacerbates stock market volatility in China, with systematic risk being driven by increases in sentiment, particularly in periods of market uncertainty. Liu & Ma (2024) further demonstrate that sentiment divergence can reduce the impact of policy uncertainty on stock volatility, underscoring the critical role of sentiment in cushioning policy-driven market fluctuations.

In the US, Piccoli & Chaudhury (2018) confirm the findings of Qiang & Shu-e (2009), indicating that during periods of low sentiment, extreme market movements trigger heightened overreactions, particularly within the ETF market. Studies on the G7 countries by Huang &

Liu (2022) and Kundu & Paul (2022) emphasize the asymmetric effects of EU on stock returns. The impact of EU is most pronounced in bear markets, leading to sharp volatility and a decline in stock returns, as demonstrated in both studies. Similarly, Batabyal & Killins (2021) find that EU affects stock market returns asymmetrically in Canada, with investor sentiment driving the shift between safer and riskier assets during periods of uncertainty.

This international evidence is further complemented by studies examining the US bond market. Nanayakkara (2024) investigates how different policy uncertainties influence bond prices, noting that inflation and fiscal policy uncertainties have the strongest impact on bond yields. This provides insights into how bond markets, much like stock markets, are affected by shifts in EU.

Collectively, these studies highlight the profound influence of EU and investor sentiment on financial markets. From China to the US and G7 countries, the asymmetric effects of EU are consistently observed, particularly in periods of heightened uncertainty, leading to increased market volatility and declining returns. Investor sentiment, often driving overreactions during extreme events, further complicates market behaviour, with both noise trading and sentiment divergence playing crucial roles in market fluctuations.

In the South African context, Kunjal & Peerbhai (2021) find that investor overconfidence contributes to ETF market volatility, while Asafo-Adjei *et al.* (2020) show how global EU affects African stock returns, especially in the long term. Expanding this perspective, Kisten (2020) notes that macroeconomic variables, including borrowing costs and risk premia, are also susceptible to EU, amplifying financial stress. Redl (2015) complements this by providing a South African EU index, showing that uncertainty spikes can signal recessions and inflationary pressures, similar to findings in other emerging markets.

Taken together, these studies underline the fact that EU is not only a critical factor shaping market behaviour in both developed and emerging economies but also that investor sentiment plays a key role in exacerbating or mitigating market movements. The international evidence consistently points to the conclusion that financial markets are inherently influenced by psychological factors, with sentiment-induced volatility and overreactions playing a crucial role in determining market outcomes. For investors and policymakers, this suggests the need for a more calculated approach to forecasting and responding to market fluctuations, one that takes into account not only traditional economic indicators but also the psychological and behavioural dynamics that drive market sentiment. The evidence from diverse international

markets further reinforces the importance of considering both local and global uncertainties when making investment decisions or formulating policy responses to financial instability.

## **CHAPTER 4: RESEARCH METHODOLOGY**

### **4.1. Overview**

Research methodology is important in ensuring the study follows a coherent format. Additionally, it allows other researchers to replicate the study which is a pivotal role in building on knowledge (Newhart & Patten, 2023). This study is dedicated to a comprehensive exploration of how EU impacts ETF performance and volatility in South Africa. It aims to achieve this by examining the influence of EU on the returns of bond and equity ETFs in both bullish and bearish market conditions. Additionally, it compares market dynamics between bond and equity ETFs and scrutinizes the effects of EU on volatility in the bond and equity ETF markets.

To achieve these objectives, a quantitative methodology is employed. The Markov Switching Regression (MSM) model is utilized to examine the impact of EU on ETF returns across varying market conditions, while the influence of EU on ETF volatility is analysed through a range of models, including GARCH, EGARCH, TGARCH, GARCH-M, EGARCH-M, and TGARCH-M. The most suitable model is selected based on each model's information criterion. The following sections of this chapter delve into critical aspects of the data used in the study. This discussion covers essential components such as the sample period, data frequency, selection criteria for ETFs, descriptions of the primary variables, and the process of transitioning from preliminary to final data analysis.

### **4.2. ETF Sample Selection**

This research centres on analysing the South African market for ETFs that track both local and international benchmarks, with a particular focus on bond and equity ETFs. The motivation for selecting bond and equity ETFs lies in their distinct roles in an investor's portfolio, particularly in their response to EU and market volatility. Bond ETFs typically exhibit more stable returns compared to equity ETFs, which are more volatile but offer higher potential returns. By examining both asset classes, this study aims to uncover whether investors can gain diversification benefits by holding a mix of bond and equity ETFs, especially in the context of fluctuating market conditions driven by EU. The unique behaviour of these two categories of ETFs in response to economic shocks can potentially help investors hedge against risks and mitigate the negative impact of market volatility on overall portfolio performance.

The decision to treat bond and equity ETFs separately in this analysis is crucial, as it allows for a clearer understanding of how each asset class behaves under various conditions. Bonds tend to be less sensitive to short-term market movements and economic cycles, while equities are more susceptible to changes in investor sentiment and broader economic fluctuations. Understanding these differences is important for investors who seek to balance risk and return. For instance, during periods of heightened EU or market stress, bond ETFs may serve as a stabilizing force, offering steady income and acting as a hedge against equity market downturns. Conversely, equity ETFs, while more volatile, may present opportunities for growth when market conditions improve, especially for those tracking global benchmarks that are less influenced by domestic economic uncertainties (Papadamou, Fassas, Kenourgios & Dimitriou, 2021).

To gain deeper insights, the study follows the methodology outlined by Kunjal and Peerbhai (2021), which involves segregating the ETFs tracking domestic benchmarks from those tracking international benchmarks into four distinct portfolios. This classification approach allows for a more detailed understanding of how local versus global market factors affect ETF performance. The distinction between domestic and international ETFs is particularly relevant in the South African context, where local economic conditions, such as inflation, political instability, and fiscal policy, can differ significantly from global trends. By separating these portfolios, the study aims to identify any variations in performance and volatility between domestic and global ETFs, offering investors a clearer perspective on the relative benefits and risks associated with each. The portfolios are constructed using monthly price and market capitalization data for the individual ETFs within each category. The price data is used to calculate logged returns using equation 4.1:

$$R_t = \ln \left( \frac{P_t}{P_{t-1}} \right) \quad (4.1)$$

In this context,  $R_t$  represents the monthly return for month  $t$ ,  $P_t$  is the closing price for month  $t$  and  $P_{t-1}$  refers to the closing price for the previous month.

Market capitalisation is utilized to determine the weight each ETF holds within the portfolio, a method adopted from Kunjal & Peerbhai (2021). The return for each ETF in a specific month is then multiplied by its respective weight, and the overall portfolio return for that month is calculated by summing the returns of all individual ETFs. The market capitalisation weighting approach involves distributing investment capital according to the market capitalization of each asset, giving larger companies a more significant representation in the portfolio (Nyakurukwa

& Seetharam, 2024). This strategy has become popular due to its low turnover, simplicity, and its ability to create a portfolio that reflects broad investment exposure (Raza & Ashraf, 2019).

According to Lee & Chen (2020), if markets operate efficiently, ETFs that track international benchmarks should primarily be influenced by risk factors specific to their home countries, rather than those of the countries in which they are listed. This analysis aims to assist investors in evaluating whether they can mitigate their exposure to economic risks and volatility by observing the differing impacts on ETFs with domestic benchmarks compared to those tracking international benchmarks. The sample set includes only ETFs that have price data spanning over three years. Specifically, there are 6 bond ETFs and 27 equity ETFs tracking domestic benchmarks, and 4 bond ETFs and 19 equity ETFs tracking international benchmarks. A detailed list of the ETFs included in the study is provided in Appendix A (page 123). Following Kunjal and Peerbhai (2021), the monthly return for each market is calculated by aggregating the individual ETF returns on a market value-weighted basis. ETF data, including monthly closing prices and the number of shares outstanding, are sourced from the IRESS database.

### **4.3. Sample Period and Data Frequency**

Choosing the right sample period and data frequency is essential for any study, as it significantly affects the dependability of the results and the strength of the analysis, providing valuable insights into trends and patterns over time (Lopez & Whitehead, 2013). The application of quantitative analysis, particularly time series analysis, plays a pivotal role in uncovering patterns and trends across specific sample periods. Examining trading behaviour over extended durations enhances our understanding of market dynamics, aiding in the identification of discernible patterns with heightened efficiency. An analysis conducted over a broader timeframe enables market participants to discern the details of trends, reversals, and key support or resistance levels that might be obscured in shorter-term assessments (Zhao, 2024). This extended perspective not only assists traders and investors in revealing underlying market forces but also facilitates the evaluation of the sustainability of price movements.

Moreover, exploring longer timeframes allows for the recognition of macroeconomic factors, global events, and structural shifts that can significantly influence market sentiment. By considering a more extensive historical context, analysts gain valuable insights into the evolution of market conditions and can determine whether observed patterns indicate enduring trends or mere temporary fluctuations (Bekiros, Jlassi, Lucey, Naoui & Uddin, 2017). The chosen sample period for analysis therefore spans from 2006 to 2023. The chosen period for

this study is validated by the introduction of the first South African ETF tracking a domestic benchmark on the JSE on November 27, 2000, and the listing of the first South African ETF tracking an international benchmark on October 10, 2005 (Kunjai, Peerbhai & Muzindutsi, 2022).

This sample period encapsulates significant events in both political and economic history for South Africa. Hlatshwayo and Saxegaard (2016) highlight that the period from 1990 to 2015 marked significant peaks in the uncertainty index, consistently rising above its average levels. Figure 4.1, adapted from Hlatshwayo & Saxegaard (2016), displays the periods from 1990 to 2015 when the uncertainty index exceeded its average levels. The 2008-2009 period saw global pressures from the financial crisis, combined with domestic challenges in South Africa, including electricity shortages that nearly led to a national power grid collapse, and the division of the African National Congress (ANC) into factions, raising fears of populist policy shifts. In 2012, uncertainty heightened due to protests related to the Marikana mining tragedy, regarded as the worst strike action in post-apartheid South Africa (Kisten, 2020). Between 2014 and 2015, uncertainty deepened because of a severe drought that resulted in food shortages, rising food prices, and the replacement of the Finance Minister twice within a span of four days (Kisten, 2020). The selected sample period in this study captures the effects of these significant economic and political events, including the global COVID-19 pandemic and other factors not considered by Hlatshwayo and Saxegaard (2016).

The selection of an appropriate data frequency stands as a foundational pillar, shaping the accuracy, depth, and reliability of insights gleaned from temporal data streams. High-frequency data risks introducing noise into the model which may result in meaningful patterns being obscured. However, low-frequency data may refine and miss key short-term variations. Thus, it is crucial to find a balance between the two to ensure the series does not contain noise while at the same time ensuring information is not lost due to low-frequency data (Salvador, Floros & Arago, 2014). Like many economic indicators, the Rand Merchant Bank (RMB)/ BER BCI which is used in this study as a proxy for EU, is only available quarterly. Given a sample period of 2006-2023 we are only left with 72 observations. This does not provide us with a sample set large enough to form discernible opinions and therefore prompts the conversion of quarterly data to monthly data through interpolation using Eviews 14.

The interpolation process fills in the missing values within a series by interpolating the values from the data provided. Eviews 14 offers various algorithms for performing interpolation such

as linear and log-linear algorithms. The log-linear method is used along with the use of logged monthly ETF returns. Log-linear interpolation is calculated by first logging the series values before performing the interpolation, and then exponentiating the interpolated value (Eviews, 2022). If the series contains negative values before and after the missing data point, the absolute value is used for interpolation, which is then negated. If the surrounding values are both positive and negative, the interpolation algorithm returns an NA (Eviews, 2022). By applying this method, the sample size increases to 215 monthly observations from February 2006 to December 2023, along with 934 weekly observations. Monthly data is utilized to analyse the effect of EU on bond and equity ETF returns under varying market conditions, as outlined in previous studies (Kundu & Paul, 2022; Huang & Liu, 2022). However, to assess the impact of uncertainty on ETF return volatility, high-frequency data is needed (Dumas *et al.* 2009; Piccoli & Chaudhury, 2018). Weekly data is utilised to smooth out any market noise. The sample period is further broken down to accommodate for the unequal data availability for the bond ETF portfolios which track domestic and international benchmarks. The data for bond ETFs which track a domestic benchmark begins in May 2009 while the bond ETFs which track an international benchmark begins in March 2018. For the sake of comparability, the bond ETF portfolios will examine a sample period of 2018 to 2023.

#### **4.4. Measuring Economic Uncertainty**

Uncertainty can be split into two cases, namely PU and impact uncertainty (Pastor & Veronesi, 2012). PU plainly refers to uncertainty surrounding government decisions whilst impact uncertainty refers to uncertainty surrounding the after-math of political changes. Pastor and Veronesi (2012) demonstrate that during periods of policy uncertainty, stock market returns tend to decrease, and the severity of this decline is influenced by the level of uncertainty. This finding aligns with Bloom (2009), who proposed that there is a counter-cyclical relationship between uncertainty and real economic activity, a relationship that can be reflected in the stock market.

Bloom (2009) developed the measurement of uncertainty proxies and their effects on the broader economy. The study utilizes US stock market volatility as an uncertainty measure because it has proven to be a leading indicator of declines in key economic variables such as employment, industrial production, and the federal funds rate (FFR). The decrease in real economic activity occurs because heightened uncertainty leads businesses to pause their hiring and investment plans (Kisten, 2020). The direct method is survey-based. Surveys are issued to analysts to capture their predictions on inflation, GDP and stock prices. These are compared to

realized values in order to calculate uncertainty. However, the variability in outputs proves to be unreliable due to the results hinging on forecaster sentiment (Poncela and Senra, 2017). Text mining is another method used to measure uncertainty. It is used to extract information from sources such as the media, monetary policy documents and tweets posted on Twitter. Text mining is made possible through the development of big data processing frameworks<sup>1</sup>. There are methods which employ diverse data sources to gauge uncertainty. Employing these techniques illuminates the examination of less transparent economies by incorporating a substantial volume of publicly available information (Hlatshwayo & Saxegaard, 2016). Baker *et al.* (2013) created a news-based index tailored for South Africa, which underscores the crucial impact of policy uncertainty as a key barrier to the country's economic performance. Their innovative method for measuring uncertainty relies on analysing "news chatter" in the media, with an algorithm designed to identify articles related to policy uncertainty. The popularity of this index has grown due to its accessibility and simplicity (Al-Thaqeb & Algharabali, 2019). However, undoubtedly, investor decisions are guided by expectations about the economy and businesses which is regarded as business confidence (Lucey & Dowling, 2005).

When economic agents have limited access to future market conditions, this results in uncertainty (Nguyen & Trinh, 2023). Business confidence refers to the optimism of the current business climate and the anticipated future business conditions (Hardi, Idroes, Hamaguchi, Can, Noviandy & Idroes, 2024). Given that business activities span nearly all sectors of the economy, business confidence is regarded as one of the most vital indicators for tracking economic growth and forecasting potential expansions or contractions. Leduc & Sill (2010) note that optimistic expectations result in a positive outlook regarding the overall economy. Conversely, a pessimistic outlook results in reduced business confidence which leads to reduced investment (Meinen & Roehe, 2017). This reasoning substantiates the use of the BCI as a proxy for EU. The BCI is a useful indicator of EU, illustrating how companies modify their investment choices based on changing future expectations. The BER at Stellenbosch University in South Africa has been conducting business tendency surveys for 70 years (Kirsten & De Schepper, 2024). Sponsored by RMB, this index is known as the RMB/BER BCI. The index collects responses from manufacturers, retailers, wholesalers, new vehicle dealers, and major construction contractors, all of which are key sectors that often lead overall economic

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<sup>1</sup> Big data is a broad term that encompasses the non-traditional approaches and technologies required to collect, organize, process, and extract insights from large datasets (Gurusamy, Kannan & Nandhini, 2017).

trends. The survey regularly asks participants about factors impacting business conditions, using the same set of questions each quarter for decades, which provides a robust long-term data series. Notably, for the past decade, manufacturers have frequently identified the general political climate as the most significant constraint on their business conditions. Following Adekoya & Oliyide (2021) the BCI is obtained from the BER for the given sample period. The index is composed by calculating the unweighted average of five sector indices: manufacturing, retail, building contractors, wholesalers, and new vehicle dealers. The index is scored between 0 and 100 (Adekoya & Oliyide, 2021). Lower scores indicate low confidence and higher scores indicate higher confidence with respect to the current domestic investment climate (De Jongh & Mncayi, 2018).

The real options approach posits that firms face multiple projects and may opt to halt investments if economic prospects appear dim (Bernanke, 1983). Under conditions of partial irreversibility in investment, as noted by Redl (2015), uncertainty can impede the expansion of productive firms while allowing unproductive ones to persist, leading to inefficiencies. The BCI captures this sentiment; when confidence is low, firms are less likely to pursue growth opportunities, thereby stalling economic momentum. Furthermore, the relationship between the BCI and productivity highlights how fluctuations in business confidence can create pro-cyclical effects, influencing the broader business cycle. A declining BCI typically signals increasing uncertainty, prompting firms to delay or scale back investments, which can exacerbate economic downturns, while a rising BCI indicates recovery and growth potential. Thus, the BCI encapsulates the idea that current decisions impact future actions, making it a crucial indicator for understanding the interplay between business sentiment and economic dynamics (Redl, 2015). Additionally, the ease of accessibility to data made it an ideal proxy.

#### **4.5. Model Specification**

The first objective of this study is to examine the influence of EU on the returns of bond and equity ETFs listed in South Africa during both bull and bear market phases. The second objective is to assess the effect of EU on the volatility of these ETFs. To achieve the first objective, the MSM model is used, while for the second objective, various models such as GARCH, EGARCH, TGARCH, GARCH-M, EGARCH-M, and TGARCH-M are employed. The information criteria for each model are compared to determine the most appropriate model for the second objective. Finally, diagnostic tests for each model are outlined.

#### **4.5.1. Markov Switching Regression Model**

Many financial and economic time series appear to experience periods where their behaviour shifts dramatically from what was observed previously (Brooks, 2019). This behaviour can evolve over time in terms of its average value, volatility, or the level of correlation between current and past values. These shifts may either be permanent, referred to as a "structural break," or temporary, leading to a return to the original behaviour or a transition to a new pattern, often known as a "regime shift" or "regime switch" (Brooks, 2019). The first research goal of this study is to analyse how EU affects the returns of bond and equity ETFs listed in South Africa under both bull and bear market conditions. One limitation of the linear VAR model is its inability to capture varying market conditions.

The MSM, introduced by Hamilton (1989), is also known as the "regime switching model". It consists of multiple equations that describe the behaviour of time series across different regimes (Kuan, 2002). The Markov model is recognized for its switching mechanism, which is driven by an unobservable state variable that follows a first-order Markov chain. The characteristics of the Markov model dictate that the present value of the state variable depends only on its immediate past value. This means that a structure can persist for a random period before being replaced when the state changes (Kuan, 2002).

This study uses a two-state MSM, as it has been empirically shown that economic and financial time series undergo periods where their behaviour significantly deviates from past trends (Brooks, 2019). When the behaviour shifts temporarily and then either returns to its previous state or transitions to a new state, this is known as a regime switch (Brooks, 2019). Brooks (2019) observes that such regime shifts can occur frequently, leading to considerable changes in financial market return behaviour. In such instances, using a linear model that estimates the entire sample would be inappropriate. Therefore, it is hypothesized that the returns of bond and equity ETFs are non-linear and that their relationship with EU is best modelled through a regime switching framework. The MSM model is chosen because it enables the estimation of the full sample while accounting for different behaviours across different regimes (Brooks, 2019). Although Batabyal & Killins (2021) use the NARDL to analyse the impact of EU on stock returns, the NARDL is better suited to capturing non-linear asymmetric relationships, while the MSM is more appropriate for datasets that exhibit distinct periods of varying behaviour (Obalade & Muzindutsi, 2019; Kunjal & Peerbhai, 2021; Moodley, Nzimande & Muzindutsi, 2022; Muzindutsi & Obalade, 2024). One of the limitations of this model is the choice of distribution functions (e.g. normal, Student-t) and other model specifications can

introduce biases. If the data deviates from the assumed distributions, the estimation results may be skewed (Sharif, Ghoul, Bouteska & Abedin, 2024).

The first-order Markov assumption holds that the probability of being in a particular state is determined by the most recent state, such that

$$P(s_t = j | s_{t-1} = i) = p_{ij} = (t) \quad (4.2.)$$

The  $i^{\text{th}}$  and  $j^{\text{th}}$  elements represent the probability of transitioning from regime  $i$  at time  $t - 1$  to regime  $j$  at time  $t$ . The probabilities are assumed to be constant, such that  $p_{ij}(t) = p_{ij}$  for all  $t$ . A  $m \times m$  matrix of the probabilities that the regime will be in a state based on its previous state is created to yield a vector of current state probabilities (Moodley *et al.*, 2022). Equation (4.2) expressed as a matrix is given below:

$$P = \begin{bmatrix} P(S_T = 1 | S_{T-1} = 1) & P(S_T = 2 | S_{T-1} = 1) \\ P(S_T = 1 | S_{T-1} = 2) & P(S_T = 2 | S_{T-1} = 2) \end{bmatrix} = \begin{bmatrix} P_{11} & P_{12} \\ P_{21} & P_{22} \end{bmatrix} \quad (4.3.)$$

Where  $S_T$  is the regime at time  $T$ ,  $S_{T-1}$  is the regime one period before time  $T$ , and  $P_{ij}$  is the probability of switching from regime  $i$  to regime  $j$ . This matrix of probabilities enables the assessment of how long each bond and equity ETF portfolio stays in a bullish or bearish regime before switching.  $P_{11}$  represents being in state/regime 1 in period  $T-1$  and staying in state 1 during period  $T$ , (e.g. being in a bear condition and staying in the same bear condition in the next period).  $P_{12}$  represents being in state 1 in period  $T-1$  and moving to state 2 during period  $T$ . (e.g. being in a bear condition and switching to a bull condition in the next period).  $P_{21}$  represents being in state 2 in period  $T-1$  and moving to state 1 during period  $T$ , (e.g. being in a bull condition and switching to a bear condition in the next period) and  $P_{22}$  represents being in state/regime 2 in period  $T-1$  and staying in state 2 during period  $T$ , (e.g. being in a bull condition and staying in the same bullish condition in the next period).

The identification of the bull and bear regimes is carried out by analysing the log standard deviations within each respective regime. A high standard deviation is associated with high volatility which refers to a bear market (Moodley *et al.*, 2022). In a bear market, where prices are generally falling, EU can have a more pronounced effect. In this environment, negative news and uncertainty can exacerbate declines as investors become more risk-averse and market sentiment turns more pessimistic (Devault *et al.*, 2019). ETFs, particularly those tied to sectors or assets that are more sensitive to economic conditions, might experience more significant declines during periods of heightened uncertainty.

Equations 4.4 to 4.7 depict the MSM for bond and equity ETF portfolio returns, incorporating interest rates and inflation as control variables to address persistent global economic challenges. Stock price fluctuations take place within the broader economy and, as a result, should be influenced by changes in other market factors, including macroeconomic elements like inflation and interest rates (de Jesus, Willows & Olivier, 2020). In order to ensure that the stationarity requirements for modelling purposes are met, the change in each variable is calculated and examined.

Inflation and real prime interest rates are employed as control variables to address persistent global economic challenges as the BCI does not consider these crucial economic variables in its composition. Inflation is typically measured by the CPI, which tracks the prices consumers pay for a representative selection of goods (Statsa, 2013). It is posited that inflation negatively impacts stock returns, as it often coincides with contractionary monetary policies. These policies usually reduce the money supply, which leads to a lower disposable income for consumers and, in turn, a reduction in cash inflow for companies (Shawtari, Salem, Hussain & Hawariyuni, 2016).

The South African stock market has felt the ripple effects of global economic shifts, particularly in response to inflationary pressures and the tightening of monetary policies in major economies. The Federal Reserve's contractionary stance, aimed at curbing inflation in the US, has had a substantial knock-on effect on South African financial markets. By raising interest rates, the US has created a stronger US dollar, making other currencies, including the South African rand, more vulnerable. This has led to increased capital flight from South Africa, as investors look for safer, higher-yielding investments elsewhere. The resultant capital outflows further weaken the local currency and heighten market volatility, triggering a vicious cycle that impacts both domestic and foreign investor sentiment (Bahlmann, 2024).

Interest rate changes are particularly significant in the South African context, as they introduce what is known as interest rate risk. Rising interest rates make borrowing more expensive, which has a direct impact on businesses' investment decisions. Firms with high levels of debt face increased costs for servicing loans, reducing their capacity to expand and invest. At the same time, higher borrowing costs constrain consumer spending, leading to a decline in aggregate demand. This weakens corporate earnings and, by extension, stock prices, creating a negative feedback loop that feeds into market instability.

In a high-interest-rate environment, investors typically seek safer, more predictable returns. As a result, demand for equities may decline, as the returns on government bonds or other fixed-income securities become more attractive due to their lower perceived risk. This shift away from equities in favour of bonds exacerbates market downturns, as capital is reallocated out of the stock market and into these more stable instruments. According to Cohen and Kudryavtsev (2012), this inverse relationship between interest rates and stock market performance is particularly evident in South Africa, where foreign investor behaviour and the dynamics of local institutional investors are heavily influenced by global interest rate trends.

Furthermore, high interest rates can dampen domestic economic activity, leading to slower economic growth. As Ali (2014) suggests, reduced borrowing means less money circulating in the economy, which lowers consumer demand and slows down investment in capital markets. The ripple effects on business growth, employment, and consumer spending translate into a more cautious approach to stock market investment. In addition, businesses in sectors such as real estate, construction, and consumer goods—industries sensitive to interest rate movements—experience slower growth, which further drags down stock prices.

The role of South Africa's prime lending rate is crucial here. As de Jesus *et al.* (2020) explain, the prime lending rate directly impacts borrowing behaviour by commercial banks and, by extension, the broader economy. When the central bank raises interest rates, commercial banks respond by adjusting their prime lending rates upwards, making loans more expensive for both individuals and businesses. This, in turn, influences consumer spending and corporate investment decisions. As van der Westhuizen, van Eyden, and Aye (2022) point out, this can result in a contraction in economic activity, leading to a slowdown in both stock market growth and overall economic development.

The interconnection between inflation and interest rates also cannot be overlooked. Marschner and Ceretta (2021) emphasize that inflation directly erodes the purchasing power of individuals, which influences their consumption patterns and investment decisions. With inflation eating into savings and reducing disposable income, consumers tend to prioritize immediate needs, often diverting funds away from long-term investments such as stocks. This in turn impacts corporate earnings and, ultimately, stock market performance. To mitigate these effects, investors may turn to inflation-linked assets or adjust their portfolio strategies to counter the erosion of purchasing power. In this environment, the real prime interest rate, which accounts for inflationary effects, becomes an essential tool for understanding the true cost of borrowing and its impact on consumption and investment. The change in real prime interest

rates is a crucial indicator of the economic climate and can guide both investor expectations and economic policy decisions.

In summary, the combination of rising interest rates, inflationary pressures, and geopolitical uncertainties creates a complex environment for the South African stock market. Investors must navigate these challenges by adjusting their strategies to balance risk and return, while policymakers work to strike a delicate balance between controlling inflation and fostering economic growth. The resulting interplay between interest rates, inflation, and market stability underscores the vulnerability of emerging markets like South Africa to global economic shifts.

Thus, the estimated equations are as follows:

$$\begin{aligned} DOMESTIC\_BONDS_T = & \alpha_{ST} + \beta_{1ST}\Delta EU_T + \gamma_{1ST}INFLATION_T + \\ & \delta_{1ST}\Delta INTEREST_T + e_{ST} \end{aligned} \quad (4.4)$$

$$\begin{aligned} DOMESTIC\_EQUITY_T = & \alpha_{ST} + \beta_{1ST}\Delta EU_T + \gamma_{1ST}INFLATION_T + \\ & \delta_{1ST}\Delta INTEREST_T + e_{ST} \end{aligned} \quad (4.5)$$

$$\begin{aligned} INT\_BONDS_T = & \alpha_{ST} + \beta_{1ST}\Delta EU_T + \gamma_{1ST}INFLATION_T + \\ & \delta_{1ST}\Delta INTEREST_T + e_{ST} \end{aligned} \quad (4.6)$$

$$\begin{aligned} INT\_EQUITY_T = & \alpha_{ST} + \beta_{1ST}\Delta EU_T + \gamma_{1ST}INFLATION_T + \\ & \delta_{1ST}\Delta INTEREST_T + e_{ST} \end{aligned} \quad (4.7)$$

The variables used in the model include  $DOMESTIC\_BONDS_T$ , which represents the returns of the domestic bond ETF portfolio returns,  $DOMESTIC\_EQUITY_T$  for the domestic equity ETF portfolio returns,  $INT\_BONDS_T$  for the international bond ETF portfolio returns, and  $INT\_EQUITY_T$  for the international equity ETF portfolio returns. The switching intercept is denoted as  $\alpha_{ST}$ , while  $\Delta EU_T$  refers to the change in the EU variable, and  $INFLATION_T$  represents a change in the CPI. The change in the real prime interest rate is represented by  $\Delta INTEREST_T$ . The coefficients  $\beta_{ST}$ ,  $\gamma_{ST}$  and  $\delta_{ST}$  are to be estimated for each regime, and  $e_{ST}$  is the error term. The variable ST represents the regime (1 or 2) in which the bond and equity ETF markets are operating.

Hypothesis testing is conducted using the coefficients produced by the regression, according to the following conditions:

$$H_0 : \beta_{1ST} = 0$$

$$H_1 : \beta_{1ST} \neq 0$$

The beta coefficient is estimated under both bullish and bearish regime. Rejecting the null hypothesis will indicate that EU has a significant effect on the changes in bond and equity ETF prices in a bullish or bearish regime.

#### **4.5.2. Generalised Autoregressive Conditional Heteroskedasticity (GARCH) Model**

This study analyses two markets: The South African ETFs that track domestic benchmarks and those that track international benchmarks. Furthermore, the bond ETFs and equity ETFs within each market are examined separately. Heteroskedasticity, a violation of the Ordinary Least Squares (OLS) assumption, occurs when the variance of the error term is not constant across observations (Guirguis, 2018). A key feature of financial time series is uncertainty, which is associated with volatility (Zivot, 2016). This is the basis of the reward-to-risk theory, where investors demand additional reward for taking on higher risk. Modelling and forecasting volatility are crucial for risk management and asset allocation, as they help policymakers and investors avoid unnecessary losses (Dinga, Claver, Cletus & Che, 2023). In this study, GARCH models are employed to analyse how EU affects volatility in the equity and bond ETF markets. These models are preferred over other alternatives due to their widespread acceptance in financial literature for modelling volatility (Rupande *et al.*, 2019).

The Autoregressive Conditional Heteroskedasticity (ARCH) model was introduced by Engle in 1982. It was designed to model the volatility of heteroskedastic time series. This concept was later expanded upon by Bollerslev (1986) and Taylor (1986), who developed the more advanced GARCH model. The standard GARCH model allows for conditional variance to depend on its own previous lags (Su, 2010). However, both the ARCH and GARCH models are symmetric in nature. To determine whether the effect of EU on equity and bond ETF volatility is symmetric or asymmetric, the study explores the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model and the Threshold Generalized Autoregressive Conditional Heteroskedasticity (TGARCH) model. GARCH models are particularly suited for high-frequency data, which is why weekly data is used to explore the second research objective of this study (Rupande *et al.*, 2019). However, while the EGARCH can capture asymmetric volatility, not all GARCH variants do. This limitation should be noted when trying to model the differing impacts of positive and negative economic shocks on ETFs (Lu, Wang & Li, 2025).

The GARCH models estimated in this study include two equations: the mean and variance equations. The mean equation allows for the examination of the risk-return relationship, where

a significant and positive risk premium coefficient would align with financial theory on compensation for bearing risk (Muguto & Muzindutsi, 2022). To examine the risk premium,  $\theta$ , in the returns of each ETF portfolio, the mean equations are modelled with a GARCH-in-mean specification (GARCH-M). A general GARCH model of order (p, q) characterizes the dependence of current variance (i.e., at period T) on past changes in the variables being studied and previous variance estimates, also known as "old news" (Petkov, Shopova, Varbanov, Ovchinnikov & Lalev, 2024). A lag order of 1.1 is used, as empirical studies in South Africa have shown that it captures both ARCH effects and autocorrelation in variance (Muzindutsi, Apau, Muguto & Muguto, 2023). The mean equation for the GARCH-M (1,1), EGARCH-M (1,1), and TGARCH-M (1,1) models in each market are provided by equations 4.8-4.11.

$$DOMESTIC\_BONDS_T = \mu + ar_{T-1} + \Delta EU_T + \theta \sigma^2_{T-1} + \varepsilon_T \quad (4.8)$$

$$DOMESTIC\_EQUITY_T = \mu + ar_{T-1} + \Delta EU_T + \theta \sigma^2_{T-1} + \varepsilon_T \quad (4.9)$$

$$INT\_BONDS_T = \mu + ar_{T-1} + \Delta EU_T + \theta \sigma^2_{T-1} + \varepsilon_T \quad (4.10)$$

$$INT\_EQUITY_T = \mu + ar_{T-1} + \Delta EU_T + \theta \sigma^2_{T-1} + \varepsilon_T \quad (4.11)$$

$$h_t = \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1} \quad (4.12)$$

Where  $\mu$  represents the mean of the respective ETF return at time T,  $\varepsilon_t$  is the random error term considered as an innovation process with mean equal to  $\sigma_t^2$  or  $h_t$ , that is dependant on the available information on returns to period T-1.  $\Delta EU_T$  is the EU proxied by the BCI which is included to determine its effect on volatility and  $\theta$  allows for the examination of the risk premium. The error term is calculated as:

$$\varepsilon_T = \sqrt{h_t} z_T \quad (4.13)$$

Where  $h_t$  is the conditional volatility and  $z_T$  is a white noise error term with zero mean and unit variance,  $z_T \sim N(0,1)$ . Equations 4.8 – 4.11 are the mean equations which incorporate an autoregressive (AR) component (indicating the influence of the previous month's returns) and the variance estimate. In practice, it may also include a moving average (MA) component. In this case, the model would be classified as ARMA (1,0)- GARCH (1,1). Decomposing weekly returns into expected conditional mean returns and innovations, represented as a standardized "white noise" process with time-varying conditional variance, is both convenient and feasible. This approach ensures that all necessary information is utilized and that the model is properly specified. Additionally, the volatility is known or predetermined at time T-1. Equation 4.12

defines the volatility, which includes the ARCH (squared residuals from the previous month's returns) and the GARCH factors (the AR component, which includes the ARCH factors and residuals from the most recent period). The coefficients  $\alpha$  and  $\beta$  must meet the stationarity conditions, namely  $\alpha \geq 0$ ,  $\beta \geq 0$  and  $\alpha + \beta \leq 1$ . The sum of the parameters  $\alpha$  and  $\beta$  reflects the extent to which stationarity is maintained and is referred to as persistence. However, a key limitation of both ARCH and GARCH models is their symmetry; they are influenced by the absolute values of the variances rather than their actual signs. In other words, negative and positive changes of the same magnitude exert an identical effect on future values of the conditional variance. In contrast, asymmetric models distinguish between the effects of good and bad news, with the latter having a more pronounced impact on future outcomes. Another drawback of the ARCH and GARCH models is their inability to capture the leverage effect inherent in financial time series due to asymmetry. The leverage effect, identified by Black (1976), occurs when negative shocks or bad news have a greater impact on volatility than positive shocks or good news. This means that volatility tends to be higher during market downturns than in periods of growth (Dinga *et al.*, 2023). This occurs because negative shocks drive prices lower, increasing the debt-equity ratio and heightening uncertainty regarding future events, ultimately raising volatility.

The EGARCH model addresses this limitation by incorporating an asymmetric parameter, enabling it to capture the unequal responses of time-varying volatility to shocks in the GARCH model. By doing so, it ensures that the conditional variance remains positive, modelling the natural logarithm of the variance without restricting the signs of the model parameters (Dinga *et al.*, 2023). The variance equation for the EGARCH (1,1) model can be expressed as follows:

$$\log(\sigma_T^2) = \omega + \sum_{i=1}^p \left[ \alpha_i \left( \frac{|\varepsilon_{T-i}|}{\sigma_{T-i}} - \sqrt{\frac{2}{\pi}} \right) + \gamma_i \left( \frac{\varepsilon_{T-i}}{\sigma_{T-i}} \right) \right] + \sum_{j=1}^q \beta_j \log(\sigma_{T-j}^2) + \Delta EU_T \quad (4.14)$$

$\alpha_i$  measures the magnitude of the shock  $\frac{\varepsilon_{T-i}}{\sigma_{T-i}}$ ,  $\beta_j$  captures the persistence of the shock to the bond or equities ETF portfolio and  $\gamma_i$  is the asymmetric parameter which measures the leverage effect. For a significant market shock, volatility will persist for an extended period, especially for larger values of  $\beta_j$  (Dinga *et al.*, 2023). The model is asymmetric when  $\gamma_i \neq 0$ . For  $\gamma_i < 0$  bad news ( $z_{t-1} < 0$ ) is expected to have a greater impact on volatility than good news ( $z_{t-1} > 0$ ) which is known as the leverage effect (Epaphra, 2017). According to Poon (2005), this is

because when  $\gamma_i < 0$  the shock effect  $(\alpha_i + \gamma_i) z_{T-1}$  for  $z_{T-1} < 0$  and  $(\alpha_i - \gamma_i) z_{T-1}$  for  $z_{T-1} > 0$  results in the model being stationary if  $\sum_{j=1}^q \beta_j < 1$ .

The TGARCH (1,1) variance equation is as follows:

$$\log(\sigma_T^2) = \omega + \alpha \varepsilon_{T-1}^2 + \gamma \varepsilon_{T-1}^2 + \beta \sigma_{T-1}^2 + \Delta EU_T \quad (4.15)$$

$\sigma_t^2$  is the variance and  $\omega$  is the constant.  $\alpha \varepsilon_{T-1}^2$  reflects the ARCH effect which is measured as the lag of squared residuals.  $\gamma \varepsilon_{T-1}^2$  is the asymmetric effect due to leverage and is multiplied by the impact of good or bad news. Bad news represents a negative shock which indicates that EU is increasing, while good news represents a positive shock indicating that EU is decreasing. If  $\varepsilon_{T-1} > 0$ , it represents good news and if  $\varepsilon_{T-1} < 0$ , it represents bad news. Good news impacts  $\alpha$  while bad news has an impact on  $\alpha + \gamma$ . If  $\gamma > 0$ , then bad news increases volatility and there is a leverage effect. If  $\gamma \neq 0$ , the news effect is asymmetric.  $\beta \sigma_{T-1}^2$  is the GARCH term which is last periods forecasted variance (Guriguiz, 2018).

The GARCH models are estimated and evaluated under three different error distribution assumptions—normal, Student’s t, and generalized. This approach is necessary because the residuals from GARCH models tend to exhibit leptokurtosis, leading to asymptotically inefficient parameter estimates (Muguto & Muzindutsi, 2022). While both the Student’s t and generalized distributions can accommodate the leptokurtic nature of the data, the normal distribution specification cannot. Additionally, parameter estimates derived from these two distributions are less affected by extreme outliers, such as those seen during market crashes. All three distribution assumptions are considered, and the best-fitting model is selected based on Schwarz’s Bayesian Information Criterion (SBIC). SBIC is favoured over other criteria like the Akaike Information Criterion (AIC) because it applies a stronger penalty for the number of parameters in the model. Furthermore, SBIC tends to select better-fitting models when dealing with large sample sizes, unlike AIC, which may favour more complex models as the sample size increases (Brooks, 2019). It is often assumed that GARCH processes are stationary, even when the sample periods span times of significant economic disruption, such as the 2007–2008 global financial crisis and the COVID-19 pandemic, both of which involve structural breaks. Structural breaks, resulting from global and country-specific financial, economic, social, and political events, can greatly affect volatility (De Gaetano, 2018), and as such, these structural

breaks are taken into account in the estimations since the sample period includes these two major crises.

#### **4.6. Preliminary and Diagnostic Tests**

The MSM model for conditional mean with constant transitional probabilities, along with GARCH models, requires the data to exhibit stationarity properties if structural breaks are present in the stationary series (Paliouras, 2007). Consequently, it is crucial to perform tests beforehand to verify the accuracy of the models' outputs. Therefore, the study employs preliminary tests such as correlation, unit root, and stationarity tests, both with and without structural breaks. Additionally, residual diagnostic tests, including normality tests, are conducted. The next section provides an in-depth explanation of each test performed.

##### **4.6.1. Correlation Analysis**

The study utilizes the correlation coefficient test to assess the strength and direction of the relationship between the respective ETF portfolio returns and EU. A positive correlation coefficient suggests a positive relationship between the ETF portfolio returns and EU, whereas a negative coefficient indicates an inverse association (Brooks, 2019). The mathematical formula for the correlation coefficient test can be expressed as follows:

$$C = \frac{(n \sum xy - (\sum x)(\sum y))}{\sqrt{n(\sum x^2) - (\sum x)^2} \sqrt{n(\sum y^2) - (\sum y)^2}} \quad (4.16)$$

Where C calculates the correlation coefficient, n reflects the number of observations, and x and y correspond to the relevant ETF portfolios and EU variables.

##### **4.6.2. Unit Root and Stationarity Testing**

The data analysis begins with determining whether the ETF portfolio returns, as well as the BCI, inflation, and interest rates, are stationary. Time series studies assume that the underlying series is stationary. A series is considered stationary if its mean and variance remain constant over time, and the covariance between two time periods depends only on the lag or distance between the two periods, not on the specific time at which the covariance is computed.

For the MSM model to be valid, both the dependent and independent variables must be pretested for stationarity, with and without structural breaks (Kuan, 2002). Only when the series is confirmed to be stationary at level or I (0) can the model be accurately estimated and interpreted. The stationarity of each variable is tested using the Kwiatkowski, Phillips, Schmidt, and Shine (KPSS) test (Kwiatkowski, Phillips, Schmidt & Shine, 1992), while the unit root test is performed using the Augmented Dickey and Fuller (ADF) test (Dickey &

Fuller, 1981). The ADF test evaluates the null hypothesis that the series contains a unit root, while the alternative hypothesis suggests that it is stationary. In contrast, the KPSS test reverses the null and alternative hypotheses.

Along with the standard unit root and stationarity tests, the study also conducts a test to determine if the dependent and independent variables are stationary in the presence of structural breaks. Ignoring unit root tests with structural breaks—caused by economic events—can lead to incorrect inferences (Chaudhuri & Wu, 2003), which may result in biased conclusions. To address this, the study applies the Enders & Lee (2012) Fourier Augmented-Dickey Fuller (ADF min-t) test to demonstrate the series' stationarity with structural breaks. The ADF min-t test has two variations: an innovation outlier (IO) and an additive outlier (AO) (Narayan and Smyth, 2005). The innovation outlier assumes that structural breaks occur in stages, following the pattern of prior innovations, whereas the additive outlier assumes that structural breaks happen immediately and do not follow the innovations' dynamic pattern. For this study, the innovation outlier is selected, as structural breaks in time series data generally occur gradually, reflecting the innovations of the preceding period. Therefore, the innovation outlier method is better suited for determining the stationarity of time series data in the presence of structural breaks.

#### **4.6.2.1. The Augmented-Dickey Fuller Test**

The ADF unit root test tests the null hypotheses ( $H_0$ ): Unit root series against the alternative hypothesis ( $H_1$ ): stationary series. The null hypothesis is rejected when the test statistic is more negative than the critical values (1 percent, 5 percent and 10 percent level of significance) of the estimation output.

The ADF unit root test can be expressed as:

$$y_t = \Psi y_{t-1} + \mu + \lambda t + \sum_{i=1}^p \alpha_i \Delta y_{t-1} + \mu_i \quad (4.17)$$

Where  $\Psi$  represents the unit root,  $\mu$  is the intercept and  $\lambda$  is the time trend which can be included or excluded depending on the necessity.  $p$  denotes the number of lags and  $\mu_i$  is the white noise disturbance term (Brooks, 2019).

#### **4.6.2.2. The Augmented-Dickey Fuller Structural Break Test**

The ADF min-t structural break test evaluates the null hypothesis ( $H_0$ ) that the series has a unit root with an unknown number of level breaks, versus the alternative hypothesis ( $H_1$ ) that the series is stationary with an unknown number of level breaks. The null hypothesis is rejected in

favour of the alternative hypothesis if the test statistic is more negative than the critical values at the 1 percent, 5 percent and 10 percent level of significance derived from the estimation output. The ADF min-t structural break test can be represented as:

$$y_t = \Psi y_{t-1} + \mu D_L + \lambda t + \sum_{i=1}^p \beta_i \Delta y_{t-1} + \mu_i \quad (4.18)$$

Where  $\Psi$  signifies the unit root,  $\mu$  represents the intercept,  $D_L$  and  $\beta_i$  are breakpoint parameters and  $\lambda$  is the time trend which may or may not be included depending on the necessity. The variable  $p$  denotes the number of lags and  $\mu_i$  represents the white noise disturbance term (Enders & Lee, 2012).

#### 4.6.2.3. The Kwiatkowski, Phillips, Schmidt and Shine Test

The KPSS test evaluates the null hypothesis ( $H_0$ ) that the series is stationary, against the alternative hypothesis ( $H_1$ ) that the series contains a unit root. The null hypothesis is rejected in favour of the alternative hypothesis when the test statistic exceeds the critical values (1 percent, 5 percent and 10 percent level of significance) from the estimation output. The KPSS test can be expressed as:

$$\Delta y_t = (T^{-2} \sum_{t=1}^T \widehat{St}^2) / \lambda^2 \quad (4.19)$$

Where  $St = \sum_{i=1}^t \widehat{U}_t, \widehat{U}_t$  is the residuals of the regression of  $y_t$  on  $D_t$ .  $\lambda^2$  is a constant estimate of the long-run variance of  $U_t$  using  $\widehat{U}_t$  (Kwiatkowski *et al.*, 1992).

#### 4.6.3. Nonlinearity Test

The Broock, Scheinkman, Dechert & LeBaron (1996) test is employed to assess the nonlinear dependence between the dependent and independent variables. It is important to note that this test is not used to determine the linear or nonlinear dependency between the respective ETF portfolio returns and EU. It is conducted for two key reasons: (1) the study analyses two distinct regimes (i.e., a bull and bear market regime), and linear models do not account for regime switching, making the nonlinearity test irrelevant; (2) empirical literature suggests evidence of nonlinear dependence between stock returns and macroeconomic variables, leading the study to conclude the existence of such nonlinear dependence between the two series (Abadi & Ismail, 2016).

#### 4.6.4. Normality Test

A normal distribution is symmetric and has a kurtosis coefficient of 3 (Brooks, 2019). It is possible to define the coefficient of excess kurtosis, which is the kurtosis coefficient minus 3.

A normal distribution has a coefficient of excess kurtosis of zero. This concept was formalised by Bera and Jarque (1981), who tested whether the coefficients of skewness and the coefficients of excess kurtosis are jointly zero. Thus, the Jarque-Bera test evaluates the null hypothesis ( $H_0$ ) that the residuals are normally distributed, against the alternative hypothesis ( $H_1$ ) that the residuals are not normally distributed. The p-value is used to reject the null hypothesis at all levels of significance. If the p-value is lower than 1 percent, 5 percent and 10 percent level of significance, the null hypothesis is rejected in favour of the alternative hypothesis at the specified level of significance. The Jarque-Bera test statistic can be specified as:

$$JB = \left[ \left( \frac{S^2}{6+N} \right) + \left( \frac{(K-3)^2}{24+N} \right) \right] \quad (4.20)$$

Where JB represents the Jarque-Bera test statistic, S is the sample size and K is the kurtosis coefficient. The Jarque-Bera test statistic follows a Chi-squared distribution with two degrees of freedom (Brooks, 2019).

#### **4.6.5. ARCH Effect Test**

The ARCH effect is tested using the Lagrange Multiplier (LM) test (Engle, 1982), which is designed to assess autocorrelation within the residuals (Brooks, 2019). This test examines the relationship between the residual components and their corresponding lags. The null hypothesis ( $H_0$ ) posits that all q lags of the squared residuals have coefficient values that are not significantly different from zero. In contrast, the alternative hypothesis ( $H_1$ ) suggests that all q lags of the squared residuals have coefficient values that are significantly different from zero. If the test statistic exceeds the critical value from the Chi-squared distribution, the null hypothesis is rejected.

#### **4.7. Chapter Summary**

The purpose of this study is to examine the effect of EU on bond and equity ETF portfolio returns and volatility in South Africa. The ETFs are broken down into four portfolios and split into domestic and international bond and equity tracked ETFs. Monthly data obtained from the IRESS database, BER, StatSA and the SARB for the sample period February 2006 to December 2023 is utilised to conduct this analysis.

Quantitative analysis is pursued in determining the objective of this study and to answer the first research question – which looks at the effect of EU on bond and equity ETF returns under changing market conditions - a regime-switching model is employed. This model is ideal as it is able to cater to the bull and bear market conditions which occur at different time intervals

(Chen, Zhou & Dai, 2015). The second research objective looks at the volatility brought about by EU on the ETF portfolio returns. Due to the modelling requirements of volatility, weekly data is used for this analysis and a GARCH model is employed to examine this research objective. The EGARCH, EGARCH-M, GARCH, GARCH-M, TGARCH and TGARCH-M models are run and the best model is selected based off their SBIC. Before estimating the models, a series of preliminary and diagnostic tests are conducted, including correlation analyses, unit root tests with and without structural breaks, stationarity tests, and residual normality tests. The following chapter presents the estimated results and provides an interpretation of the empirical statistical model and econometric tests.

## **CHAPTER 5: DATA ANALYSIS AND DISCUSSION**

### **5.1. Introduction**

The global financial landscape is continuously shaped by EU, affecting investment decisions, asset prices, and market volatility. This study investigates the influence of EU on the returns and volatility of South African bond and equity ETFs, under both bullish and bearish market conditions. By employing advanced econometric models such as the Markov Switching Model (MSM) and Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models, this chapter provides empirical insights into the behaviour of ETF returns in response to EU. The analysis begins with a presentation of preliminary tests, including graphical representations, descriptive statistics, correlation analysis, and stationarity tests, which lay the groundwork for the empirical models. The MSM framework examines how ETF returns shift between market regimes in response to EU, while the GARCH models assess its impact on ETF volatility. The findings provide a detailed understanding of how investors react to EU, revealing key differences between domestic and international ETFs. This chapter concludes with a discussion of the results, highlighting their implications for market participants, policymakers, and portfolio managers.

### **5.2. Preliminary Tests**

This section includes a graphical representation featuring a combination graph of the four ETF portfolio returns and EU. Following this, descriptive statistics for each analysed variable are presented, followed by a correlation analysis to examine the relationship between the dependent and independent variables. Finally, tests for stationarity and ARCH effects are conducted.

#### **5.2.1. Graphical Representation**

A graphical representation is key to visually displaying the trend and co-movements amongst the variables under analysis. Figure 5.1. depicts a graphical representation of the four ETF portfolio returns under examination and EU. A combination graph is best suited to illustrate any possible trends in the series and to ascertain if the series attributes stationary properties. The BCI was the highest of all time within this sample period from 2006 and noticeably began to decrease owing to the 2008 financial crisis which also transitioned into a very bumpy political era for South Africa. The most noticeable jump is observed between 2020 and 2021. This could be due to the increased uncertainty that the COVID-19 pandemic brought to the global economy. However, the graph does not indicate any co-movement between the BCI and any of the portfolios as anticipated. The graph clearly indicates that the ETF portfolio returns

and EU series illustrates a white noise process. This is due to a lack of a trend in the series as well as the fact that each series crosses their respective mean frequently. If a series is seen to exhibit a white noise process, the series can be deemed as stationary (Brooks, 2019). This implies that the series maintains a constant mean, variance and autocovariance. As a result, when shocks are introduced to the process, a stationary series ensures that these shocks gradually diminish over time, preserving the data's accuracy (Moodley *et al.*, 2022). However, to confirm the stationarity of the ETF portfolio returns, EU and other control variables such as inflation and interest rates series the ADF test and KPSS test is administered.

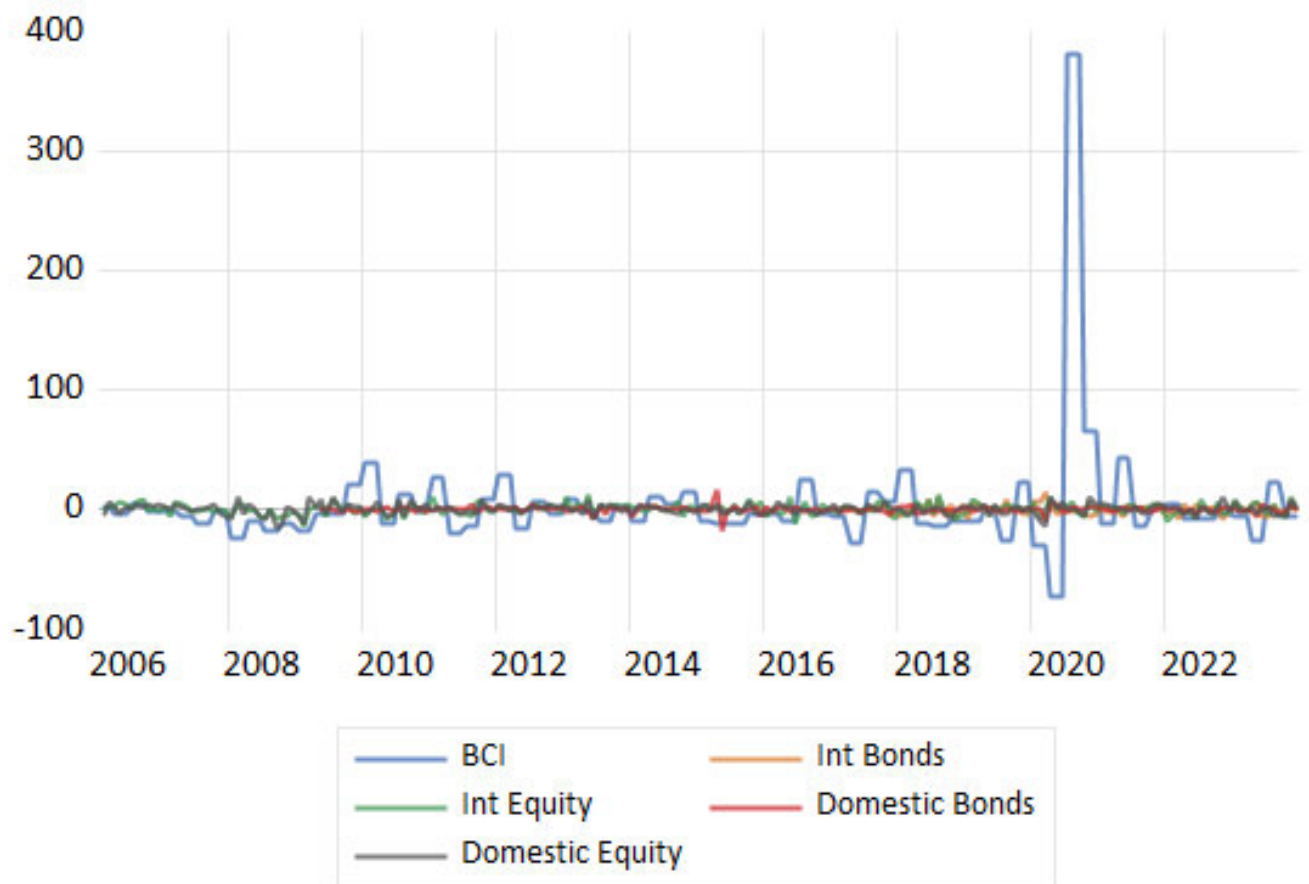


Figure 5.1. Plot of the ETF Portfolio Returns and Economic Uncertainty

Source: Authors own estimation

### 5.2.2. Descriptive Statistic Results

The descriptive statistics report on each variable's mean, median, maximum, minimum, standard deviation, skewness, kurtosis, Jarque-Bera statistics as well as the probability (p-

values) of the ETF portfolio returns, EU and control variables which are inflation and the change in the real prime interest rate. This is displayed in table 5.1 and 5.2.

*Table 5.1. EU and ETF Portfolio Returns Descriptive Statistics*

	<b>EU</b>	<b>DOM BONDS</b>	<b>DOM EQUITY</b>	<b>INT BONDS</b>	<b>INT EQUITY</b>
<b>Mean</b>	41,639	0,247	0,610	0,429	0,874
<b>Median</b>	39,5	0,402	0,921	0,019	0,938
<b>Maximum</b>	82	5,260	11,519	14,497	12,415
<b>Minimum</b>	5	-9,069	-15,620	-7,959	-14,380
<b>Std, Dev,</b>	15,035	2,150	4,333	4,354	4,545
<b>Skewness</b>	1,060	-0,766	-0,349	0,484	-0,040
<b>Kurtosis</b>	1,582	6,480	4,273	3,395	3,259
<b>Jarque-Bera</b>	0,089	49,992	18,875	3,775	0,659
<b>Probability</b>	0,000	0,000	0,000	0,151	0,719
<b>Observations</b>	214	83	214	83	214
<i>Notes:</i>					
1. All figures rounded off to 3 decimal places					
2. Source: Authors own estimation					

*Table 5.2. Control Variable Descriptive Statistics*

	<b>INTEREST</b>	<b>INFLATION</b>
<b>Mean</b>	5,579	0,465
<b>Median</b>	4,297	0,375
<b>Maximum</b>	13,485	1,946
<b>Minimum</b>	1,039	-0,945
<b>Std, Dev,</b>	2,102	0,429
<b>Skewness</b>	1,416	0,467
<b>Kurtosis</b>	3,100	3,887
<b>Jarque-Bera</b>	12,624	14,816
<b>Probability</b>	0,000	0,000
<b>Observations</b>	214	214
<i>Notes:</i>		
1. All figures rounded off to 3 decimal places		
2. Source: Authors own estimation		

The mean reveals that, among the ETF portfolios analysed, the international equity ETF portfolio exhibits the highest average return over the sample period, whereas the domestic bond ETF portfolio records the lowest average return.

Both domestic bond and equity ETFs exhibit negative skewness, meaning the mean lies to the left of the median and mode. This suggests that the sample contains more negative returns than positive ones. Negative skewness in the domestic ETF portfolios implies a higher risk of loss, particularly when considering the impact of the EU in South Africa. In contrast, EU, inflation, international bond and equity ETFs, and changes in the real prime interest rate show positive skewness. The difference in skewness between domestic and international ETFs highlights a clear distinction in return patterns, which can be used to offset the volatility seen in the domestic ETF portfolios.

A high standard deviation across all four ETF portfolios reflects considerable volatility. Moreover, the kurtosis value exceeds 3 for all variables, indicating a higher frequency of extreme returns (both positive and negative) than what would be expected under a normal distribution. The results of the Jarque-Bera test reject the null hypothesis at a 1 percent significance level for all variables except for the international bond and equity ETF portfolios, suggesting that only the domestic ETFs deviate from normality.

The combination of non-normality and elevated kurtosis implies that extreme losses (negative returns) are more probable than a normal distribution would suggest, making domestic ETFs riskier due to their susceptibility to significant market fluctuations. In contrast, the international bond and equity ETFs do not reject normality, implying their return distributions are closer to a bell curve and less prone to large deviations, making them easier to model and predict with traditional methods. However, the high kurtosis in these portfolios still points to the possibility of occasional extreme returns, both positive and negative, indicating that even "normally distributed" portfolios carry risks that require careful management.

### **5.2.3. Correlation Analysis**

Correlation analysis provides an indication of the level of association between variables. It shows the degree at which variables move in the same direction. Table 5.3 illustrates the correlation matrix which depicts the cross-correlation between each ETF portfolio's returns and EU, inflation and interest rate changes. Inflation is the only variable which reflects significant correlation amongst the four ETF portfolios. Negative correlation exists between inflation and the domestic bond and equity ETF portfolios as well as the international equity

ETF portfolio while positive correlation exists between inflation and the international bond ETF portfolio. Historically, the relationship between inflation and bond returns has been negative because inflation erodes the purchasing power of fixed-income payments and leads to higher interest rates, which hurt the performance of bonds. When inflation is high, bond prices tend to fall, leading to negative returns for bond ETFs. The rising inflation, especially when combined with high interest rates, can increase investor risk aversion. Investors may expect lower future earnings and become more cautious in allocating funds to riskier assets like equities, leading to lower stock prices and returns for equity ETFs. However, EU does not have any significant relationship with any of the ETF portfolio returns indicating zero association between the portfolio returns and EU.

*Table 5.3. Correlation Matrix*

	<b>DOM BONDS</b>	<b>DOM EQUITY</b>	<b>INT BONDS</b>	<b>INT EQUITY</b>
<b>ΔEU</b>	0,061	-0,016	-0,159	-0,045
	(0,586)	(0,887)	(0,150)	(0,683)
<b>ΔINTEREST</b>	0,047	0,119	-0,085	0,025
	(0,671)	(0,284)	(0,445)	(0,821)
<b>INFLATION</b>	-0,275	-0,229	0,009	-0,122
	(0,012)**	(0,0373)**	(0,933)	(0,273)
<i>Notes:</i>				
1. The correlation coefficient test is estimated using the ordinary method with probability test statistics.				
2. The parenthesis indicates the p-values.				
3. *, **, *** represent statistical significance at 1%, 5% and 10% level of significance, respectively				
4. All figures rounded off to 3 decimal places				
5. Source: Authors own estimation				

#### **5.2.4. Unit Root and Stationarity Test Results**

A data series is considered stationary when its mean and variance remain constant over time. Table 5.4 presents the results of unit root and stationarity tests for ETF portfolio returns, EU, and the control variables—inflation and real interest rates. The unit root test is conducted using the ADF test, while the stationarity test is performed using the KPSS test. Additionally, to determine whether the data remains stationary in the presence of structural breaks, the ADF min-t breakpoint unit root test with an innovation outlier is estimated. The standard ADF test and the breakpoint ADF test are both conducted with a maximum of 14 lags, as determined by the Schwarz Bayesian Information Criterion (SBIC). SBIC is preferred over other information criteria, such as the AIC, because it imposes a stronger penalty for model complexity (i.e., the

number of parameters). Furthermore, SBIC is more reliable in selecting the correct model as sample size increases, whereas AIC tends to favour more complex models, especially in large samples (Brooks, 2019). The KPSS test is estimated using the Bartlett Kernel spectral estimation method and the Newey-West bandwidth method. In both cases, the tests are performed at levels with a trend and an intercept.

Table 5.4 indicates that the ADF test statistic is more negative than the critical values at the 1 percent significance level, allowing for the rejection of the null hypothesis in favour of the alternative hypothesis, which confirms the stationarity of the variables. The KPSS test results align with the unit root test findings, reinforcing that all variables are stationary. The KPSS test statistic is smaller than the critical values at the 1 percent significance level for all variables, leading to a failure to reject the null hypothesis, which further confirms stationarity. Additionally, the breakpoint unit root test verifies that all variables remain stationary even in the presence of structural breaks. The identified breakpoint dates for each variable analysed in this study correspond to major economic events, such as the 2008 financial crisis and the COVID-19 pandemic. The breakpoint date for interest rates is particularly linked to the increase in the SARB repo rate, which rose to 7 percent from 3.75 percent at the end of 2021—exceeding the projected rate of 5 percent (CRS, 2022). The null hypothesis of a unit root is rejected in favour of the alternative hypothesis, as the test statistic is more negative than the critical values at the 1 percent significance level. Based on these findings, the study concludes that all variables included in the analysis are stationary, both at levels and in the presence of structural breaks.

Table 5.4. Unit Root and Stationarity Test Results

VARIABLE	ADF Test	KPSS Test	Breakpoint Date
Unit root and stationarity tests in levels with trend and intercept			
$\Delta$ EU	-4.205607*	0.041230	N/A
$\Delta$ INTEREST	-13.14133*	0.051273	
DOM BOND	-13.65538*	0.059619	
DOM EQUITY	-15.33255*	0.034686	
INFLATION	-10.07720*	0.082540	
INT BONDS	-9.957580*	0.051076	
INT EQUITY	-15.84667*	0.074465	
Break point unit root test in levels with trend and intercept			
$\Delta$ EU	-12.21452*	N/A	2020M06
$\Delta$ INTEREST	-15.43066		2022M06
DOM BOND	-18.16040*		2010M08
DOM EQUITY	-16.92336*		2009M02
INFLATION	-11.85114*		2008M07
INT BONDS	-11.41033*		2020M03
INT EQUITY	-17.47056*		2009M02
<p>1. *, **, *** represent statistical significance at 1%, 5% and 10% level of significance, respectively</p> <p>2. Source: Authors Own Estimation</p>			

### 5.3. Empirical Model Analysis

The empirical findings on the effect of EU on South African listed bond and equity ETFs are presented in the subsequent sections. The MSM shows the effect of EU on ETF returns under changing market conditions while GARCH models present the effect of EU on ETF volatility. The section is outlined as follows: section 5.3.1 contains the results of the MSM model and section 5.3.2 contains the results of the GARCH models.

#### 5.3.1. Markov Regime-Switching Results

All variables included in the analysis are found to be stationary in levels and with structural breaks. This indicates that the Markov regime-switching analysis can be conducted to determine how EU impacts bond and equity ETF returns under bull and bear market conditions. Due to the uneven sample, the domestic and international bond ETF portfolios are examined for the period 2017 to 2023 while the domestic and international equity ETF portfolios are examined for the full sample period (2006 to 2023).

In MSM estimations, it cannot be assumed that regime 1 represents a bull market and regime 2 represents a bear market. The residual diagnostic test is reflected in each portfolio's estimation output. Campbell (2002) determined that in a two-state regime characterized by high volatility, the assumption of normality is violated. This occurs because the volatile regime exhibits a distribution that is both negatively skewed and leptokurtic when compared to a normal distribution (Campbell, 2002). Consequently, the deviation from normality in a two-regime model with a highly volatile regime is apparent; however, it does not compromise the efficiency of the model's output. Since bear market conditions are defined by declining returns, a high-volatility regime is typically associated with a bearish market, whereas a low-volatility regime aligns with a bullish market. Therefore, if the Jarque-Bera normality test indicates a departure from normality in the estimated residuals, this explanation remains valid and applicable. Table 5.5 shows the regime and associated market condition for each of the four portfolios.

*Table 5.5. Regime Market Condition*

	<b>Coefficient</b>	<b>Std. Dev</b>	<b>Market</b>
<b>Regime 1</b>			
<b>Domestic Bonds</b>	0,498	1,645	Bull
<b>Domestic Equity</b>	1,226	3,407	Bull
<b>Int Bonds</b>	1,219	3,385	Bull
<b>Int Equity</b>	1,579	4,852	Bear
<b>Regime 2</b>			
<b>Domestic Bonds</b>	2,070	7,921	Bear
<b>Domestic Equity</b>	1,908	6,737	Bear
<b>Int Bonds</b>	1,737	5,680	Bear
<b>Int Equity</b>	0,477	1,611	Bull
<i>1. All figures rounded off to 3 decimal places</i>			
<i>2. Source: Authors own estimation</i>			

### 5.3.1.1. The Domestic Bond and Equity ETF Portfolio Regime-Switching Results

Table 5.6. Domestic Bond and Equity ETF Markov Switching Regression Results

Domestic Bond ETFs		Domestic Equity ETFs	
Regime 1: Bull Market		Regime 1: Bull Market	
Variable	Coefficient	Variable	Coefficient
C	-18,262 0,000*	C	-0,465 0,737
ΔEU	-0,277 0,000*	ΔEU	0,155 0,001**
INFLATION	-3,590 0,345	INFLATION	-0,642 0,729
ΔINTEREST	28,208 0,333	ΔINTEREST	20,107 0,000*
Regime 2: Bear Market		Regime 2: Bear Market	
C	0,278 0,319	C	1,323 0,012**
ΔEU	0,002 0,639	ΔEU	-0,001 0,163
INFLATION	0,383 0,430	INFLATION	0,160 0,846
ΔINTEREST	0,965 0,443	ΔINTEREST	-4,812 0,105
Residual Diagnostic Test		Residual Diagnostic Test	
Normality Test		Normality Test	
Jarque-Bera	2205,703 0,000*	Jarque-Bera	18,875 0,000*
<i>Notes:</i>		<i>Notes:</i>	
1. The probabilities of each coefficient is presented below the respective coefficient.		1. The probabilities of each coefficient is presented below the respective coefficient.	
2. *, **, *** represent 1%, 5% and 10% level of significance respectively.		2. *, **, *** represent 1%, 5% and 10% level of significance respectively.	
3. All figures rounded off to 3 decimal places.		3. All figures rounded off to 3 decimal places.	
4. Source: Authors own estimation		4. Source: Authors own estimation	

The domestic bond and equity ETF portfolio regime-switching results are presented in table 5.6 above. The equation for each portfolio can be explained by equations 4.4 and 4.5.

$$DOMESTIC\_BONDS_T = \alpha_{S_T} + \beta_{1S_T}\Delta EU_T + \gamma_{1S_T}INFLATION_T + \delta_{1S_T}\Delta INTEREST_T + e_{S_T} \quad (4.4)$$

$$DOMESTIC\_EQUITY_T = \alpha_{S_T} + \beta_{1S_T}\Delta EU_T + \gamma_{1S_T}INFLATION_T + \delta_{1S_T}\Delta INTEREST_T + e_{S_T} \quad (4.5)$$

Regime 1 is characterized by bull market conditions, while Regime 2 represents bear market conditions for both domestic ETF portfolios. This observation contrasts with traditional

literature, which dictates that bonds and equities are expected to exhibit inverse behaviour. However, the alignment of bull market characteristics in both portfolios can be justified during recessionary recovery phases. During such periods, central banks provide ample liquidity, benefiting bonds through reduced yields while equities rise on improved growth prospects. Consequently, both asset classes can perform well simultaneously, creating scenarios where Regime 1 aligns as a bull market for each portfolio.

The alignment of bear market characteristics in Regime 2 can be explained by broad EU or inflationary pressures. For instance, rising inflation negatively impacts both equities, due to margin compression, and bonds, due to falling prices. Similarly, stagflation or policy uncertainty can suppress returns across both asset classes, aligning them as bear markets.

The EU coefficient exhibits opposite effects for the two portfolios under both regimes. In Regime 1, EU is significant for both portfolios. A 1 percent increase in EU activity is associated with a 0.277 percent decrease in returns for the domestic bond ETF portfolio, *ceteris paribus*. This negative relationship may reflect a flight-to-safety behaviour, where investors seek bonds as a hedge against EU. As bond prices rise, yields fall. However, heightened uncertainty may also lead investors to demand higher bond yields to compensate for perceived risks, especially if inflation expectations increase or central banks signal tighter monetary policy.

For the domestic equity ETF portfolio, a 1 percent increase in EU activity results in a 0.155 percent increase in returns, *ceteris paribus*. This positive relationship may occur if investors perceive that the worst of the economic downturn has passed or if they believe the market has overreacted, leading to sharp rebounds in stock prices.

Changes in the real prime interest rate significantly and positively impact domestic equity ETF portfolio returns under Regime 1. A 1 percent increase in the real prime interest rate corresponds to a 20.107 percent increase in portfolio returns, *ceteris paribus*. This result diverges from conventional financial theory, where rising interest rates are typically associated with declining returns. However, it may reflect investor optimism, as rising interest rates can signal economic strength or effective inflation management.

Under Regime 2, no variables are significant for either portfolios. The insignificance of EU under bear market conditions may stem from the perception of South African government bonds as riskier than those from developed markets. Investors in South African-tracked bond ETFs may already price in risks such as political instability, inflation, and currency volatility.

As such, during periods of EU, additional risks may have less impact on bond prices, as these are already embedded in bond yields.

Similarly, the lack of significance of EU in the equity portfolio under bear market conditions aligns with financial theory. Investors are generally risk-averse during such periods, avoiding equities, a riskier asset class. The insignificance of inflation and real prime interest rate changes for both portfolios in Regime 2 reflects the nature of bear markets, which are typically driven by sentiment and risk aversion rather than traditional macroeconomic indicators.

Residual diagnostics are presented in Table 5.6. The Jarque-Bera normality test indicates a p-value of 0.000, allowing for rejection of the null hypothesis of normally distributed residuals in favour of the alternative hypothesis at the 1 percent significance level. This confirms a departure from normality in the residuals of the models specified by Equations 4.4 and 4.5.

The transition probabilities in the MSM refer to the likelihood of moving from one state (or regime) to another at the next time step. While the expected duration refers to the expected length of time the system will remain in a given regime before transitioning to another regime. Table 5.7 presents the transition probabilities and expected durations for the domestic bond and equity ETF portfolios. The results indicate that the domestic portfolios are mainly characterised by bull regime trends.

*Table 5.7. Constant Markov Transition Probabilities and Expected Duration – Domestic Bonds and Equity ETF Portfolio*

<b>Domestic Bonds</b>		
	<b>Regime 1 - Bull Market</b>	<b>Regime 2 - Bear Market</b>
<b>Regime 1</b>	0,531	0,469
<b>Regime 2</b>	0,012	0,988
<b>Constant expected durations</b>	<b>Regime 1</b>	<b>Regime 2</b>
<b>All periods</b>	2,134	81,597
<i>Notes:</i>		
1. All figures rounded off to 3 decimal places.		
2. Source: Authors own estimation		
<b>Domestic Equity</b>		
	<b>Regime 1 - Bull Market</b>	<b>Regime 2 - Bear Market</b>
<b>Regime 1</b>	0,527	0,473
<b>Regime 2</b>	0,197	0,803
<b>Constant expected durations</b>	<b>Regime 1</b>	<b>Regime 2</b>
<b>All periods</b>	2,114	5,068
<i>Notes:</i>		
1. All figures rounded off to 3 decimal places.		
2. Source: Authors own estimation		

For the domestic bond ETF portfolio, the probability of remaining in a bull regime in the next period is 53.1 percent, which is significantly lower than the probability of staying in a bear regime at 98.8 percent. Transitions from a bull to a bear regime are less likely (1.2%) compared to transitions from a bear to a bull regime (46.9%). On average, returns are expected to remain in a bull regime for 2.134 months, while a bear regime lasts significantly longer, averaging 81.597 months. Similarly, for the domestic equity ETF portfolio, the probability of staying in a bull regime in the next period is 52.7 percent, lower than the probability of remaining in a bear regime at 80.3 percent. The likelihood of transitioning from a bull to a bear regime is 19.7 percent, compared to a higher probability of 47.3 percent for moving from a bear to a bull regime. The average duration of a bull regime for the equity portfolio is 2.114 months, whereas the bear regime lasts 5.068 months.

### 5.3.1.2. The International Bond and Equity ETF Portfolio Regime-Switching Results

Table 5.8. International Bond and Equity ETF Markov Switching Regression Results

International Bond ETFs		International Equity ETFs	
Regime 1: Bull Market		Regime 1: Bear Market	
Variable	Coefficient	Variable	Coefficient
C	-1,030 0,156	C	-0,589 0,319
ΔEU	-0,004 0,413	ΔEU	-0,002 0,788
INFLATION	1,546 0,253	INFLATION	0,732 0,402
ΔINTEREST	-3,007 0,543	ΔINTEREST	-1,002 0,682
Regime 2: Bear Market		Regime 2: Bull Market	
C	5,535 0,000*	C	6,633 0,000*
ΔEU	-0,198 0,000*	ΔEU	0,004 0,726
INFLATION	-7,209 0,039**	INFLATION	-5,879 0,000*
ΔINTEREST	-9,618 0,303	ΔINTEREST	19,850 0,001**
Residual Diagnostic Test		Residual Diagnostic Test	
Normality Test		Normality Test	
Jarque-Bera	3,775 0,151	Jarque-Bera	0,660 0,719
<i>Notes:</i>		<i>Notes:</i>	
1. The probabilities of each coefficient is presented below the respective coefficient.		1. The probabilities of each coefficient is presented below the respective coefficient.	
2. *, **, *** represent 1%, 5% and 10% level of significance respectively.		2. *, **, *** represent 1%, 5% and 10% level of significance respectively.	
3. All figures rounded off to 3 decimal places.		3. All figures rounded off to 3 decimal places.	
4. Source: Authors own estimation		4. Source: Authors own estimation	

The international bond and equity ETF portfolio regime-switching results are presented in table 5.8 above. The equation for each portfolio can be explained by equations 4.6 and 4.7.

$$INT\_BONDS_T = \alpha_{S_T} + \beta_{1S_T}\Delta EU_T + \gamma_{1S_T}INFLATION_T + \delta_{1S_T}\Delta INTEREST_T + e_{S_T} \quad (4.6)$$

$$INT\_EQUITY_T = \alpha_{S_T} + \beta_{1S_T}\Delta EU_T + \gamma_{1S_T}INFLATION_T + \delta_{1S_T}\Delta INTEREST_T + e_{S_T} \quad (4.7)$$

Regime 1 is characterised by bull market conditions while regime 2 reflects bear market conditions for the international bond ETF portfolio while the opposite applies for the international equity ETF portfolio. It should be noted that as compared to the domestic portfolios above, the regimes of the international portfolios are the inverse of each other. This conforms to financial theory as it is expected that bonds and equities behave in the opposite manner opening up opportunities for diversification.

There are no statistically significant variables under regime 1 for both international portfolios. Under regime 2, EU and inflation are the only variables which are statistically significant for the international bond ETF portfolio while inflation and a change in the real prime interest rate are the only significant variables for the international equity ETF portfolio.

The results show that a 1 percent change in EU will result in the international bond ETF portfolio returns decreasing by 0.198 percent, *ceteris paribus*. Since South African bond ETFs tracking international benchmarks include exposure to global markets, any shift in investor sentiment towards safety can reduce demand for South African bonds, causing their prices to fall. Bond prices and yields have an inverse relationship—so as bond prices decline, yields increase. This will lead to a decrease in the returns for bond ETFs.

A 1 percent change in inflation will result in the portfolio returns decreasing by 7.209 percent, *ceteris paribus*. This may be viewed due to the inverse relationship shared between interest rates and bond returns, EU is heightened under bear market conditions and thus may result in higher inflation, this may result in an increase in the real prime interest rate which inevitably decreases bond returns. Despite these ETFs tracking international benchmarks, the interconnectedness of the work does not isolate these returns from the uncertainty of South Africa.

The lack of significance of EU under the international equity ETF portfolio may be attributed to the international presence in the portfolio which may eliminate the exposure to EU due to the international diversification regardless of the regime. It is only inflation and a change in the real prime interest rate that have a significant effect under bull market conditions.

A 1 percent change in inflation reduces portfolio returns by 5.879 percent, *ceteris paribus*. A 1 percent change in the real prime interest rate increases portfolio returns by 19.850 percent, *ceteris paribus*. This suggests that rising interest rates are associated with higher equity returns, possibly due to their signalling effect of economic strength.

Residual diagnostics are presented in Table 5.7. The Jarque-Bera normality test indicates a p-value of 0.000, allowing for rejection of the null hypothesis of normally distributed residuals in favour of the alternative hypothesis at the 1 percent significance level for the international bond ETF portfolio only. This confirms a departure from normality in the residuals of the models specified by Equations 4.6 only. The normality of residuals may suggest that the portfolio's returns and their transitions between regimes are more predictable and less prone to extreme deviations or shocks, compared to other portfolios analysed. For investors and policymakers, the normality of residuals indicates a lower likelihood of extreme, unpredictable behaviour in the portfolio under the modelled conditions. This could make the international equity ETF portfolio more attractive for risk-averse investors, as it suggests more stable behaviour compared to portfolios with non-normally distributed residuals.

Table 5.9 presents the transition probabilities and expected durations for the international bond and equity ETF portfolios. There is high persistence in the bear market for international portfolios. This indicates that once a bear market is entered, it is likely to continue whereas there is no persistence in a bull market.

Table 5.9. Constant Markov Transition Probabilities and Expected Duration – International Bond and Equity ETF Portfolio

<b>Domestic Equity</b>		
	<b>Regime 1 - Bull Market</b>	<b>Regime 2 - Bear Market</b>
<b>Regime 1</b>	0,527	0,473
<b>Regime 2</b>	0,197	0,803
<b>Constant expected durations</b>	<b>Regime 1</b>	<b>Regime 2</b>
<b>All periods</b>	2,114	5,068
<i>Notes:</i>		
1. All figures rounded off to 3 decimal places.		
2. Source: Authors own estimation		
<b>International Bonds</b>		
	<b>Regime 1 - Bull Market</b>	<b>Regime 2 - Bear Market</b>
<b>Regime 1</b>	0,381	0,619
<b>Regime 2</b>	0,440	0,560
<b>Constant expected durations</b>	<b>Regime 1</b>	<b>Regime 2</b>
<b>All periods</b>	1,615	2,273
<i>Notes:</i>		
1. All figures rounded off to 3 decimal places.		
2. Source: Authors own estimation		

The international bond ETF portfolio demonstrates a lower probability of remaining in a bull regime in the next period (38.1%) compared to staying in a bear regime (56%). Transitions from a bull to a bear regime occur 44 percent of the time, while the likelihood of moving from a bear to a bull regime is higher at 61.9 percent. On average, bull regimes last 1.615 months, whereas bear regimes persist for 2.273 months, reflecting greater longevity of bearish conditions.

For the international equity ETF portfolio, the likelihood of staying in a bear regime in the next period is 62.6 percent, while the probability of remaining in a bull regime is 0 percent, indicating the absence of bull market persistence. Transitions from a bear to a bull regime occur 100 percent of the time, significantly exceeding the 37.4 percent probability of moving from a bull to a bear regime. On average, bear regimes last for 2.676 months, whereas bull regimes are brief, lasting only 1 month. The dominance of bear markets in this portfolio could stem

from heightened exposure to global risk factors and abrupt shifts in sentiment, which are often linked to elevated levels of EU uncertainty.

Both international portfolios show high persistence in bear markets, indicating that once bearish conditions take hold, they are likely to continue. Conversely, bull markets lack persistence, reflecting shorter durations and lower stability. Notably, the international equity ETF portfolio stands apart from the other portfolios due to the normality of its residuals. This normality suggests that the portfolio's returns and regime transitions are more predictable and less prone to extreme shocks or deviations compared to others analysed. For investors and policymakers, the normality of residuals indicates a reduced likelihood of extreme or unpredictable behaviour under the modelled conditions. This stability could make the international equity ETF portfolio particularly appealing to risk-averse investors, as it implies more reliable performance relative to portfolios with non-normally distributed residuals.

#### **5.3.1.3. Markov Regime Switching Regression Discussion**

The analysis reveals that the domestic portfolios exhibit very different behaviour when compared to the international portfolios. The alignment of the bull and bear regimes for the domestic portfolios can be explained through inflationary concerns as well as policy uncertainties which are common concerns faced by the South African economy. On the other hand, the international portfolios exhibit characteristics which conform to financial theory. The bull and bear regimes are the opposite for the bond and equity portfolios which confirms the inverse behaviour of the two asset classes. This indicates that investors may seek diversification benefits through the international portfolios during uncertainty. The inverse relationship between bonds and equities in both domestic and international portfolios is consistent with findings in the literature. For example, Kundu & Paul (2022) and Huang & Liu (2022) observe that increased policy uncertainty often leads to higher volatility in equity markets and a flight to bonds, which are perceived as safer. This aligns with the study's finding that international bond portfolios exhibit a higher probability of transitioning from a bear to a bull regime, while equity markets tend to remain in bear markets, recovering briefly, as investor sentiment responds to macroeconomic shocks.

The domestic ETF portfolio findings support literature by reflecting the asymmetric effect of EU on returns. Both portfolios exhibit varying behaviours under bull and bear market conditions, particularly the bond market where higher inflation expectations and fiscal concerns create a persistent bearish environment. This matches the literature by Batabyal &

Killins (2021) and Nanayakkara (2024), which emphasize that EPU negatively impacts bond markets, particularly in times of high uncertainty.

The domestic bond ETF portfolio also shows a lower probability of transition from a bull to a bear regime which implies that once the bond market is in a bear state, it is unlikely to shift to a bull market in the short term. This could reflect persistent economic challenges, such as high inflation, fiscal concerns, or investor risk aversion, which maintain a bearish environment. There is a higher probability of transition from a bear to a bull regime. Despite the bond market remaining in a bear market, there is a significant chance of shifting to a bull state, possibly due to unexpected economic improvements, central bank policy shifts (such as rate cuts), or changes in investor sentiment. This market is mainly characterised as a bear market and could be indicative of structural economic difficulties (e.g., high government debt, low growth, or high inflation) that make it hard for the bond market to maintain positive momentum for extended periods.

The significant effect of EU on domestic equity ETF returns under bull market conditions, despite generally pessimistic market conditions, reflects a detailed understanding seen in the literature, such as Asafo-Adjei *et al.*, (2020) and Kunjal & Peerbhai (2021), highlight that South African markets may respond differently to EU compared to developed markets. This reflects volatility and investor sentiment shifts, particularly in the South African ETF market, where overconfidence and heightened uncertainty lead to increased market volatility. For this portfolio, the probability of staying in a bull regime is slightly lower than the probability of remaining in a bear regime, indicating that while the equity market is somewhat more optimistic than the bond market, it is still more prone to bear market conditions than sustained bull markets. The higher probability of transitioning from a bear to a bull regime compared to the reverse suggests that, despite significant challenges, there is a relatively strong chance of recovery in the equity market, driven by factors such as improved corporate earnings, political stability, or favourable external market conditions. However, the duration of bull markets is much shorter than that of bear markets, reflecting the volatility of the South African economy, where positive market conditions—such as favourable commodity prices or policy reforms—tend to be temporary, while negative factors like political instability or economic slowdowns persist for longer periods.

The probability of remaining in a bull regime for international bond markets is lower than the probability of staying in a bear regime, indicating that these markets are more prone to bear

conditions, though less so than the domestic bond market. The higher probability of transitioning from a bear to a bull regime compared to the reverse suggests that global bond markets experience more frequent shifts between bear and bull phases, likely influenced by global economic and monetary policies, such as interest rate changes by central banks, which can rapidly affect bond yields. The duration of bull markets is shorter than bear market, reflecting heightened economic volatility and the impact of external shocks, such as global financial crises or geopolitical events, which tend to push international bond markets into prolonged bear phases, with brief bull markets occurring during periods of lower interest rates or economic optimism.

The probability of remaining in a bear regime for international equity markets is significantly higher than the probability of staying in a bull regime, indicating that these markets are in a prolonged bear phase, with no sustained bull market persistence. The absence of a sustained bull market is further emphasized by the 0 percent probability of remaining in a bull regime, suggesting that any bull markets are either extremely short-lived or non-existent. However, the 100 percent transition rate from bear to bull indicates that international equity markets consistently recover from bear phases, although these recoveries tend to be brief. This could be a result of macroeconomic factors such as shifts in investor sentiment, economic data, or geopolitical events, which often drive sharp market reversals. The duration of bull markets (1 month) is notably short compared to the longer duration of bear markets, reflecting the high volatility of international equity markets and their susceptibility to sudden downturns. The extended bear market phases are likely driven by persistent global risks, including economic recessions, financial crises, and geopolitical uncertainties (e.g., Brexit, global trade disputes), which create sustained bearish sentiment and longer periods of market negativity, with brief recoveries in between.

EU is observed to impact ETF returns under different market conditions for all portfolios except the international equity ETF portfolio where no statistically significant effect is found. For the domestic portfolios, EU impacts bond ETF returns negatively while equity ETF returns are impacted positively under bull market conditions. These findings do not conform to theoretical norms however, in a bull market, when overall market sentiment is optimistic and asset prices are generally rising, EU can still exert a negative influence on bond returns. This is primarily because EU often leads to rising inflation expectations and concerns about interest rate hikes by central banks. Investors, fearing that inflation could erode the purchasing power of future bond payments, may demand higher yields on newly issued bonds. In response, the

prices of existing bonds with lower yields decline, which results in lower returns for current bondholders. Moreover, EU often signals concerns about fiscal instability or sovereign credit risk. In the context of an emerging market like South Africa, this could reflect fears about government debt, potential downgrades by credit rating agencies, or political instability, which make bonds less attractive. The fear of inflation or rising borrowing costs often causes bond investors to reassess the risk profile of their portfolios, leading to higher yields and lower bond prices, especially for long-duration bonds. These findings align with that of Nanayakkara (2024) who finds that inflation uncertainty positively affects bond prices in the U.S. as a result of inflation expectations. This suggests that in both emerging and developed markets, rising uncertainty can lead to an increase in bond prices as investors seek safe havens.

On the other hand, EU can sometimes positively impact equity returns, particularly under bull market conditions. In such environments, investors may view uncertain economic conditions as temporary and potentially more favourable for equities in the long term. For example, companies in cyclical industries might benefit from stronger consumer demand or government stimulus packages, even if there are concerns about the broader economic outlook (Segal, Shaliastovich & Yaron, 2015).

Bonds generate fixed nominal cash flows, which means their actual value diminishes as inflation increases. Consequently, bond investors seek higher yields to counteract the reduction in purchasing power. However, this yield adjustment does not entirely mitigate the adverse effects of inflation on bond returns (Perras & Wagner, 2020). On the other hand, equities represent claims on real assets and, in theory, should remain unaffected by inflation. Nonetheless, empirical research indicates that inflation can still have a detrimental impact on stock returns, though the relationship is intricate and depends on varying economic conditions (Perras & Wagner, 2020). Historical trends reveal that equities tend to outperform bonds when inflation is between 0 percent and 4 percent, as well as when it surpasses 4 percent. However, during periods of deflation, bonds generally yield better returns than equities (Ma, Marshall, Nguyen & Visaltanachoti, 2024). Equities are frequently regarded as an effective hedge against inflation since businesses can transfer rising costs to consumers by increasing prices, thereby preserving their profit margins (Davies, 2008). This ability to adjust prices allows equities to perform more favourably than bonds in inflationary environments. Nevertheless, elevated inflation can also drive higher demand for bonds due to increasing nominal interest rates, which, in turn, can suppress the demand for equities. Furthermore, in times of significant inflation, companies may opt to raise funds through equity rather than debt, leading to a greater

supply of stocks and potentially causing stock prices to decline (Quayes & Jamal, 2016). Despite these factors, equities often outperform bonds in high-inflation settings because businesses can shift rising costs onto consumers, whereas bondholders experience a decrease in the real value of fixed coupon payments. Additionally, during a bull market, investors may anticipate that uncertainties tied to inflation will eventually subside, allowing earnings growth to persist and fostering continued optimism toward equities.

Equity markets may also see an inflow of capital from risk-tolerant investors seeking higher returns, especially when bond yields are less attractive due to the rising risk premium. The positive impact of EU on equities can thus be linked to market optimism, where investors are willing to look past short-term volatility in anticipation of future gains driven by stronger corporate earnings or favourable policy responses.

When examining the international bond ETF portfolio, it is found that EU and inflation have a significant impact on returns under bear market conditions. During bear markets, the risk of default and volatility in equity markets often leads investors to shift their allocations towards bonds, especially those perceived as more secure or those that offer better yields relative to risk. South African bonds, tracking international benchmarks, may become attractive as they provide diversification and potentially lower correlation with domestic equities. Additionally, the nature of bonds means that they can be more sensitive to macroeconomic signals; thus, when uncertainty looms, bond prices may react strongly to changes in economic indicators, interest rates, or fiscal policies.

The international equity ETF portfolio did not show any effect to EU experienced in South Africa which indicates that the international ETF portfolios successfully provide diversification benefits for investors. This contrasts with some studies in the literature, such as Huang & Liu (2022) and Kundu & Paul (2022), which note that EPU has asymmetric effects even on equity returns in other regions (like G7 countries). The absence of a significant impact in international equity ETFs in the study suggests that the international portfolios may offer protection against domestic policy uncertainties, offering a hedge against South African-specific risks. Perry (2017) notes that country risk is non-diversifiable within the bounds of the domestic market and given that EU forms part of the economic risk component, it is expected to have an effect on the returns of ETFs which track domestic benchmarks (both bonds and equity ETFs). To overcome the issue of non-diversifiability, investors may invest in different financial markets while still remaining in the domestic market. This allows funds to flow across financial

markets, as investors react to changes in EU by reallocating their funds to hedge uncertainty or benefit from fluctuations which they may gain from through speculative positions (Muzindutsi & Obalade, 2020).

### 5.3.2. GARCH Model Results

The second research objective of this study is to investigate the impact of EU on the volatility of South African bond and equity ETFs. To assist with this, GARCH models are best suited for modelling volatility which a preference for high frequency data. This is why weekly data is used for this model. The ARCH effect test is first performed to ensure that GARCH models may be used. Next the GARCH models are run for each portfolio and their information criteria are compared and the best model is selected using the SBIC. This is followed by the estimation and discussion of each portfolios' results.

#### 5.3.2.1. ARCH Effect Test

Before proceeding to estimate a GARCH model, a test for the ARCH effect must be conducted. The results of the ARCH-LM test used to detect the presence of autoregressive conditional heteroskedasticity in the ETF portfolio returns are presented in table 5.10. The F statistic and chi-squared statistic (Obs\*R-squared) are statistically significant at a 1 percent level of significance for all four portfolios. This indicates that these returns exhibit significant heteroskedasticity and therefore the respective GARCH models are run.

*Table 5.10. ARCH Effect Test*

Portfolio	F-Statistic	Obs*R-Squared
Domestic_Bonds	16,491*	15,736*
Domestic_Equity	81,275*	74,941*
Int_Bonds	24,219*	22,560*
Int_Equity	26,275*	25,612*
<i>Notes:</i>		
1. *, **, *** represent statistical significance at 1%, 5% and 10% level of significance, respectively		
2. All figures rounded off to 3 decimal places		
3. Source: Authors own estimation		

#### 5.3.2.2. GARCH Model Selection

The best model for each ETF portfolio is chosen based on the information criterion provided by each model. The results of the information criteria for each model is displayed in table 5.11. SBIC is preferred over other information criteria and as a result, the GARCH-M is selected for

the domestic bond, international bond and equity ETF portfolios while the EGARCH-M model is selected for the domestic equity ETF portfolio.

Table 5.11. Best Model Selection

<i>DOMESTIC BOND</i>						
	<b>GARCH</b>	<b>GARCH-M</b>	<b>TGARCH</b>	<b>TGARCH-M</b>	<b>EGARCH</b>	<b>EGARCH-M</b>
<b>Akaike info criterion</b>	3,188	2,457	3,191	2,454*	3,175	2,466
<b>Schwarz criterion</b>	3,231	2,512*	3,239	2,515	3,224	2,527
<b>Hannan-Quinn criterion</b>	3,205	2,478	3,210	2,477*	3,194	2,490
<i>DOMESTIC EQUITY</i>						
	<b>GARCH</b>	<b>GARCH-M</b>	<b>TGARCH</b>	<b>TGARCH-M</b>	<b>EGARCH</b>	<b>EGARCH-M</b>
<b>Akaike info criterion</b>	4,527	4,480	4,483	4,447	4,480	4,443*
<b>Schwarz criterion</b>	4,563	4,527	4,524	4,498	4,521	4,495*
<b>Hannan-Quinn criterion</b>	4,541	4,498	4,498	4,466	4,496	4,463*
<i>INT BOND</i>						
	<b>GARCH</b>	<b>GARCH-M</b>	<b>TGARCH</b>	<b>TGARCH-M</b>	<b>EGARCH</b>	<b>EGARCH-M</b>
<b>Akaike info criterion</b>	4,426	4,397*	4,431	4,403	4,453	4,399
<b>Schwarz criterion</b>	4,512	4,508*	4,530	4,525	4,551	4,522
<b>Hannan-Quinn criterion</b>	4,461	4,442*	4,471	4,452	4,492	4,448
<i>INT EQUITY</i>						
	<b>GARCH</b>	<b>GARCH-M</b>	<b>TGARCH</b>	<b>TGARCH-M</b>	<b>EGARCH</b>	<b>EGARCH-M</b>
<b>Akaike info criterion</b>	4,498	4,444	4,489	4,443*	4,493	4,447
<b>Schwarz criterion</b>	4,534	4,491*	4,530	4,494	4,534	4,498
<b>Hannan-Quinn criterion</b>	4,512	4,462*	4,505	4,462*	4,509	4,466
<i>Notes:</i>						
1. * Indicates the best model selected as per each IC						
2. * Indicates the best model selected as per SBIC						
3. Source: Authors own estimation						

### 5.3.2.3. GARCH-M Model Output

Table 5.12. GARCH-M Results

DOMESTIC BONDS		INT BONDS		INT EQUITY	
Variable	Coefficient	Variable	Coefficient	Variable	Coefficient
<b>Mean Equation</b>		<b>Mean Equation</b>		<b>Mean Equation</b>	
@SQRT(GARCH)	-0,118 0,198	@SQRT(GARCH)	-0,254 0,523	@SQRT(GARCH)	-0,206 0,301
C	0,262 0,008**	C	0,541 0,520	C	0,702 0,111
ΔEU	0,001 0,198	ΔEU	-0,002 0,276	ΔEU	0,000 0,935
AR(1)	0,018 0,619	AR(1)	-0,035 0,569	AR(1)	-0,076 0,024**
<b>Variance Equation</b>		<b>Variance Equation</b>		<b>Variance Equation</b>	
C	0,571 0,010**	C	0,886 0,126	C	0,500 0,024**
RESID(-1)^2	0,675 0,030**	RESID(-1)^2	0,093 0,155	RESID(-1)^2	0,088 0,002**
GARCH(-1)	0,311 0,004**	GARCH(-1)	0,722 0,000*	GARCH(-1)	0,820 0,000*
ΔEU	0,000 0,914	ΔEU	0,001 0,761	ΔEU	0,001 0,540
<i>Notes:</i>		<i>Notes:</i>		<i>Notes:</i>	
1. The probabilities of each coefficient is presented below the respective coefficient.		1. The probabilities of each coefficient is presented below the respective coefficient.		1. The probabilities of each coefficient is presented below the respective coefficient.	
2. *, **, *** represent statistical significance at 1%, 5% and 10% respectively		2. *, **, *** represent statistical significance at 1%, 5% and 10% respectively		2. *, **, *** represent statistical significance at 1%, 5% and 10% respectively	
3. All figures rounded off to 3 decimal places		3. All figures rounded off to 3 decimal places		3. All figures rounded off to 3 decimal places	
4. Source: Authors own estimation		4. Source: Authors own estimation		4. Source: Authors own estimation	

Table 5.12 above presents the results for the GARCH-M models for the domestic bond ETF portfolio as well as the international bond and equity ETF portfolios. The standard deviation in the mean equation for all three portfolios is not statistically significant, however its inclusion helps to improve the results of the GARCH term in the variance equation. This suggest that there is no clear evidence of a risk-return trade-off within these portfolios. Investors may not receive additional returns for bearing higher returns. The constant is only statistically significant for the domestic bond ETF portfolio. This indicates that the average return for this portfolio is 0.262 however, past values do not significantly predict the current series. However, the past values of the international equity ETF portfolio do significantly predict the current

series by -0.076. EU is also not significant in the mean equation for all three portfolios which indicates that changes in EU do not drive returns in any of the ETF portfolios.

The variance equation reinforces the idea that EU has limited influence on the volatility of portfolio returns. The ARCH term is statistically significant for the domestic bond and international equity ETF portfolio and GARCH term is significant for all three portfolios. This indicates the presence of volatility clustering. This means periods of high volatility are followed by high volatility and highlights the impact of market shocks. The ARCH term is insignificant for the international bond ETF portfolio which suggest that the immediate impact of shocks on volatility is limited. This reflects the influence of international diversification which smoothens the immediate effect of localised events. It can be concluded that volatility in the international bond ETF portfolio is largely determined by historical patterns rather than current shocks or EU. Investors may view this portfolio as a relatively stable option, particularly during volatile economic periods.

Table 5.13. Domestic Equity ETF Portfolio EGARCH-M Results

Variable	Coefficient
<b>Mean Equation</b>	
@SQRT(GARCH)	0,284** (0,023)
C	-0,416 (0,116)
ΔBCI	0,000 (0,991)
AR(1)	-0,041 (0,240)
<b>Variance Equation</b>	
ω	0,070 (0,177)
α	0,139** (0,003)
γ	-0,218* (0,000)
β	0,885* (0,000)
ΔBCI	0,000 (0,931)
1. *, **, *** represent statistical significance at 1%, 5% and 10% respectively	
2. All figures rounded off to 3 decimal places	
3. Source: Authors own estimation	

Table 5.13 reflects the findings of the EGARCH-M model for the domestic equity ETF portfolio. The standard deviation term in the mean equation is positive and statistically significant. This supports the existence of a risk-return trade-off, where higher volatility is associated with higher expected returns. This is consistent with financial theory, as equity investors typically demand a premium for accepting higher risk. However, the EU coefficient is near zero, indicating that it does not directly affect returns. This result suggest that market-wide factors or sentiment are more influential than specific EU indicators.

The significant positive coefficients of the GARCH (0.885) and ARCH (0.139) terms indicate strong persistence in volatility when examining the variance equation. The asymmetric effect is negative and significant (-0.218). This indicates that negative shocks such as a market downturn increases volatility more than positive shocks of the same magnitude. This is a typical feature of equity markets where bad news tends to cause greater market turbulence. The implications of this show that equity investors must account for the asymmetric nature of

volatility. During times of market stress, returns could become highly unpredictable. The significant risk-return relationship implies that higher volatility periods may present opportunities for higher returns.

#### **5.3.2.4. GARCH Model Discussion**

The findings from the GARCH-M and EGARCH-M models for domestic and international bond and equity ETF portfolios provide valuable insights into the relationship between volatility, returns, and EU. For the domestic bond, international bond, and international equity ETFs, the standard deviation term in the mean equation was not statistically significant, suggesting a lack of strong evidence for a risk-return trade-off. This implies that higher volatility does not necessarily lead to higher expected returns for these portfolios. This aligns with prior literature, such as Kundu & Paul (2022), which suggests that bond ETFs, particularly those benefiting from international diversification, often exhibit a more stable return structure with limited sensitivity to economic uncertainty.

In contrast, the EGARCH-M model applied to the domestic equity ETF portfolio presents a different picture. The standard deviation term in the mean equation is positive and statistically significant, providing evidence of a risk-return trade-off. This finding is consistent with financial theory, as equity investors typically demand a premium for accepting higher risk. Prior research, including studies by Piccoli & Chaudhury (2018) and Rupande *et al.* (2019), supports the notion that volatility is priced in equity markets, reinforcing the expectation that increased volatility leads to higher expected returns. Additionally, the presence of volatility clustering and asymmetric volatility effects, where negative shocks lead to more significant volatility than positive shocks, corroborates findings in Qiang & Shu-e (2009) and Liu & Ma (2024), which describe how investor sentiment and policy uncertainty contribute to asymmetric volatility in equity markets.

Examining the variance equations, the significance of the ARCH and GARCH terms highlights the persistence of volatility in all three portfolios. The presence of volatility clustering suggests that periods of high volatility are likely to be followed by further high volatility, reinforcing the importance of historical volatility patterns in these markets. Notably, while the ARCH term is significant for the domestic bond and international equity ETF portfolios, it is insignificant for the international bond ETF portfolio. This suggests that the immediate impact of shocks on volatility is more muted for international bonds, likely due to diversification effects that smooth out localized market disturbances. This aligns with findings from Nanayakkara (2024), which

suggest that international bond markets are less susceptible to short-term shocks compared to equities and domestic bonds.

The EGARCH model results for the domestic equity ETF portfolio further reveal an asymmetric volatility effect, with negative shocks inducing greater volatility than positive shocks of the same magnitude. This is a common feature of equity markets, where negative market events tend to cause more pronounced market reactions than positive developments. The significant positive coefficients of the GARCH (0.885) and ARCH (0.139) terms indicate strong persistence in volatility, further supporting the notion that volatility remains elevated over extended periods.

Finally, the results reinforce the limited role of EU in determining both returns and volatility. The EU coefficient in the mean equations is not statistically significant for any of the portfolios, indicating that changes in EU do not directly drive returns in these ETF markets. Additionally, the variance equation results suggest that while EU plays a role in volatility, its influence is generally limited, particularly for internationally diversified portfolios. This is consistent with broader research, including Kunjal & Peerbhai (2021), which argues that EU impacts are more pronounced in domestic markets and emerging economies but have a reduced effect in well-diversified investment vehicles.

While EU does not significantly drive returns, it has some influence on volatility patterns, particularly in domestic markets. The presence of volatility clustering and asymmetric effects in equity ETFs highlights the importance of considering risk management strategies in periods of heightened economic uncertainty. Investors in bond ETFs, particularly those with international diversification, may find these portfolios more stable, with volatility primarily driven by historical patterns rather than immediate shocks.

#### **5.4. Summary and Conclusion**

The chapter begins with a comprehensive preliminary analysis, including graphical representations, descriptive statistics, and correlation matrices. The visual analysis of ETF portfolio returns and EU highlights volatility patterns and potential co-movements. Descriptive statistics indicate that international equity ETFs exhibit the highest mean return, while domestic bond ETFs yield the lowest. The findings suggest significant volatility across all ETFs, with elevated kurtosis values indicating frequent extreme returns. The correlation analysis reveals a notable relationship between inflation and ETF returns, while EU does not exhibit a strong correlation with any ETF portfolio.

The empirical analysis is divided into two key sections: MSM results and GARCH model results. The MSM framework is used to assess the effect of EU on ETF returns under different market conditions. The study finds that for domestic ETFs, bond and equity portfolios experience similar regime characteristics, contradicting traditional expectations of inverse behaviour. However, this alignment is explained by South African-specific economic conditions, such as inflationary pressures and policy uncertainty. The EU coefficient shows mixed effects: it negatively impacts domestic bond ETF returns while positively affecting domestic equity ETFs under bullish conditions. The probability of remaining in a bear market is significantly higher for domestic bond ETFs, suggesting persistent structural challenges within the South African economy.

Conversely, international bond and equity ETFs conform to financial theory, exhibiting inverse behaviours under bull and bear market conditions. The international bond ETF portfolio shows a significant negative relationship between EU and returns in bear markets, implying that global investors react to uncertainty by shifting capital away from emerging market bonds. The international equity ETF portfolio does not show any significant relationship with EU, suggesting that global diversification mitigates exposure to South African-specific risks.

The GARCH analysis focuses on the impact of EU on ETF volatility. The results indicate strong volatility clustering, meaning periods of high volatility are followed by sustained volatility. However, EU does not significantly influence volatility in any portfolio. The domestic equity ETF portfolio exhibits a positive risk-return trade-off, where higher volatility is associated with higher expected returns, a feature absent in other ETF portfolios. The EGARCH model reveals asymmetric volatility in domestic equity ETFs, with negative shocks leading to greater volatility than positive shocks. This highlights the heightened sensitivity of the South African equity market to adverse economic events.

The findings suggest that international bond ETFs offer greater stability due to their lower sensitivity to immediate economic shocks, while domestic ETFs are more vulnerable to local economic conditions. The persistence of bear markets in both domestic and international ETFs suggests that investors should consider long-term hedging strategies against economic downturns. The results emphasize the importance of diversification, particularly through international ETFs, which provide a buffer against local economic instability.

This chapter provides a detailed empirical assessment of the effects of EU on the returns and volatility of South African bond and equity ETFs. The findings indicate that EU impacts ETF

returns differently depending on market conditions, with notable distinctions between domestic and international portfolios. The Markov Switching Model highlights the asymmetric effects of EU, where domestic ETFs exhibit prolonged bearish trends, reflecting South Africa's economic vulnerabilities. The international ETFs align with theoretical expectations, displaying inverse relationships between bond and equity markets, reinforcing the benefits of global diversification.

The GARCH results confirm that ETF portfolios exhibit persistent volatility clustering, but EU does not significantly influence volatility dynamics. This suggests that while EU affects returns under certain conditions, other macroeconomic factors, such as inflation and interest rates, play a more substantial role in determining market volatility. The asymmetric volatility observed in the domestic equity ETF portfolio further highlights the risk sensitivity of South African markets to negative shocks.

Overall, the study underscores the importance of diversification for ETF investors. While domestic ETFs are subject to heightened risks due to local economic instability, international ETFs provide a hedge against South African-specific uncertainties. The prolonged bearish conditions in domestic bond and equity ETFs highlight structural economic challenges, suggesting the need for robust policy interventions to stabilize financial markets. Future research could explore the role of geopolitical risks and broader global financial factors in shaping ETF performance. By understanding the interplay between EU, returns, and volatility, investors can make more informed portfolio decisions, mitigating risks while capitalizing on potential market opportunities.

## **CHAPTER 6: SUMMARIES, RECOMMENDATIONS AND CONCLUSION**

### **6.1. Introduction**

This chapter provides a comprehensive conclusion to the study, synthesizing findings, addressing limitations, and recommending future research directions. The primary aim of this research is to investigate the impact of EU on the returns and volatility of ETFs in South Africa. By employing advanced econometric models such as Markov Switching Regression and GARCH, the study offers insights into how EU influences bond and equity ETFs under varying market conditions.

The necessity of this study stems from the growing significance of ETFs in modern financial markets, particularly in South Africa, where these investment vehicles have gained prominence over the last decade. Given the role of economic and political uncertainties in shaping financial markets, understanding their impact on ETFs is crucial for informed decision-making by investors, fund managers, and policymakers.

### **6.2. Summary of the Study**

This study set out to explore how EU affects ETF returns and volatility in South Africa. The following research objectives were pursued:

- To determine how EU influences bond and equity ETF returns in South Africa under bullish and bearish market conditions.
- To assess the effect of EU on volatility in South African bond and equity ETFs.

The methodology employed included Markov Switching Models (MSM) to analyze return regime shifts and Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models to examine volatility clustering. The dataset consisted of domestic and international bond and equity ETFs listed in South Africa from 2006 to 2023.

The preliminary data analysis included descriptive statistics, correlation analysis, and stationarity tests. The visual analysis of ETF portfolio returns and EU highlighted volatility patterns and potential co-movements. Descriptive statistics revealed that international equity ETFs had the highest mean return, while domestic bond ETFs recorded the lowest. Correlation analysis demonstrated a significant relationship between inflation and ETF returns, whereas EU did not exhibit a strong correlation with any ETF portfolio.

The empirical findings were structured into two key sections: MSM results and GARCH model results. The MSM framework was utilized to analyse the influence of EU on ETF returns across

different market regimes. The findings suggested that for domestic ETFs, both bond and equity portfolios exhibited similar regime characteristics, diverging from the conventional expectation that bonds and equities behave inversely. This anomaly can be attributed to South African-specific economic conditions, including inflationary pressures and policy uncertainty. The EU coefficient was found to negatively impact domestic bond ETF returns, whereas it had a positive effect on domestic equity ETFs under bullish market conditions. Additionally, domestic bond ETFs had a higher probability of remaining in bear markets, indicative of persistent structural challenges within the South African economy.

On the other hand, international bond and equity ETFs conformed more closely to established financial theory, demonstrating inverse behaviours under bullish and bearish market conditions. The international bond ETF portfolio displayed a significant negative relationship between EU and returns in bear markets, suggesting that global investors tend to reallocate capital away from emerging market bonds in times of heightened uncertainty. Meanwhile, international equity ETFs did not exhibit a significant relationship with EU, reinforcing the notion that global diversification mitigates exposure to South African-specific risks.

The GARCH model results focused on the impact of EU on ETF volatility. The analysis confirmed strong volatility clustering, indicating that periods of high volatility were typically followed by sustained volatility. However, EU did not significantly influence volatility across any of the ETF portfolios. The domestic equity ETF portfolio displayed a positive risk-return trade-off, where higher volatility was associated with greater expected returns, a pattern not observed in the other ETF categories. The EGARCH model further revealed asymmetric volatility effects in domestic equity ETFs, with negative shocks leading to greater volatility increases compared to positive shocks. This suggests that the South African equity market is particularly sensitive to adverse economic events.

Overall, the study found that international bond ETFs provided greater stability, given their lower sensitivity to immediate economic shocks, while domestic ETFs were more vulnerable to local economic conditions. The persistence of bearish trends in both domestic and international ETF markets underscores the need for investors to adopt long-term hedging strategies to mitigate economic downturn risks. The findings emphasize the critical role of portfolio diversification, particularly through international ETFs, as a means of shielding investments from domestic economic instability.

#### **6.4. Chapter Summaries**

The following summaries provide a concise review of the key findings from each of the five chapters, offering the reader a clear refresher on the study's insights. Chapter 1 introduced the study, outlining the research problem, objectives, and methodology. It provided a background on ETFs in South Africa, discussing their rise in popularity and the increasing relevance of EU in financial markets. The chapter also justified the study by highlighting gaps in the literature regarding how EU impacts ETF returns and volatility in an emerging market like South Africa.

The theoretical review investigated key financial theories, including the EMH, behavioural finance, and the AMH. It examined how investor psychology influences market behaviour, particularly under conditions of EU. The chapter also provided insights into how traditional and modern finance theories interact in explaining ETF performance under EU.

Chapter 3 synthesized empirical studies on EU, ETF performance, and market volatility. It examined global and regional perspectives on ETF markets, highlighting the impact of EU on asset returns and investor behaviour. The chapter also explored studies that analysed ETFs within the South African context, addressing key gaps in understanding the local ETF market.

The methodology chapter detailed the research design, data sources, and econometric models used in the study. The MSM and various GARCH models were discussed as tools for analysing ETF return regimes and volatility clustering. The chapter also explained the rationale behind selecting specific ETFs and market conditions for analysis.

Chapter 5 presented the empirical findings, demonstrating how EU impacts ETF returns across different market regimes and confirming the presence of volatility clustering. The results highlighted notable differences between domestic and international ETFs, providing valuable insights into how investors respond to uncertainty. The chapter also discussed the implications of these findings for market participants, policymakers, and investment strategists.

#### **6.3. Limitations and Recommendations for Further Study**

The study contributes to the existing body of literature by offering insights into how EU impacts stock and bond ETF returns in South Africa. The study's findings are influenced by several limitations that offer avenues for future exploration. First, data constraints limit the analysis, particularly for high-frequency volatility studies, which would have allowed for a more granular understanding of ETF performance. Additionally, the use of the BCI as a proxy for EU, while practical, does not fully encapsulate the multifaceted nature of EU. The

econometric models employed, including Markov Switching and GARCH, although robust, are constrained by their inherent assumptions and do not account for all market dynamics.

Future research could address these limitations by incorporating alternative or composite measures of EU, such as text-based indices or global uncertainty measures, to provide a broader perspective. Sector-specific analyses could further illuminate the effects of EU on different industries within ETFs, offering granular insights into investor behaviour. Employing high-frequency intraday data would enhance the understanding of volatility patterns, particularly for equity ETFs. Expanding the scope to include cross-country comparisons would contextualize the findings within a global framework, highlighting regional disparities and similarities. Finally, integrating behavioural finance frameworks would shed light on the psychological factors driving investor responses to EU, enriching the analysis with a behavioural dimension.

#### **6.4. Conclusion**

This study underscores the intricate and multifaceted relationship between EU and ETF performance in South Africa. The results affirm that EU significantly affects ETF returns, particularly under distinct market conditions, while its influence on volatility remains nuanced and context-specific. These findings provide a foundation for understanding the dynamic interplay between macro EU and investment vehicles like ETFs, which have become vital components of modern financial systems.

The implications of these findings are manifold. For investors, the research highlights the importance of strategic asset allocation during periods of EU, underscoring the role of bond ETFs as a stabilizing force in portfolios. For policymakers, the study offers insights into how EPU can shape financial markets, influencing investor behaviour and market stability. Finally, for academics, the research enriches the existing body of literature on ETFs, paving the way for further exploration of their performance in emerging markets.

Looking ahead, addressing the identified limitations and pursuing the proposed research directions will be crucial for advancing our understanding of ETFs under EU. By leveraging more sophisticated data and methodologies, future studies can uncover deeper insights into the behavioural and systemic drivers of ETF performance. This evolving body of knowledge will empower stakeholders to navigate the complexities of global and local financial landscapes with greater confidence and resilience.

## REFERENCES

Abadi, B.M.K. & Ismail, M.T., (2016). Investigating the Relationship Between Japanese Stock Market and International Stock Markets Using Logistic Smooth Transition Regression Model. *Unpublished Masters Dissertation. University of Istanbul, Turkey.* Available at: <https://civilica.com/doc/505091/>

Abner, D.J., (2016). *The ETF handbook: How to Value and Trade Exchange-Traded funds* (2<sup>nd</sup> ed.). Wiley & Sons. Available at: <https://onlinelibrary.wiley.com/doi/book/10.1002/9781119297727?msocid=19218b4a0cd46da5128f9ec20d1d6c87>

Adekoya, O.B. & Oliyide, J.A., (2021) Business Confidence as a Strong Tracker of Future Growth: Is it Driven by Economic Policy Uncertainty and Oil Price Shocks in the OECD Countries? *Future Business Journal*,7 (58). Available at: <https://doi.org/10.1186/s43093-021-00103-7>

Ahir, H., Bloom, N. & Furceri, D., (2023). Global Economic Uncertainty Remains Elevated, Weighing on Growth. *IMF*. [Online]. Available at: Global Economic Uncertainty Remains Elevated, Weighing on Growth (imf.org). [Accessed 18 09 2024].

Ahmed, F., Gurdgiev, C., Sohag, K., Islam, M.M. & Zeqiraj, V., (2024). Global, Local or Glocal? Unravelling the Interplay of Geopolitical Risks and Financial Stress. *Journal of Multinational Financial Management*, 75. Available at: <https://doi.org/10.1016/j.mulfin.2024.100871>

Akbas, F., Boehmer, E., Jiang, C. & Koch, P. D., (2019). Overnight Returns, Daytime Reversals, and Future Stock Returns: The Risk of Investing in a Tug of War with Noise Traders. *Cambridge, MA: Social Science Research Network. Working Paper*, pp. 1–57.

Al-Thaqeb, S.A. & Algharabali, B.G., (2019). Economic Policy Uncertainty: A Literature Review. *The Journal of Economic Asymmetries*, 20. Available at: <https://doi.org/10.1016/j.jeca.2019.e00133>

Ali, H., (2014). Impact of Interest Rate on Stock Market: Evidence from Pakistani Market. *IOSR Journal of Business Management*, 16(1), pp. 64-69.

Aranha, C., Azevedo, C.R.B. & Iba, H., (2012). Money in Trees: How Memes, Trees and Isolation can Optimise Financial Portfolios. *Information Science*, 182(1), pp. 184-198.

Arellano, C., Bai, Y. & Kehoe, P.J., (2016). Financial Frictions and Fluctuations in Volatility. *Federal Reserve Bank of Minnesota Research Department Staff Report*. [Online]. Available at: <https://minneapolisfed.org/research/sr/sr466.pdf>. [Accessed 20 03 2023].

Arouri, M., Estay, C., Rault, C. & Roubaud, D., (2016). Economic Policy Uncertainty and Stock Markets: Long-run Evidence from the US. *Finance Research Letters*, 18, pp. 136–141.

Asafo-Adjei, E., Agyapong, D., Agyei, S.K., Frimpong, S., Djimatey, R., & Adam, A.M., (2020) Economic Policy Uncertainty and Stock Returns of Africa: A Wavelet Coherence Analysis. *Discrete Dynamics in Nature and Society*. pp. 1-8.

Asur, S., & Huberman, B. A., (2010, August). Predicting the Future with Social Media. In *Proceedings of the 2010 IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology*, 1, pp.492-499.

Aye, G.C., Balcilar, M., Demirer, R. & Gupta, R., (2018). Firm-level Political Risk and Asymmetric Volatility. *The Journal of Economic Asymmetries*, 18. Available at: <https://doi.org/10.1016/j.jeca.2018.e00110>.

Baele, L., Bekaert, G., Inghelbrecht, K. & Wei, M., (2004). Flights to Safety. *Journal of Financial Economics*, 73(3), pp. 453-490.

Bahadar, S., Mahmood, H. & Zaman, R., (2019). The Herds of Bulls and Bears in Leveraged ETF Market. *Journal of Behavioural Finance*, 20(4), pp. 408-423.

Bahlmann, A., (2024). SA Stocks React to Global Economic Challenges. *IOL*. [Online]. Available at: [SA stocks react to global economic challenges \(iol.co.za\)](https://www.iol.co.za/news/sa-stocks-react-to-global-economic-challenges). [Accessed: 06 05 2024].

Bahloul, W. & Bouri, A., (2016). The Impact of Investor Sentiment on Returns and Conditional Volatility in US Futures Markets. *Journal of Multinational Financial Management*, 36(1), pp. 89–102.

Bahmani-Oskooee, M., Ghodsi, S.H. & Hadzic, M., (2020). Asymmetric Causality Between Stock Returns and Usual Hedges: An Industry-Level Analysis. *The Journal of Economic Asymmetries*, 21. Available at: <https://doi.org/10.1016/j.jeca.2020.e00160>

Baker, S. R., & Bloom, N., (2013). Does Uncertainty Reduce Growth? Using Disasters as Natural Experiments. *Washington DC: National Bureau of Economic Research, Working Paper 19475*. DOI 10.3386/w19475

Baker, S. R., Bloom, N., & Davis, S.J., (2013). Measuring Economic Policy Uncertainty. *Studies of Particular Policy Episodes*. Available at: <https://api.semanticscholar.org/CorpusID:96452750>.

Baker, S. R., Bloom, N., & Davis, S.J., (2016). Measuring Economic Policy Uncertainty. *The Quarterly Journal of Economics*, 131(4), pp. 1593-1636.

Baker, S.R., Bloom, N., Davis, S.J. & Kost, K.J., (2019). Policy News and Stock Market Volatility. *National Bureau of Economic Research, Working paper 25720*. Available at: <https://www.nber.org/papers/w25720>

Baker, M. & Wurgler, J. (2006). Investor Sentiment and the Cross-Section of Stock Returns. *The Journal of Finance*, 61(4), pp.1645–1680.

Balcilar, M., Usman, O., Gungor, H., Roubaud, D. & Wohar, M.E., (2021). Role of Global, Regional, and Advanced Market Economic Policy Uncertainty on Bond Spreads in Emerging Markets. *Economic Modelling*, 102. Available at: <https://doi.org/10.1016/j.econmod.2021.105576>

Bali, T.G., Brown, S.J. & Tang, Y. (2017). Is Economic Uncertainty Priced in the Cross-Section of Stock Returns? *Journal of Financial Economics*. 126 (3), pp. 471–489.

Bali, T.G., Subrahmanyam, A. & Quan, W., (2018). Economic Policy Uncertainty Premium in the Corporate Bond Market. *Journal of Financial and Quantitative Analysis*, 58(7), pp. 3195-3200.

Bao, H. & Li, S., (2020). Investor Overconfidence and Trading Activity in the Asia Pacific REIT Markets. *Journal of Risk and Financial Management*, 13(10), pp. 1 - 21.

Barker, R.M. & Chiu, I.H.Y., (2017). Corporate Governance and Investment Management: The Promises and Limitations of the New Financial Economy. *Edward Elgar Publishing Ltd*. Available at: <https://www.elgaronline.com/monobook/9781784713515/9781784713515.xml>

Batabyal, S. & Killins, R., (2021). Economic Policy Uncertainty at Stock Market Returns: Evidence from Canada. *The Journal of Economic Asymmetries*, 24. Available at: <https://doi.org/10.1016/j.jeca.2021.e00215>

Beckmann, J. & Czudaj, R., (2017). Exchange Rate Expectations and Economic Policy Uncertainty. *European Journal of Political Economy*, 47, pp. 148–162.

Bekiros, S., Jlassi, M., Lucey, B., Naoui, K. & Uddin, G.S., (2017). Herding Behaviour, Market Sentiment and Volatility: Will the Bubble Resume? *The North American Journal of Economics and Finance*, 42, pp. 107-131.

Belcaid, K. & El Ghini, A., (2019). U.S., European, Chinese Economic Policy Uncertainty and Moroccan Stock Market Volatility. *The Journal of Economic Asymmetries*, 20. Available at: <https://doi.org/10.1016/j.jeca.2019.e00128>

Ben-David, I., Franzoni, F. & Moussawi, R., (2017). Exchange Traded Funds. *Annual Review of Financial Economics*, 18(17), pp. 169-189.

Ben-David, I., Franzoni, F. & Moussawi, R., (2018) Do ETFs Increase Volatility?. *The Journal of Finance*, 73(6), pp. 2471-2535.

Ben-David, I., Graham, J.R., & Harvey, C.R., (2010). Managerial Miscalibration. *The Quarterly Journal of Economics*, 128(4), pp. 1547-1584.

Bera, A.K. & Jarque, C.M., (1981). Efficient Tests for Normality, Homoscedasticity and Serial Independence of Regression Residuals: Monte Carlo Evidence. *Economics Letters*, 7(4), pp. 313-318.

Bernanke, B.S., (1983). Irreversibility, Uncertainty and Cyclical Investment. *Quarterly Journal of Economics*, 98(1), pp. 85–106.

Binge, L.H. & Boshoff, W.H., (2020). Economic Uncertainty in South Africa. *Economic Modelling*, 88, pp. 113-131.

Black, F., (1976). Studies of Stock Market Volatility Changes. *Proceedings of the American Statistical Association, Business and Economic Statistics Section*, 1, pp.177–181.

Black, F., (1986). Noise. *Journal of Finance*, 41(3), pp. 528 – 777.

Black, J.R., Das, N. & Leal, G., (2025). Economic Policy Uncertainty and Corporate Bond Liquidity. *Journal of Banking & Finance*, 170. Available at: <https://doi.org/10.1016/j.jbankfin.2024.107340>

Blasco, N., Corredor, P. & Ferrer, E., (2018). Analysts Herding: When Does Sentiment Matter? *Applied Economics*, 50(51), pp. 5495–5509.

Blitz, D., Huij, J. & Swinkels, L., (2012). The Performance of European Index Funds and Exchange-Traded Funds. *European Financial Management*, 18(4), pp. 649-662.

Bloom, N., (2009). The Impact of Uncertainty Shocks. *Econometrica*, 77 (3), pp. 623–685.

Bloom, N., (2014). Fluctuations in Uncertainty. *Journal of Economic Perspectives*, 28 (2), pp. 153–176.

Boakye, R.O., Mensah, L.K., Kang, S.H. & Osei, K.A., (2023). Foreign Exchange Market Return Spillovers and Connectedness Among African Countries. *International Review of Financial Analysis*, 86. Available at: <https://doi.org/10.1016/j.irfa.2023.102505>

Bodie, Z., Kane, A., & Marcus, A. J., (2024). Essentials of Investments (12th ed.). *McGraw-Hill/Irwin*.

Bollerslev, T. P., (1986). Generalized Autoregressive Conditional Heteroscedasticity. *Journal of Economics*, 31, pp. 307-327.

Bouteska, A., (2019). The Effect of Investor Sentiment on Market Reactions. *Journal of Behavioural and Experimental Finance*, 24. Available at: <https://api.semanticscholar.org/CorpusID:204421354>

Box, T., Davis, R., Evans, R. & Lynch. A., (2021). Intraday Arbitrage Between ETFs and the Underlying Portfolios. *Journal of Financial Economics*, 141(3), pp. 1078-1095.

Boya, C.M., (2019). From Efficient Markets to Adaptive Markets: Evidence from the French Stock Exchange. *Research in International Business and Finance*, 49, pp. 156–165.

Brogaard, J. & Detzel, A., (2015). The Asset-Pricing Implications of Government Economic Policy Uncertainty. *Management Science*, 61(1), pp. 3–18.

Broock, W.A., Scheinkman, J.A., Dechert, W.D. & LeBaron, B., (1996). A Test for Independence Based on the Correlation Dimension. *Econometric Reviews*, 15(3), pp. 197-235.

Brooks, C., (2019). Introductory Econometrics for Finance (4<sup>th</sup> ed.). *Cambridge University Press*.

Brown, G. W., (1999). Volatility, Sentiment, and Noise Traders. *Financial Analysts Journal*, 55(2), pp. 82–90.

Brown, M., (2024). State of the South African Exchange Traded Product (ETP) Industry – as at 28 March 2024. *EtfSA*. [Online]. Available at: <https://etfsa.co.za/wp->

content/uploads/2024/07/State-of-the-South-African-ETP-Industry-Mar2024.pdf#:~:text=State%20of%20the%20South%20African%20Exchange%20Traded%20Product,first%20quarter%20of%202024%2C%20a%20rise%20of%207%2C7%25.  
[Accessed 27 09 2024].

Brown, G. W. & Cliff, M. T., (2005). Investor Sentiment and Asset Valuation. *The Journal of Business*, 78(2), pp.405–440.

Campbell, S.D., (2002). Specification Testing and Semiparametric Estimation of Regime Switching Models: An Examination of the US Short Term Interest Rate. *Working Paper, No. 2002-26, Brown University, Department of Economics, Providence, RI*

Carriere-Swallow, Y, & Cespedes, L. F., (2013). The Impact of Uncertainty Shocks in Emerging Economies. *Journal of International Economics*, 90(2), pp. 316–325.

Charfeddine, L., Khediri, K.B., Aye, G.C. & Gupta, R., (2018). Time-Varying Efficiency of Developed and Emerging Bond Markets: Evidence from Long-Spans of Historical Data. *Physica A: Statistical Mechanics and its Applications*, 505, pp. 632-647.

Chaudhuri, K. & Wu, Y., (2003). Random Walk Versus Breaking Trend in Stock Prices: Evidence from Emerging Markets. *Journal of Banking and Finance*, 27, pp. 575-592.

Chen, H. K. & Lien, C.T., (2017). Market Reaction to Macroeconomic News: The Role of Investor Sentiment. *Asia-Pacific Journal of Financial Studies*, 46(6), pp. 853–875.

Chen, M.P., Lee, C.C. & Hsu, Y.C., (2017). Investor Sentiment and Country Exchange Traded Funds: Does Economic Freedom Matter? *The North American Journal of Economics and Finance*, 42, pp. 285-299.

Chen, K., Zhou, Y. & Dai, F., (2015). A LSTM-Based Method for Stock Returns Prediction: A Case Study of China Stock Market. *IEEE International Conference on Big Data*. Available at: <https://doi.org/10.1109/BigData.2015.7364089>

Christiano, L.J., Motto, R. & Rostagno, M., (2014). Risk Shocks. *American Economic Review*, 104(1), pp. 27-65.

Christou, C., Cunado, J., Gupta, R. & Hassapis, C., (2017). Economic Policy Uncertainty and Stock Market Returns in Pacific-Rim Countries: Evidence Based on a Bayesian Panel VAR Model. *Journal of Multinational Financial Management*, 40, pp. 92–102.

Chu, Y., Hirshleifer, D. & Ma, L., (2017). The Causal Effect of Limits to Arbitrage on Asset Pricing Anomalies. *Cambridge, MA: National Bureau of Economic Research, Inc. No. 24144*, pp. 1-61.

Cohen, G. & Kudryavtsev, A., (2012). Investor Rationality and Financial Decisions. *Journal of Behavioural Finance*, 13(1), pp. 11-16.

Corelli, A., (2023). The Relationship Between Risk and Return. *Analytical Corporate Finance*, pp. 71-114.

Da, Z. & Shive, S., (2018) Exchange Traded Funds and Asset Return Correlations. *European Financial Management*, 24(1), pp. 136-168.

Daniel, M., Neves, R.F. & Horta, N., (2017). Company Event Popularity for Financial Markets Using Twitter and Sentiment Analysis. *Expert Systems with Applications*, 71, pp. 111-124.

Das, D. & Kumar, S.B., (2018). International Economic Policy Uncertainty and Stock Prices Revisited: Multiple and Partial Wavelet Approach. *Economic Letters*, 164, pp. 100-108.

Davies, A., (2008). Credit Spread Determinants: An 85 Year Perspective. *Journal of Financial Markets*, 11(2), pp. 180-197.

De Andrés, P., de la Fuente, G. & Velasco, P., (2021). Exercising a Firm's Growth Options: A Portfolio Approach. *Journal of Business Research*, 132, pp. 571-585.

De Gaetano, D., (2018). Forecast Combinations for Structural Breaks in Volatility: Evidence from BRICS countries. *Journal of Risk and Financial Management*, 11(64). Available at:

[https://www.researchgate.net/publication/328469993\\_Forecast\\_Combinations\\_for\\_Structural\\_Breaks\\_in\\_Volatility\\_Evidence\\_from\\_BRICS\\_Countries](https://www.researchgate.net/publication/328469993_Forecast_Combinations_for_Structural_Breaks_in_Volatility_Evidence_from_BRICS_Countries)

De Jesus, C., Willows, G.D. & Olivier, A.M., (2020). The Influence of the Market on Inflation, Not the Other Way Around. *Investment Analysts Journal*, 49(2), pp. 79-91.

De Jongh, J. & Mncayi, P., (2018). An Econometric Analysis on the Impact of Business Confidence and Investment on Economic Growth in Post-Apartheid South Africa. *International Journal of Economics and Finance Studies*, 10(1), pp. 115-133.

De Long, J.B., Shleifer, A., Summers, L.H. & Waldmann, R.J., (1990). Noise Trader Risk in Financial Markets. *Journal of Political Economy*, 98(4), pp. 703-738.

Dendy, C., Mumtaz, H., Silver, L., (2013). An Uncertainty Index for the UK 1986-2012. Available at: <https://sites.google.com/site/hmumtaz77/research-papers>

Derrien, F. & Kecskes, A., (2013). The Real Effects of Financial Shocks: Evidence from Exogenous Changes in Analyst Coverage. *The Journal of Finance*, 68, pp.1407-1440.

Devault, L., Sias, R. & Starks, L., (2019). Sentiment Metrics and Investor Demand. *Journal of Finance*, 74(2), pp. 985–1024.

Dias, R., Galvao, R., Irfan, M., Alexandre, P., Goncalves, S. & Almeida, L., (2024). Delving into the Exchange-Traded Funds (ETFs) Market: Understanding Market Efficiency. *Journal of Ecohumanism*, 3(4), pp. 2670 – 2681.

Dickey, D.A. & Fuller, W.A., (1981). Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica*, 49(4), pp.1057-1072.

Diebold, F. X. & Li, C., (2006). Forecasting the Term Structure of Government Bond Yields. *Journal of Econometrics*, 130(2), pp. 337-364.

Dinga, B., Claver, J.H., Cletus, K.K. & Che, S.F., (2023). Modelling and Predicting Exchange Rate Volatility: Application of Symmetric GARCH and Asymmetric EGARCH and GJR-GARCH Models. *Journal of the Cameroon Academy of Science*, 19(2), pp.155-178.

Dumas, B., Kurshev, A. & Uppal, R., (2009). Equilibrium Portfolio Strategies in the Presence of Sentiment Risk and Excess Volatility. *The Journal of Finance*, 64 (2), pp. 579–629.

Economou, F., Hassapis, C. & Philippas, N., (2018). Investors' Fear and Herding in the Stock Market. *Applied Economics*, 50(34), pp. 3654–3663.

Enders, W. & Lee, J., (2012). The Flexible Fourier Form and Dickey-Fuller Type Unit Root Tests. *Economic Letters*, 117(1), pp. 196-199.

Engelberg, J. E., Reed, A. V. & Ringgenberg, M. C., (2018). Short-selling Risk. *Journal of Finance*, 73(2), pp. 755–786.

Engle, R. F., (1982). Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation. *Econometrica*, 50(4), pp.987-1008.

Eviews., (2022). Interpolate. *Eviews*. [Online]. Available at: EViews Help: Interpolate. [Accessed: 02 04 2024].

Fama, E., (1970). Efficient Capital Market: A Review of Theory and Empirical Work. *Journal of Finance*, 25, pp. 382-417.

Fama, F. E., (1991). Efficient Capital Markets: II. *The Journal of Finance*, 46(5), pp. 1575-1617.

Fang, L., Yu, H. & Li, L., (2017). The Effect of Economic Policy Uncertainty on the Long-Term Correlation Between US Stock and Bond Markets. *Economic Modelling*, 66, pp. 139–145.

Fasanya, I. & Makanda, S., (2024). Disentangled Oil Shocks and Macroeconomic Policy Uncertainty in South Africa. *Resources Policy*, 95. Available at: <https://doi.org/10.1016/j.resourpol.2024.105195>

Fateye, T.B., Peiser, R.B. & Ajayi, C.A., (2024). Behavioural Factors Influencing Investment Decision-Making in the Nigerian Real Estate Stock Market. *Scientific African*, 24, pp. 1-9.

Fedderke, J. & Szalontai, G., (2009). Industry Concentration in South African Manufacturing Industry: Trends and Consequences, 1972-96. *Economic Modelling*, 26(1), pp. 241-250.

Fielding, D., (2002). Human Rights, Political Instability and Investment in South Africa: A Note. *Journal of Development Economics*, 67(1), pp. 173-180.

Galbraith, J. K., (1977). *The Age of Uncertainty*. Boston: Houghton Mifflin.

Ghani, M. & Ghani, U., (2024). Economic Policy Uncertainty and Emerging Stock Market Volatility. *Asia-Pacific Financial Markets*, 31, pp. 165-181.

Gibb, R., (2016). The Impact of Brexit on South Africa. *Discussion Paper 9*. Available at: <https://www.thebrenthurstfoundation.org/uploads/9052b847-c84a-4d50-88f2-84baa7ed3065.pdf>

Gilchrist, S., Sim, J. W. & Zakrajsek, E., (2014). Uncertainty, Financial Frictions and Investment Dynamics, *Working Paper No. w20038*. Washington DC: National Bureau of Economic Research.

Guirguis, M.Z., (2018). Application of a GARCH, TGARCH and EGARCH models to test the spot GBP/USD Exchange Rate Volatility. Available at: <https://ssrn.com/abstract=3253608>.

Guo, Y. & He, S., (2020). Does Confidence Matter for Economic Growth? An Analysis from the Perspective of Policy Effectiveness. *International Review of Economics & Finance*, 69, pp. 1-19.

Gurusamy, V., Kannan, S. & Nandhini, K., (2017). The Real Time Big Data Processing Framework: Advantages and Limitations. *International Journal of Computer Sciences and Engineering*, 5(12), pp. 305-312.

Hamilton, J.D., (1989). A New Approach to the Economic Analysis of Nonstationary Time Series and the Business Cycle. *Econometrica*, 57, pp.357-384.

Hardi, I., Idroes, G.M., Hamaguchi, Y., Can, M., Noviandy, T.R. & Idroes, R., (2024). Business Confidence in the Shift to Renewable Energy: A Country Specific Assessment in Major Asian Economies. *Journal of Economy and Technology*. Available at: <https://doi.org/10.1016/j.ject.2024.08.002>.

Hill, J. M., Nadig, D. & Hougan, M., (2015). A Comprehensive Guide to Exchange Traded Funds (ETFs). *CFA Institute Research Foundation*. Available at: [rf-v2015-n3-1-pdf.ashx](http://rf-v2015-n3-1-pdf.ashx) (cfainstitute.org).

Hirshleifer, D., (2001). Investor Psychology and Asset Pricing. *The Journal of Finance*, 56, pp. 1533-1597.

Hlatshwayo, S. & Saxegaard, M., (2016). The Consequences of Policy Uncertainty: Disconnects and Dilutions in the South African Real Effective Exchange Rate-Export Relationship. *IMF Working Paper No. 16/113*.

Holmes, M. J. & Maghrebi, N., (2016). Financial Market Impact on the Real Economy: An Assessment of Asymmetries and Volatility Linkages Between the Stock Market and Unemployment Rate. *The Journal of Economic Asymmetries*, 13, pp. 1–7.

Hossain, M.S., Voumik, L.C., Ahmed, T.T., Alam, M.B. & Tasmim, Z., (2024). Impact of Geopolitical Risk, GDP, Inflation, Interest Rate and Trade Openness on Foreign Direct Investment: Evidence from Five Southeast Asian Countries. *Regional Sustainability*, 5(4). Available at: <https://doi.org/10.1016/j.regSus.2024.100177>

Huang, W.Q. & Liu, P., (2022). Asymmetric Effects of Economic Policy Uncertainty on Stock Returns Under Different Market Conditions: Evidence from G7 Stock Markets. *Applied Economics Letters*, 29(9), pp. 780-784.

Hudson, Y., Yan, M. & Zhang, D., (2018). Herd Behaviour & Investor Sentiment: Evidence from UK Mutual Funds. *Working Paper, Social Science Research Network*.

Ibenrissoul, N., (2022). Traditional versus Behavioural Finance Theory. *International Journal of Accounting, Finance, Auditing, Management and Economics*, 3(2). Available at: [https://www.researchgate.net/publication/359921147\\_Traditional\\_versus\\_Behavioral\\_Finance\\_Theory](https://www.researchgate.net/publication/359921147_Traditional_versus_Behavioral_Finance_Theory)

Iltut, C. L. & Schneider, M., (2014). Ambiguous Business Cycles. *American Economic Review*, 104 (8), pp. 2368–99.

International Monetary Fund., (2017). World Economic Outlook Update. *IMF Publications*. [Online]. Available at: <https://www.imf.org/en/Publications/WEO/Issues/2017/09/19/world-economic-outlook-october-2017>. [Accessed 17 09 2024].

Itzhak, B.D., Franzoni, F. & Moussawi, R., (2017). Exchange Traded Funds. *Annual Review of Financial Economics*, 9(1), pp. 169-189.

Jain, R., Jain, P. & Jain, C., (2015). Behavioural Biases in the Decision-Making of Individual Investors. *IUP Journal of Management Research*, 14(3), pp. 7–27.

Jensen, M.C., Black, F. & Scholes, M.S., (1972). The Capital Asset Pricing Model: Some Empirical Tests. *Studies in the Theory of Capital Markets*, pp. 79-121.

Kahneman, D. & Tversky, A., (1979). Prospect Theory: An Analysis of Decision Under Risk. *Econometrica*, 47(2), pp. 263-292.

Kamoune, A. & Ibenrissoul, N., (2022). Traditional Versus Behavioural Finance Theory. *International Journal of Accounting, Finance, Auditing, Management & Economics*, 3(2.1), pp. 282 – 294.

Kapoor, S. & Prosad, J.M., (2017). Behavioural Finance: A Review. *Procedia Computer Science*, 122, pp. 50-54.

Karnizova, L. & Li, J. C., (2014). Economic Policy Uncertainty, Financial Markets and Probability of US Recessions. *Economics Letters*, 125(2), pp. 261–265.

Kaur, P., Singh, J., & Seth, S., (2021). Investigating the Dynamics of Exchange Traded Funds Across the Bear and Bull Markets: Evidence from Indian Equity ETFs. *The Journal of Business Perspectives*, 25(3). Available at: <https://doi.org/10.1177/09722629211007581>

Kelly, B. & Ljungqvist, A., (2012). Testing Asymmetric-Information Asset Pricing Models. *The Review of Financial Studies*, 25(5), pp. 1366-1413.

Kılıç, Y., (2020). Adaptive Market Hypothesis: Evidence from the Turkey Stock Market. *Journal of Applied Economics and Business Research*, 10(1), pp. 28-39.

Kim, J.H., Shamsuddin, A. & Lim, K-P., (2011). Stock Return Predictability and the Adaptive Market Hypothesis: Evidence from Century-Long US Data. *Journal of Empirical Finance*, 18(5), pp. 868-879.

Kim, K., Ryu, D. & Yang, H., (2021). Information Uncertainty, Investor Sentiment and Analyst Reports. *International Review of Financial Analysis*, 77. Available at: <https://doi.org/10.1016/j.irfa.2021.101835>

Kirsten, J. & De Schepper, I., (2024) Business Confidence in South Africa: How a 70-Year-Old Survey Has Given Early Signals of the Economy's Pulse. *Times Live*. [Online]. Available at: <https://www.timeslive.co.za/sunday-times-daily/opinion-and-analysis/2024-09-26-business-confidence-in-south-africa-how-a-70-year-old-survey-has-given-early-signals-of-the-economys-pulse/>. [Accessed 30 09 2024].

Kisten, T., (2020). Macroeconomic Implications of Uncertainty in South Africa. *South African Journal of Economic and Management Sciences*, 23(1). Available at: <https://doi.org/10.4102/sajems.v23i1.3350>

Koenker, R. & Bassett, G., (1978). Regression Quantiles. *Econometrica: Journal of the Econometric Society*, 46 (1), pp. 33–50

Kuan, C.M., (2002). Lecture on the Markov Switching Model. *Institute of Economics Academia Sinica*. Available at: <https://pdfs.semanticscholar.org/5055/aab200259d666faeddb7ba17d588683b3029.pdf>

Kumar, J. & Prince, N., (2022). Overconfidence Biase in the Indian Stock Market in Diverse Market Situations: An Empirical Study. *International Journal of System Assurance Engineering and Management*, 13, pp. 3031-3047.

Kundu, S. & Paul, A., (2022). Effect of Economic Policy Uncertainty on Stock Market Returns and Volatility Under Heterogeneous Market Characteristics. *International Review of Economics and Finance*, 80, pp. 597-612.

Kunjil, D. & Peerbhai, F., (2021). Investor Overconfidence in the South African Exchange Traded Fund Market. *Cogent Economics and Finance*, 9(1). Available at: <https://doi.org/10.1080/23322039.2021.1978190>

Kunjil, D. & Peerbhai, F. & Muzindutsi, P.F., (2021). The Performance of South African Exchange Traded Funds Under Changing Market Conditions. *Journal of Asset Management*, 22(2), pp. 350-359.

Kunjil, D., Peerbhai, F. & Muzindutsi, P.F., (2022). Political, Economic and Financial Country Risks and the Volatility of the South African Exchange Traded Fund Market: A GARCH-MIDAS Approach. *Risk Management*, 24, pp. 236-258.

Kwiatkowski, D., Phillips, P.C.B., Schmidt, P. & Shin, Y., (1992). Testing the Null Hypothesis of Stationarity Against the Alternative of a Unit Root. *Journal of Econometrics*, 1(3), pp. 159-178.

Leduc, S. & Sill, K., (2010). Expectations and Economic Fluctuations: An Analysis Using Survey Data. *FRBSF Working Paper 2010-09*. San Francisco: FRBSF.

Lee, C.C., & Chen, M.P., (2020). Do Natural Disasters and Geopolitical Risks Matter for Cross-Border Country Exchange-Traded Fund Returns? *The North American Journal of Economics and Finance*, 51. Available at: <https://doi.org/10.1016/j.najef.2019.101054>.

Li, K., (2020). Does Information Asymmetry Impede Market Efficiency? Evidence from Analysts Coverage. *Journal of Banking and Finance*, 118. Available at: <https://doi.org/10.1016/j.jbankfin.2020.105856>

Li, X. L., Balcilar, M., Gupta, R. & Chang, T., (2016). The Causal Relationship Between Economic Policy Uncertainty and Stock Returns in China and India: Evidence from a Bootstrap Rolling Window Approach. *Emerging Markets Finance and Trade*, 52(3), pp. 674–689.

Li, X.M. & Peng, L., (2017). US Economic Policy Uncertainty and Co-Movements Between Chinese and US Stock Markets. *Economic Modelling*, 61, pp. 27–39.

Li, X.M., Zhang, B. & Gao, R. (2015). Economic Policy Uncertainty Shocks and Stock–Bond Correlations: Evidence from the US Market. *Economics Letters*, 132, pp. 91–96.

Liu, S., (2015). Investor Sentiment and Stock Market Liquidity. *Journal of Behavioural Finance*, 16(1), pp. 51–67.

Liu, X. & Ma, Y., (2024). Stock Volatility Reactions to Economic Policy Uncertainty: The Moderating Role of Sentiment Divergence. *Applied Economics*. Available at: <https://doi.org/10.1080/00036846.2024.2312264>

Lo, A.W., (2004). The Adaptive Market Hypothesis. *The Journal of Portfolio Management*, 30 (5), pp. 15-29.

Lo, A.W., (2005). Reconciling Efficient Markets with Behavioural Finance: The Adaptive Markets Hypothesis. *Journal of Investment Consulting*, 7 (2), pp. 21-44.

Lopez, V. & Whitehead, D., (2013). Sampling Data and Data Collection in Qualitative Research. Chapter 7, pp. 123-140.

Lucey, B.M. & Dowling, M., (2005). The Role of Feelings in Investor Decision-Making. *Journal of Economic Surveys*, 19(2), pp. 211-237.

Ma, J.Z., Ho, K.C., Yang, L. & Chu, C.C., (2018). Market Sentiment and Investor Overreaction: Evidence from New York Listed Asian Country Exchange Traded Funds. *Emerging Markets Finance and Trade*, 54(11), pp. 2455-2471.

Ma, R., Marshall, B.R., Nguyen, N.H. & Visaltanachoti, N., (2024). New Zealand Long-Term Equity Returns and their Determinants. *Pacific-Basin Finance Journal*, 85. Available at: <https://doi.org/10.1016/j.pacfin.2024.102363>

Malhotra, P., (2024). The Rise of Passive Investing: A Systematic Literature Review Applying PRISMA Framework. *Journal of Capital Markets Studies*, 12, pp. 1-31.

Malkiel, B.G., (1973) A random walk down wall street. 6th ed. *New York: W.W. Norton and Company*

Malkiel, B.G., (2003). The Efficient Market Hypothesis and its Critics. *Journal of Economic Perspectives*, 17(1), pp. 59–82.

Maloumian, N., (2022). Unaccounted Forms of Complexity: A Path Away from the Efficient Market Hypothesis Paradigm. *Social Sciences and Humanities Open*, 5(1). Available at: <https://doi.org/10.1016/j.ssaho.2021.100244>

Marschner, P. F. & Ceretta, P. S., (2021). Investor Sentiment, Economic Uncertainty and Monetary Policy in Brazil. *Saude E Sociedade*, 32(87), pp. 528-540.

Marschner, P. F., Ceretta, P. S. & Ambrozini, M.A., (2024). Impacts of Investors Rational and Irrational Sentiment on the Brazilian Market. *Revista Contabilidade & Finanças*, 35(95), pp. 1-18.

Mbhokota, F., (2023). ETFs Celebrate 30 Years of Democratising Global Investing. *EBNet*. [Online]. Available at: <https://www.ebnet.co.za/etfs-celebrate-30-years-of-democratising-global-investing/#:~:text=The%20growing%20popularity%20of%20ETFs%20can%20be.> [Accessed 25 09 2024].

Meinen, P. & Roehle, O., (2017). On Measuring Uncertainty and its Impact on Investment: Cross-Country Evidence from the Euro Area. *European Economic Review*, 92(C), pp. 161-179.

Mian, A., Sufi, A. & Khoshkhoh, N., (2015). Government Economic Policy, Sentiments and Consumption, *Working Paper No. w21316*. Washington DC: National Bureau of Economic Research.

Mishra, A.K., Nakhate, A.T., Bagra, Y., Singh, A. & Kar, B.P., (2024). The Impact of Directional Global Economic Policy Uncertainty on Indian Stock Market Volatility: New Evidence. *Asia-Pacific Financial Markets*, 31, pp. 423-452.

Miwa, K., (2016). Investor Sentiment, Stock Mispricing, and Long-Term Growth Expectations. *Research in International Business & Finance*, 36(1), pp. 414–423.

Mohammed, K.S., Obeid, H., Oueslati, K. & Kaabia, O., (2023). Investor Sentiments, Economic Policy Uncertainty, US Interest Rates, and Financial Assets: Examining their Interdependence Over Time. *Finance Research Letters*, 57. Available at: <https://doi.org/10.1016/j.frl.2023.104180>

Moodley, F., Nzimande, N. & Muzindutsi, P.F., (2022). Stock Returns Indices and Changing Macroeconomic Conditions: Evidence from the Johannesburg Securities Exchange. *EuroEconomica, Danubius University of Galati*, 3(12), pp. 109-121.

Muguto, R. & Muzindutsi, P.F., (2022). A Comparative Analysis of the Nature of Stock Return Volatility in BRICS and G7 Markets. *Journal of Risk and Financial Management*, 15(85). Available at: [https://www.researchgate.net/publication/358754701\\_A\\_Comparative\\_Analysis\\_of\\_the\\_Nature\\_of\\_Stock\\_Return\\_Volatility\\_in\\_BRICS\\_and\\_G7\\_Markets](https://www.researchgate.net/publication/358754701_A_Comparative_Analysis_of_the_Nature_of_Stock_Return_Volatility_in_BRICS_and_G7_Markets)

Mullainathan, S. & Thaler, R.H., (2000). Behavioural Economics. *National Bureau of Economic Research, Working Paper 7948*. Available at: <https://www.nber.org/papers/w7948>

Mushinada, V. & Veluri, V., (2018). Investors' Overconfidence Behaviour at Bombay Stock Exchange. *International Journal of Managerial Finance*, 14 (5), pp. 613 - 632.

Mushinada, V., (2020a). Are Individual Investors Irrational or Adaptive to Market Dynamics? *Journal of Behavioural and Experimental Finance*, 25. Available at: <https://doi.org/10.1016/j.jbef.2019.100243>

Mushinada, V., (2020b). How Do Investors Behave in the Context of a Market Crash? Evidence from India. *International Journal of Emerging Markets*, 15 (6), pp. 1201 - 1217.

Muzindutsi, P.F., Apau, R., Muguto, R., & Muguto, H.T., (2023). The Impact of Investor Sentiment on Housing Prices and the Property Stock Index Volatility in South Africa. *Real Estate Management and Valuation*, 31(2). Available at: <https://doi.org/10.2478/remav-2023-0009>

Muzindutsi, P. F. & Obalade, A. A., (2020). Effects of Country Risk Shocks on the South African Bond Market Performance Under Changing Regimes. *Global Business Review*, 25, pp. 137-149.

Muzindutsi, P. F. & Obalade, A. A., (2024). Effects of Country Risk Shocks on the South African Bond Market Performance Under Changing Regimes. *Global Business Review*, 25(1), pp. 137-149.

Namouri, H., Jawadi, F., Ftiti, Z. & Hachicha, N., (2018). Threshold Effect in the Relationship Between Investor Sentiment and Stock Market Returns: A PSTR Specification. *Applied Economics*, 50 (5), pp. 559 - 573.

Nanayakkara, N.N., (2024). The Impact of Economic Policy Uncertainty on Government Bond Pricing. *Jyväskylä University School of Business and Economics Master's Thesis*.

Narayan, P.K. & Smyth, R., (2005). Structural Breaks and Unit Roots in Australian Macroeconomic Time Series. *Pacific Economic Review*, 10(4), pp. 421-437.

Newhart, M. & Patten, M. L., (2023). Understanding Research Methods: An Overview of the Essentials 11th edition. *Routledge*, pp. 28-36.

Nguyen, C.P. & Nguyen, B.Q., (2023). From Natural Risk to Social Justice: The Influence of Natural Threats on Gender Inequality. *Environmental Sustainability Indicators*, 19. Available: <https://doi.org/10.1016/j.indic.2023.100270>

Nguyen, M.H. & Trinh, V.Q., (2023). U.K. Economic Policy Uncertainty and Innovation Activities: A Firm-Level Analysis. *Journal of Economics and Business*, 123. Available at: <https://doi.org/10.1016/j.jeconbus.2022.106093>

Nofsinger, J.R., (2017). The Psychology of Investing (6<sup>th</sup> ed.). *Routledge*. Available at: <https://doi.org/10.4324/9781315230856>.

Nyakurukwa, K. & Seetharam, Y., (2024). On Bank Stock Return Spillovers in South Africa: Implications for Portfolio Hedging. *Scientific African*, 26. Available at: <https://doi.org/10.1016/j.sciaf.2024.e02406>

Nyukorong, R., (2020). Exchange-Traded Funds: What you need to know. *European Scientific Journal*, 16(19). Available at: [https://www.researchgate.net/publication/343552705\\_Exchange-Traded\\_Funds\\_What\\_You\\_Need\\_to\\_Know](https://www.researchgate.net/publication/343552705_Exchange-Traded_Funds_What_You_Need_to_Know)

Obalade, A. A. & Muzindutsi, P. F., (2019). The Adaptive Market Hypothesis and the Day of the Week Effect in African Stock Markets: The Markov Switching Model. *Comparative Economic Research. Central and Eastern Europe*, 22(3), pp. 145-162.

Oh, C. & Sheng, O., (2011). Investigating Predictive Power of Stock Micro Blog Sentiment in Forecasting Future Stock Price Directional Movement. *In ICIS*, pp. 1–19.

Oluwafemi, O.I., Famakinwa, E. O. & Balogun, O. D., (2024). Random Walk Theory and Application. *World Journal of Advanced Engineering Technology*, 11(2), pp. 346-367.

Paliouras, D.V., (2007). Comparing Regime-Switching Models in Time Series: Logistic Mixtures vs. Markov Switching. *Masters Dissertation, University of Maryland, United States*.

Pantzalis, C., Park, J.C. & Wang, P., (2025). Noise Trader Clusters and Market Efficiency. *Journal of Behavioural and Experimental Finance*, 45. Available at: <https://doi.org/10.1016/j.jbef.2025.101021>

Papadamou, S., Fassas, A.P., Kenourgios, D. & Dimitriou, D., (2021). Flight-to-Quality Between Global Stock and Bond Markets in the COVID Era. *Finance Research Letters*, 38. Available at: <https://doi.org/10.1016/j.frl.2020.101852>

Pastor, L. & Veronesi, P., (2012). Uncertainty About Government Policy and Stock Prices. *The Journal of Finance*, 67(4), pp. 1219-1264.

Pastor, L. & Veronesi, P., (2013). Political Uncertainty and Risk Premia. *Journal of Financial Economics*, 110 (3), pp. 520-545.

Perras, P. & Wagner, N., (2020). Pricing Equity-Bond Covariance Risk: Between Flight-to-Quality and Fear-of-Missing-Out. *Journal of Economic Dynamics and Control*, 121. Available at: <https://doi.org/10.1016/j.jedc.2020.104009>

Perry, B., (2017). Evaluating Country Risk for International Investing. *Investopedia*. [Online]. Available at: <http://www.investopedia.com/articles/stocks/08/country-risk-for-international-investing.asp>. [Accessed 13 09 2024].

Petkov, P., Shopova, M., Varbanov, T., Ovchinnikov, E. & Lalev, A., (2024). Econometric Analysis of SOFIX Index with GARCH Models. *Journal of Risk and Financial Management*, 17(8). Available at: <https://www.mdpi.com/1911-8074/17/8/346>

Piccoli, P. & Chaudhury, M., (2018). Overreaction to Extreme Market Events and Investor Sentiment. *Applied Economics Letters*, 25(2), pp.115–118.

Poncela, P. & Senra, E., (2017). Measuring Uncertainty and Assessing its Predictive Power in the Euro Area. *Empirical Economics*, 53(1), pp. 165–182.

Poterba, J. M. & Shoven, J. B., (2002). Exchange-Traded Funds: A New Investment Option for Taxable Investors. *American Economic Review*, 92(2), pp. 422-427.

PwC., (2020). *Financial Market Impacts of COVID-19*. PwC. [Online]. Available at: <https://www.pwc.co.za/en/assets/pdf/financial-market-impacts-of-covid-19.pdf>. [Accessed 20 09 2024].

Qiang, Z. & Shu-e, Y., (2009). Noise Trading, Investor Sentiment Volatility, and Stock Returns. *Systems Engineering- The Theory and Practice*, 29(3), pp. 40-47.

Qiu, J. & Yang, N., (2022). Rational Catering of Irrational Emotions: Investor Sentiment and Executive Tone. *Frontiers in Psychology*, 13. Available at: <https://doi.org/10.3389/fpsyg.2022.987310>

Quayes, S. & Jamal, A.M.M., (2016). Impact of Demographic Change on Stock Price. *The Quarterly Review of Economics and Finance*, 60, pp. 172-179.

Rajabi, M.M., Linnenluecke, M. & Smith, T., (2024). The Wealth Effect of the US Net Zero Announcement. *Energy Economics*, 139. Available at: <https://doi.org/10.1016/j.eneco.2024.107945>

Raza, M.W. & Ashraf, D., (2019). Does the Application of Smart Beta Strategies Enhance Portfolio Performance? The Case of Islamic Equity Investments. *International Review of Economics and Finance*, 60, pp. 46-61.

Redl, C., (2015). Macroeconomic Uncertainty in South Africa. *Working Paper. ERSA*, p509.

Rehman, M.U., Asghar, N. & Hussain, J., (2019). Are Disaggregate Industrial Returns Sensitive to Economic Policy Uncertainty. *Physica A: Statistical Mechanics and its Applications*, 527. Available at: <https://doi.org/10.1016/j.physa.2019.121301>

Reilly, F.K. & Brown, K.C., (2003) *Investment Analysis and Portfolio Management*. 7th Edition, Thomson South-Western, Australia

Renault, T., (2017). Intraday Online Investor Sentiment and Return Patterns in the US Stock Market. *Journal of Banking & Finance*, 84, pp. 25–40.

Reuters., (2023). South African Rand Firms; CPI and Rate Decision this Week's Focus. *Reuters*. [Online]. Available at: South African rand firms; CPI and rate decision this week's focus. [Accessed 23 07 2023].

Rounaghi, M.M. & Zadeh, F.N., (2016). Investigation of Market Efficiency and Financial Stability Between S&P500 and London Stock Exchange: Monthly and Yearly Forecasting of Time Series Stock Returns Using ARMA Model. *Physica A: Statistical Mechanics and its Applications*, 456, pp. 10-21.

Rupande, L., Muguto, H. T., Muzindutsi, P.F., (2019). Investor Sentiment and Stock Return Volatility: Evidence from the Johannesburg Stock Exchange. *Cogent Economics & Finance*, 7.

Sakemoto, R., (2018). Co-movement Between Equity and Bond Markets. *International Review of Economics & Finance*, 53. Available at: <https://doi.org/10.1016/j.iref.2017.10.013>

Salvador, E., Floros, C. & Arago, V., (2014). Re-Examining the Risk–Return Relationship in Europe: Linear or Non-Linear Trade-Off? *Journal of Empirical Finance*, 28, pp. 60-77.

Sawyer, J., (2023). How and Why Sentiment Declined Among South African Consumers. *IPSOS*. [Online]. Available at: <https://www.ipsos.com/en/how-and-why-sentiment-declined-among-south-african-consumers#:~:text=South%20Africa%E2%80%99s%20National%20Index,%20a%20measure%20of%20consumers%E2%80%99%20overall%20economic>. [Accessed 06 10 2024].

Segal, G., Shaliastovich, I. & Yaron, A., (2015). Good and Bad Uncertainty: Macroeconomic and Financial Market Implications. *Journal of Financial Economics*, 117(2), pp. 369-397.

Seong, N. & Nam, K., (2021). Predicting Stock Movements Based on Financial News with Segmentation. *Expert Systems with Applications*, 164. Available at: <https://doi.org/10.1016/j.eswa.2020.113988>

Shabir, M., Jiang, P., Wang, W. & Işık, Ö., (2023). COVID-19 Pandemic Impact on Banking Sector: A Cross-Country Analysis. *Journal of Multinational Financial Management*, 67. Available at: <https://doi.org/10.1016/j.mulfin.2023.100784>

Shahid, M.N., Coronado, S. & Sattar, A., (2019). Stock Market Behaviour: Efficient or Adaptive? Evidence from the Pakistan Stock Exchange. *Afro-Asian Journal of Finance and Accounting*, 9(2), pp. 167-192.

Shanmugasundaram, D. & Jansirani, M. N., (2012). Influential Factors in Investment Decision Making. *South Asian Journal of Marketing and Management Research*, 2, pp. 96-106.

Sharif, T., Ghouli, J., Bouteska, A. & Abedin, M.Z., (2024). The Impact of COVID-19 Uncertainties on Energy Market Volatility: Evidence from the US Markets, *Economic Analysis and Policy*, 84, pp. 25-41.

Sharpe, W. F., (1964). Capital Asset Prices: A theory of Market Equilibrium Under Conditions of Risk. *Journal of Finance*, 19, pp. 425-442.

Shawtari, F. A., Salem, M. A., Hussain, H. I., & Hawariyuni, W. (2016). Long Run Relationship Between Macroeconomic Indicators and Stock Price: The Case of South Africa. *Journal of Internet Banking and Commerce*.

Shiller, R.J. & Campbell, J.Y., (1991). Yield Spreads and Interest Rate Movements: A Bird's Eye View. *The Econometrics of Financial Markets*, 58(3), pp. 495-514.

Shu, H. C. & Chang, J. H., (2015). Investor Sentiment and Financial Market volatility. *Journal of Behavioural Finance*, 16(3), pp. 206–219.

Siganos, A., Vagenas-Nanos, E. & Verwijmeren, P., (2017). Divergence of Sentiment and Stock Market Trading. *Journal of Banking and Finance*, 78, pp. 130-141.

Simon, H.A., (1955). A Behavioural Model of Rational Choice. *Quarterly Journal of Economics*, 69 (1), pp. 99–118.

Statistics South Africa., (2024). *Statssa*. What is the Consumer Price Index?. [Online]. Available at: <https://www.statssa.gov.za/?p=955>. [Accessed 10 09 2024]

Strydom, B., Charteris, A. & McCullough, K., 2015. The Relative Tracking Ability of South African Exchange Traded Funds and Index Funds. *Investment Analysts Journal*, 44(2), pp. 117-133.

Su, C., (2010). Application of EGARCH Model to Estimate Financial Volatility of Daily Returns: The Empirical Case of China. *Master Degree Project No.2010:142*.

Su, C.W., Yuan, X., Umar, M. & Chang, T., (2023). Is Presidential Popularity a Threat or Encouragement for Investors? *Economic Research*, 36(2). Available at: <https://doi.org/10.1080/1331677X.2022.2129409>

Sum, V., (2012). The Effect of Economic Policy Uncertainty in the US on the Stock Market Performance in Canada and Mexico. *International Journal of Economics and Finance*, 4(11), pp. 165–171.

Tabash, M.I., Farooq, U., Al-Absy, M.S.M., Albzour, O.F. & Mahmoud, O.A., (2023). How Does Economic Policy Uncertainty Influence the Innovation Activities: Empirical Evidence from BRICS. *Journal of Open Innovation: Technology, Market and Complexity*, 9(4). Available at: <https://doi.org/10.1016/j.joitmc.2023.100164>

Taffler, R. J., Agarwal, V. & Wang, C., (2017). Asset Pricing Bubbles and Investor Emotions: An Empirical Analysis of the 2014–2016 Chinese Stock Market Bubble. *Behavioural Finance Working Group Meeting, Queen Mary University, London*, pp. 1–50.

Taylor, S., (1986) Modelling Financial Time Series. *New York, John Wiley and Sons*. Available at: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1478375#:~:text=First%20published%20in%201986%2C%20it%20is%20a%20classic,are%20applied%20by%20quantitative%20analysts%20in%20many%20banks.](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1478375#:~:text=First%20published%20in%201986%2C%20it%20is%20a%20classic,are%20applied%20by%20quantitative%20analysts%20in%20many%20banks.)

Thaler, R.H., (2016). Behavioural Economics: Past, Present, and Future. *American Economic Review*, 106 (7), pp. 1577-1600

Thirumala, M., Verma, V., Dhanya, K.A., Mate, R., & Hota, K., (2023). Investor Sentiment and Stock Market Volatility: A Behavioural Finance Perspective. *European Chemical Bulletin*, 12(8), pp. 3466-3477.

Tita, A.F., French, J.J., Gurdgiev, C. & Obalade, A., (2025). Does the Tail of Finance Wag the Dog of the Real Economy? Dynamic Connectedness of the Stock Market and Business Confidence. *International Review of Economics and Finance*, 98. Available at: <https://doi.org/10.1016/j.iref.2025.103856>

Tversky, A. & Kahneman, D., (1974). Judgment Under Uncertainty: Heuristics and Biases. *Science*, 185 (4157), pp. 1124-1131.

Uygur, U. & Taş, O., (2014). The Impacts of Investor Sentiment on Returns and Conditional Volatility of International Stock Markets. *Quality & Quantity*, 48(3), pp. 1165–1179.

Van der Westhuizen, C., van Eyden, R., & Aye, G., (2022). Contagion Across Financial Markets during COVID-19: A Look at Spillovers Between the Stock Market & Foreign Exchange Markets in South Africa. *ERSA Working Paper 872*.

Wagner, M. & Margaritis, D., (2017). All About Fun(ds) in Emerging Markets? The Case of Equity Mutual Funds. *Emerging Markets Review*, 33, pp. 62 – 78.

Wang, L., Ma, F., Niu, T. & Liang, C., (2021). The Importance of Extreme Shock: Examining the Effect of Investor Sentiment on the Crude Oil Futures Market. *Energy Economics*, 99. Available at: <https://doi.org/10.1016/j.eneco.2021.105319>

Wang, H. & Zhang, Y., (2024). Social Trust, Audit Quality and Institutional Investor Herd Behaviour. *Finance Research Letters*, 63. Available at: <https://doi.org/10.1016/j.frl.2024.105363>

Wen, F., Xiao, Y. & Wu, H., (2019). The Effects of Foreign Uncertainty Shocks on China's Macro-economy: Empirical Evidence from a Nonlinear ARDL model. *Physica A: Statistical Mechanics and its Applications*, 532. Available at: <https://doi.org/10.1016/j.physa.2019.121879>

Wu, K., Sun, Y., Shi, K. & Lin, Q., (2022). Does Economic Policy Uncertainty Drive Global ETF Flows? Available at: <https://dx.doi.org/10.2139/ssrn.3542908>

Xiang, Y. & Borjigin, S., (2024). Investment Network and Stock's Systematic Risk Contribution: Evidence from China. *The Quarterly Review of Economics and Finance*, 94, pp. 113-132.

Xiong, X., Bian, Y. & Shen, D., (2018). The Time-Varying Correlation Between Policy Uncertainty and Stock Returns: Evidence from China. *Physica a: Statistical Mechanics and Its Applications*, 499, pp. 413–419.

Zhang, X. & Zhang W., (2023). Information Asymmetry, Investor Sentiment and Asset Price. *North American Journal of Economics and Finance*, 67. Available at: <https://doi.org/10.1016/j.najef.2023.101920>

Zhao, P., (2024). Analysis of Development Trend of Financial Securitization in China under Global Economy. *Scientific Journal of Economics and Management Research*, 6(8), pp. 16-21.

Zhenghui, L. & Junhao, Z., (2020). Impact of Economic Policy Uncertainty Shocks on China's Financial Conditions. *Finance Research Letters*, 35. Available at: <https://doi.org/10.1016/j.frl.2019.101303>

Zivot, E., (2016). Introduction to Computational Finance and Financial Econometrics with R. Monograph. *Springer*.

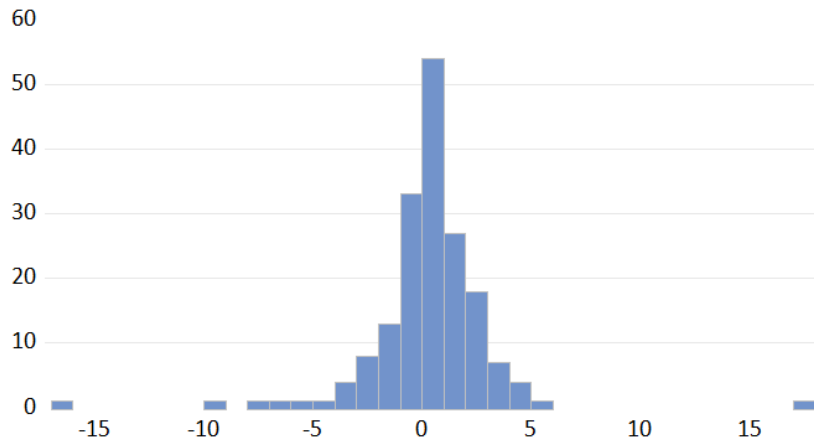
## APPENDICES

### Appendix A: ETF Sample List

<i>Domestic Bond ETFs</i>		
ETF Product	Index Tracked	JSE Ticker
Invest SA Bond	S&P SA Sovereign Bond 1+ Year Index	ETFBND
FNB Government Inflation-Linked Bond	Government Inflation Linked Bond Index (GILBx)	FNBINF
Satrix GOVI	SA Government Bond Index	STXGVI
Satrix ILBI	S&P SA Sovereign Inflation-Linked Bond	STXILB
Satrix Inflation Linked Bond	Absa South African Government Inflation-Linked Bond Index	STXIFL
Satrix SA Bond Portfolio	S&P South Africa Sovereign Bond 1+ Year Index	STXGOV
<i>Domestic Equity ETFs</i>		
Invest SA Property	FTSE/JSE Africa SA Listed Property Index	ETFSAP
Invest SWIX 40	FTSE/JSE Africa SWIX 40 Index	ETFSWX
Invest Top 40	FTSE/JSE Top40 Index	ETFT40
10X SA Dividend Aristocrat	S&P SA Dividends Aristocrat	DIVTRX
10X SA Property Income	Customised	CSPROP
10X Top 50	S&P SA 50	CTOP50
FNB Top 40	FTSE/JSE Top 40	FNBT40
Satrix Capped INDI	FTSE/JSE Capped Industrial	STXIND
Satrix DIVI	FTSE/JSE Dividend Plus	STXDIV
Satrix Equity Momentum	Absa Wits Risk-Controlled SA-Momentum Index	STXEQM
Satrix FINI	FTSE/JSE Financial 15	STXFIN
Satrix Low Volatility	Absa Wits Risk-Controlled SA Low Volatility Index	STXLVL
Satrix Momentum	Satrix Momentum Index	STXMMT
Satrix MAPPs Growth	Composite of SWIX 40, GOVI, ILBI and cash	STXMAG
Satrix MAPPs Protect	Composite	STXMAP
Satrix Quality SA	S&P Quality South Africa Index	STXQUA
Satrix RAFI	FTSE/JSE RAFI 40	STXRAF
Satrix RESI	FTSE/JSE Capped Resources 10 Index	STXRES
Satrix S&P GIVI SA Top 50	S&P GIVI SA Top 50	STXT50
Satrix S&P Namibia Bond	S&P Namibia Sovereign Bond 1+ year Top 10 Index	STXNAM
Satrix SA Property	S&P SA Composite Property Capped	STXPRO
Satrix Shariah Top 40	FTSE/JSE Shari'ah Top 40	STXSHA
Satrix SWIX Top 40	FTSE/JSE Swix Top 40	STXSWX
Satrix Top 40	FTSE/JSE Top 40	STX40
Satrix Value Equity	Absa Wits Risk-Controlled SA Value Index	STXVEQ
Sygnia Itrix SWIX Top 40	FTSE/JSE Swix Top 40	SYGSW4
Sygnia Itrix Top 40	FTSE/JSE Top 40	SYGT40
<i>International Bond ETFs</i>		
Invest Global Government Bond	FTSE G7 Government Bond Index	ETFGGB
FNB World Government Bond	FTSE World Government Bond Index	FNBWGB
10-year Dollar Custodial Certificates	n/a	DCCUSD
2-year Dollar Custodial Certificates	n/a	DCCUS2
<i>International Equity ETFs</i>		
Invest Global REIT	FTSE EPRA/NAREIT Global REIT Index	ETFGRE
Invest MSCI World	MSCI World Index	ETFWLD
Invest S&P 500	S&P 500 Index	ETF500
Invest S&P 500 Info Tech	S&P500 Info Tech Index	ETF5IT
10X S&P 500	S&P 500	CSP500
10X S&P Global Dividend Aristocrats	S&P Global Dividend Aristocrats Blend Index (Custom)	GLODIV
10X S&P Global Property	S&P Global Property 40	GLPROP
FNB Global 1200 Equity Fund of Funds	S&P Global 1200	FNBEQF
Satrix MSCI Emerging Markets	MSCI Emerging Market Index	STXEMG
Satrix Nasdaq 100	iShares NASDAQ 100 UCITS ETF	STXNDQ
Satrix S&P 500	S&P 500	STX500
Sygnia Itrix 4th Industrial Revolution Global Equity	S&P Kensho New Economics Composite Index	SYG4IR
Sygnia Itrix EuroStoxx 50	Euro Stoxx 50 Equity	SYGEU
Sygnia Itrix FTSE 100	FTSE 100 Equity	SYGUK
Sygnia Itrix Global Property	S&P Global Property 40	SYGP
Sygnia Itrix MSCI Japan	MSCI Japan Equity	SYGJP
Sygnia Itrix MSCI US	MSCI US Equity	SYGUS
Sygnia Itrix MSCI World	MSCI World Equity	SYGWD
Sygnia Itrix S&P 500	S&P 500	SYG500

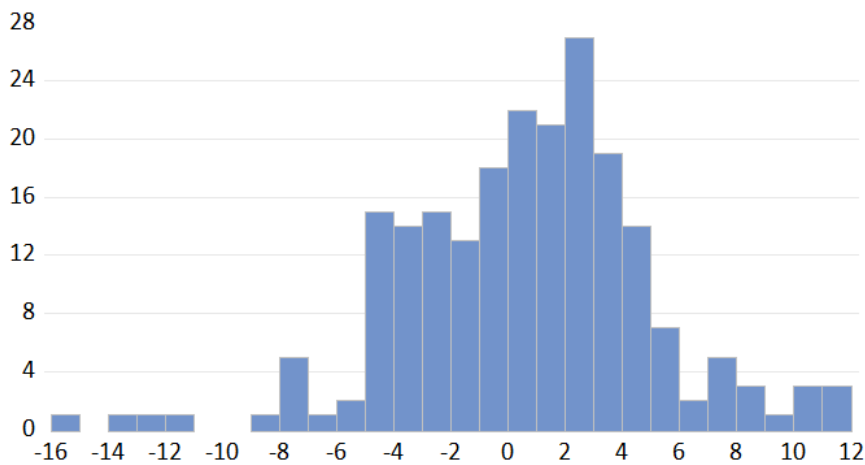
## Appendix B: EViews Jarque-Bera Test Results

### B.1. Domestic Bond ETF Portfolio



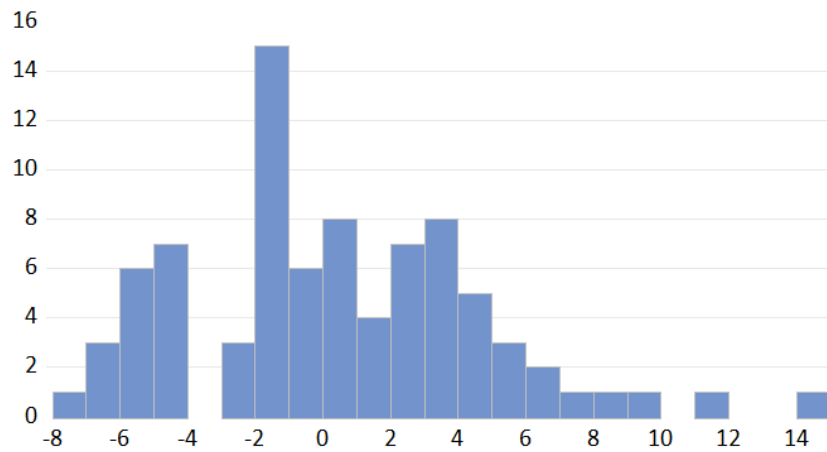
Series: DOMESTIC_BONDS	
Sample 2006M02 2023M12	
Observations 176	
Mean	0.356890
Median	0.456752
Maximum	17.86205
Minimum	-16.77234
Std. Dev.	2.739621
Skewness	-0.325299
Kurtosis	20.33084
Jarque-Bera	2205.730
Probability	0.000000

### B.2. Domestic Equity ETF Portfolio



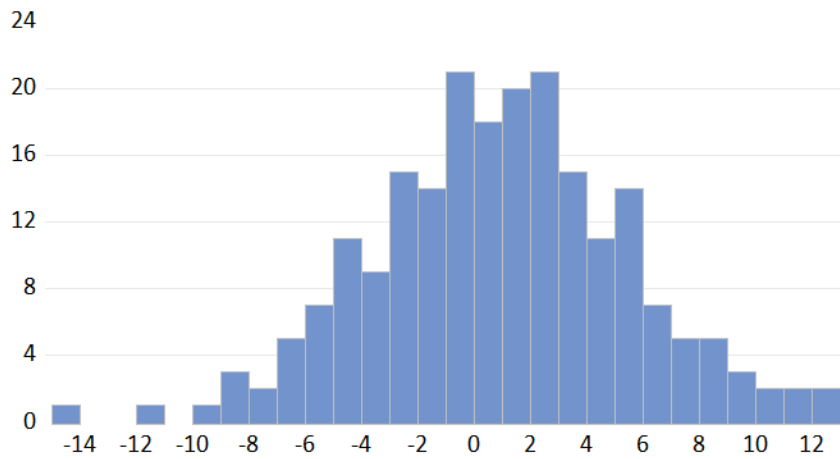
Series: DOMESTIC_EQUITY	
Sample 2006M02 2023M12	
Observations 215	
Mean	0.609895
Median	0.920671
Maximum	11.51888
Minimum	-15.61967
Std. Dev.	4.332802
Skewness	-0.348649
Kurtosis	4.273077
Jarque-Bera	18.87474
Probability	0.000080

### B.3. International Bond ETF Portfolio



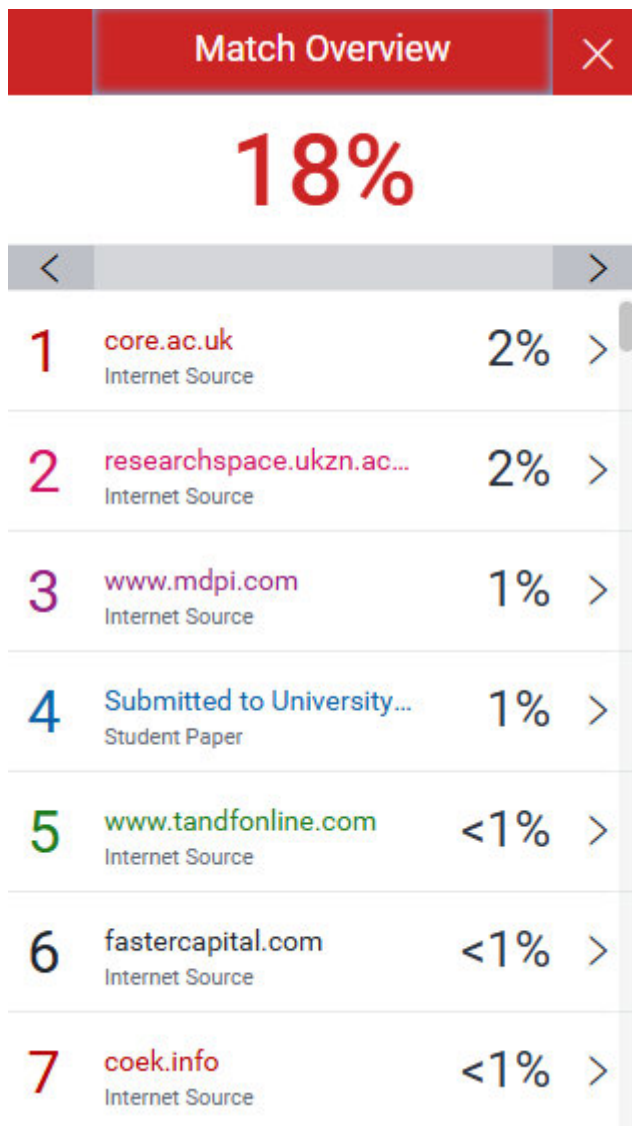
Series: INT_BONDS	
Sample 2006M02 2023M12	
Observations 83	
Mean	0.428815
Median	0.018902
Maximum	14.49683
Minimum	-7.959279
Std. Dev.	4.353691
Skewness	0.483659
Kurtosis	3.394925
Jarque-Bera	3.775360
Probability	0.151423

### B.4. International Equity ETF Portfolio



Series: INT_EQUITY	
Sample 2006M02 2023M12	
Observations 215	
Mean	0.874483
Median	0.938218
Maximum	12.41513
Minimum	-14.38013
Std. Dev.	4.545350
Skewness	-0.040103
Kurtosis	3.259107
Jarque-Bera	0.659060
Probability	0.719262

## TURNITIN REPORT



# ETHICAL CLEARANCE



6 Septmeber 2023

Miss Swastika Rajhununan (214500451)  
School Of Acc Economics&Fin  
Westville

Dear Miss Swastika Rajhununan,

**Original application number:** 00023242

**Project title:** The effect of economic uncertainty on exchange traded fund performance and volatility in South Africa

## Exemption from Ethics Review

In response to your application received on **31 August 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,

A black rectangular box redacting the signature of Prof Josue Mbonigaba.

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

## **SUPERVISOR'S PERMISSION TO SUBMIT FOR EXAMINATION**

Date: 06 February 2025

Student name: Swastika Rajhununan

Student no: 214 500 451

Dissertation Title: The effect of economic uncertainty on exchange traded fund performance and volatility in South Africa

As the candidate's supervisors, I agree to the submission of this dissertation for examination. Based on the Turnitin report and to the best of our knowledge, the dissertation is primarily the student's work, and he has acknowledged all the sources he has used.

The student has also satisfied the requirements of English language competency.

Name of Supervisor:

Signature: