**UNIVERSITY OF THE WITWATERSRAND**


# Performance Evaluation of Shariah Investments in South Africa

**by**

**Taariq GH Surtee**

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**The Graduate School of Business Administration, Wits Business School**

**University of the Witwatersrand**

**Supervisor: Professor Imhotep Paul Alagidede**

# Abstract

Shariah Investment Screening differs from country to country. Assumptions made in Shariah ruled countries might not apply in secular countries. Therefore, performance evaluation in one country cannot be used to make assumptions about another. The bulk of literature on this subject appears to focus mainly on Islamic ruled countries or countries with large Muslim populations. The literature focuses predominantly on equities as an asset class, while the literature on other asset classes is sparse and, when available, focuses on the class in isolation instead of presenting it as part of an investment portfolio. When considering these asset classes, there are explicit religious considerations that apply.

Additionally, the obligations of giving alms and removing unavoidable interest income when evaluating performance must be considered. South Africa has a small Muslim community and a robust financial system where Islamic products are traded, yet little is known about the effect of these obligations on the performance of Shariah Investments. Access to Shariah-compliant products is increasing where Islamic Banking is established, while Islamic bonds and tax-deductible investment opportunities have recently been introduced. In addition, the literature is only starting to discuss cryptocurrencies as an investment class. Drawing on these areas of investment research, our research examines the various asset classes' applicability for Shariah Investing in South Africa.

This study considers Islamic theology and redefines *Riba* as more than interest or usury. Using the newly defined *Riba*, we placed Islamic Utility in economic theory as Utility that complies with Islamic advice. These definitions gave us a platform to evaluate current investments. We found that the current screening practice is too limited, and therefore, we improved on screening practices using our new definitions and applied customised Modern Portfolio Theory (MPT) algorithms to accommodate Islamic Utility. We used four risk-reward ratios (Sharpe, Sortino, Sterling and Treynor) to predict investment portfolios in MPT. Our improved screening method shows that investors may include other asset classes in their portfolios while maintaining Shariah compliance.

The literature typically uses the Sterling and Treynor ratios to evaluate past performance and not in MPT. We argued that they should be used to predict portfolios. We, therefore, reinterpreted the two ratios and applied them in MPT algorithms. We showed that investors

could earn significant gains by using these ratios under some conditions. We confirmed our findings with statistical inference and further refined when to use the different ratios solutions.

The results are not as crucial since past success is no guarantee for future growth. As a measure of performance, we compared our results with current South African products. The best current products underperformed inflation once the compulsory alms were removed. We showed that we could indeed outperform the market and inflation, including removing the said alms. In this way, we proved our hypotheses and research questions, where we found that Shariah investing can be improved in South Africa.

We concluded our empirical confirmation by testing the robustness of our simulations against the standard Capital Asset Pricing Model (CAPM). Both MPT and the CAPM predict results. However, both allow that the actual results may defer from predictions. We, therefore, tested the magnitude of differences between the two models and found that our predictions were more precise.

In conclusion, our research introduced a more comprehensive understanding of Shariah investing with improved investment models that outperform the market.

**Key words:** Shariah Investments; Islamic Science; Quraan; Hadeeth; Riba; Islamic Utility, Modern Portfolio Theory; performance evaluation.

# Declaration

I, Taariq GH Surtee, with student identification number 9401331N, declare that this PhD thesis titled "Performance Evaluation of Shariah Investments in South Africa" is my own research project. Articles and materials representing the works of others used for this research have been duly referenced and acknowledged. This research work has not been presented before for examination leading to an award of any degree either to this university or any other.

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Taariq GH Surtee (9401331N)

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# Dedications

*To my parents, Mohamed and Hawa, who let me take on any challenge I wanted to.*

*To my wife Fatima, for her support and patience.*

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I thank Almighty Allah for the opportunity to pursue this PhD. Any benefit that comes from it is attributed to Him. I am humbled to be added to the halls of many great minds that look to inspire a better world. I am thankful for a supervisor that took me on when others could not and guided me through my undertaking. To my supervisor, Professor Imhotep Paul Alagidede, you have taught me more than just completing a PhD. Besides the feedback and guidance, you also gave me the confidence to express myself. Tomorrow when I am called, I will pay forward your mentorship to those who look to me. Jazak-Allah Prof.

To my wife, Fatima, thank you for your support, encouragement and patience. We have different minds but work well together and complete each other. I love you.

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# Table of Contents

# List of Figures



# List of Tables

# Chapter 1: Introduction and background

## 1.1 Introduction

Shariah Law governs Islam, the religion of Muslims. In 1996, 1.36% or approximately five hundred and fifty thousand South Africans were Muslim (Haron, 1997). In 2001 the population had grown to approximately six hundred and fifty thousand; 1.46% of the population, and by 2013, the Muslim population grew to approximately one million and fifty thousand, or 2% of the population (Schoeman, 2017). These censuses show growth in the number of people who accept Shariah Law as their way of life and are willing to invest in a Shariah-compliant manner rather than rely on interest-based investments to increase their wealth. Shariah-based banking is an established industry in South Africa (ABSA Bank Ltd, 2019a; First National Bank, 2019a; Oasis Group Holdings Ltd, 2019; Standard Bank Ltd, 2019). Moreover, Shariah Investments that screen equities according to Shariah law are offered in South Africa. Therefore, since it appears that the South African Muslim population is growing and that Shariah-based finance and investment is established in the country, studies in Shariah investing in South Africa are relevant to not only expose the variety of Islamic based assets and investment vehicles to the broader public but also to address the unique areas of Islamic finance that distinguishes it from conventional finance and investment.

Shariah investing has been a subject of discussion for many years (Alam, Akbar, Shahriar, & Elahi, 2017; Hussein, 2004; Ibrahim, 2015; Imad & bin Osman, 2017). The critical differentiation from conventional investing is that firstly, Muslims cannot partake of interest-based income and secondly, investments must be ethical according to Shariah law. Islam is a tolerant religion that implicitly advises a moderate approach to personal well-being and communal affairs. Islam has various levels of denouncing actions, from being frowned upon (*makruh* in Arabic) to forbidden (*haraam*), creating a spectrum of moral choices when making decisions. For example, smoking cigarettes is frowned upon because of its effect on people's health.

In contrast to this, alcohol use and gambling are strictly forbidden. Islam does not allow drinking or gambling, even in a social setting. People simply do not get intoxicated or risk losing their money by gambling. Hence, the question arises why a moderate religion may deem

some actions forbidden. While it is not made explicit in the Quraan or Hadith[1], we posit that the actions and outcomes dictate the denouncement's severity. For example, while bad for one's health, smoking cigarettes does not induce an intoxicated state like alcohol, where intoxication has a far more detrimental effect on the broader community. Intoxicated people may not have a clear mind or control of their actions. Their erratic behaviour could be anything from mild emotional outbursts to harming others. Intoxicated people could break down social ties and drive their families into health or financial hardship. Therefore, by forbidding such practice, Islam attempts to remove any potential hazard to society. This is a typical approach to internalise an externality that has a detrimental effect on third parties due to one's utility maximisation (i.e., the satisfaction that an individual derives from consuming alcohol).

Similar conclusions were made by Farooq (2006) when discussing Islamic Law and the use of Hadith. When interpreting Hadith use in a modern environment, the author emphasised that the judiciary should consider a moderate approach based on the Islamic bodies of knowledge that the community accepts as authentic. This shows that a process of ethical decision making should be executed. Specifically, when choosing an investment portfolio, it means applying one's personal Islamic thinking to add depth to what has been understood as a list of screening criteria. While the list offers some understanding and could be simpler to execute, especially in a setting of equities investment, it does little justice to the Shariah investing spirit.

A similar modernised case may be made for drug abuse. Drug use is not explicitly forbidden in Islam. However, narcotics or smoking cannabis would be forbidden for their mind-altering effects under similar analogous reasoning. Cannabis is an interesting example. Since cannabis is recommended for medical reasons, Islam's view on its use may change to allow it under strict medical conditions. These discussions show that moderate Islam needs to be accommodative when deciding what is suitable for society. Any change in rulings would need careful consideration and understanding of circumstance, while application must follow the principles and be practical. The same can be applied when dealing with interest income in finance.

1 Qur'aan and Hadith science of interpretation is covered in the Literature review section (chapter 2).

When Islamic revelation was made, it clearly singled out *Riba*[2] as forbidden (*haraam)*. Muslims believe that revelation is not coincidental. Therefore, when the Prophet Muhammad (pbuh)[3] revealed that alcohol was forbidden, R*iba* was also forbidden. To Muslims, this purposeful alignment should express the level of prohibition. Likewise, it stresses that no amount of *Riba* is acceptable. However, until recently, in secular countries, conventional finance and investments were the only investment options available to Muslims. Hence, Muslims were deprived of religiously acceptable choices. Under these conditions, Islamic scholars allowed Muslims to use conventional products under the premise that they were signing agreements under duress. Where such practice is only allowable as a temporary measure whilst viable, permissible alternatives are sought. It appears that Riba is permissible under some circumstances. Therefore, we discuss *Riba* in more depth, challenging the established translation that *Riba* is only interest.

Shariah law was developed approximately 1400 years ago in Saudi Arabia before the current complex investment environment existed. The central prohibition is against interest and usury, commonly referred to as "*Riba*" in Arabic. However, historical Islamic theology records that the prohibited *Riba* was not completely defined in the Islamic Sciences of interpretation[4] (Farooq, 2009; *The Holy Qur'aan (Translation and Commentary)*, 1993). What is established is that there are two types of *Riba*. The first relates to *Riba* defined in the Quraan (the main Islamic religious text), and the second relates to the Prophet Muhammad's (pbuh) advice (called Hadith). The first type is clear, while the Khalif (Muslim leader after the Prophet), Umar ibn Al Khattab (ra)[5], found difficulty in interpreting the Prophet's advice (*The Holy Qur'aan (Translation and Commentary)*, 1993). Umar (ra) was the second Caliph of Islam and a close companion of the Prophet (pbuh). In terms of narration, his Islamic character is considered

2 *Riba* is an Arabic word translated into the English words grow, expand or inflate (Ahmad & Hassan, 2007). It is also used as the Arabic word for Interest and Usury (Farooq, 2009). Partaking in *Riba* is prohibited in Islam (Ali, 1993). However, etymologically equating *Riba* to Interest or Usury is incomplete as it is established that the Prophet did not completely define *Riba* (Ali, 1993). This is explored in the Literature review under section 2.5.

3 Pbuh – is short for "may peace be upon him". It is an honorific and offer of respect to the Prophet of Islam.

4 Islamic science of interpretation is covered in the Literature review section (chapter 2).

5 ra – is translated to "May Allah be pleased with him". It is a prayer and offer of respect Muslims offer.

exemplary (Ahmed, 2005). Hence, *Riba* is currently defined as interest or usury (Chong & Liu, 2009; Farooq, 2009). However, since it was not wholly defined under the original theology's context, defining *Riba* today is topical and complicated. The complications stem from the fact that Arabic is a complex language, resulting in a loss of meaning when translated into other languages (Saeed & Fareh, 2006).

Moreover, the Islamic sciences of interpretation require that scholars understand the Islamic culture and a country's current economic environment. Scholars must be Muslim to interpret Shariah in different circumstances (Farooq, 2006; Hasan, 1994) and equally understand the secular industry. These scholars may not know the cultures of different countries and may make assumptions that apply in some countries while not in others. This sentiment is echoed by Ho (2015), who writes that screening standards differ between different countries. Therefore, a critical review of Shariah investments in South Africa is warranted since, for example, corporate gift-giving could be considered *Riba* in South Africa while it may not be in Malaysia.

As part of the literature (section 2.4), Islamic interpretation and the unexplained *Riba* is discussed more clearly in our context, thus contributing to literature and providing the platform for studying Shariah investing. The key difference is asset screening, which we defined in the South African context, creating further investment opportunities like legal weapons trade.

Shariah investment starts with portfolio screening. Screening is the process of selecting assets for an investment portfolio. Literature discussing Shariah screening is predominantly limited to Muslim ruled countries like Pakistan, Malaysia, Indonesia and Saudi Arabia (Boudt, Raza, & Wauters, 2019; Ho, 2015; Rizaldy & Ahmed, 2019). These countries have large Muslim populations. Larger populations can influence a country’s law and introduce Shariah-based law[6]. Hence, business activity is more conducive to Shariah's teachings. While these examples explain Shariah Investing, historical records support that the circumstances and laws differ in countries like South Africa, where the Muslim population is much smaller, and *Riba* practice is as widespread. South African Muslims may be unable to influence all laws pertaining to *Riba*. Theological records differentiate the issues of *Riba* in countries where *Riba* practice is

6 Shariah is considered as divine revelation. Shariah law would be juristic law developed from Shariah. Section 2.4 expands on Shariah law.

common. There is a historical example to support this. al-Bukhari (2020c) records an incident in Islamic history where Muslims are advised not to exchange business gifts when trading in countries where interest is used. This example shows that *Riba* could be earned from gifts. Hence, we propose that equating *Riba* to interest only, leaves a gap in *Riba's* definition. Therefore, using established Hadith and historical records, we refine the current *Riba* definition to explain that any undue income like earnings from islamically prohibited sources like alcohol or gambling may be construed as *Riba*.

Similarly, some business activities like weapons trade may be prohibited in some countries (Ashraf & Khawaja, 2016; Waris, Hassan, Abbas, Mohsin, & Waqar, 2018). Islamic history did not forbid weapons trade since the Prophet (pbuh) and his followers traded weapons (see: at-Tirmidhi, 2020b). Step forward into today's complex world, and illegal weapons trade is rife. Illegal trade could cause harm to society and add to oppression. Furthermore, weapons of mass destruction could be stored as deterrents to protect one's country or destroy civilisations. Therefore, the nature of the trade needs to be considered before judging the prohibition in a country. Analogical reasoning applied in Malaysia does not necessarily apply in South Africa, where weapons are traded under strict regulation.

Differences like these are brought forth in the literature to propose enhanced South African screening strategies. The potential differences in countries' laws and the financial structuring of companies are essential considerations in this sphere of knowledge. While screening needs to be reviewed continuously within the country's legislation to ensure portfolios remain Shariah-compliant, there has been no specific literature dealing with how this should be done. Since countries' laws and regulations defer, our study extends the literature by focusing on why adopting another country's screening methodologies for South Africa could be problematic, and at the same time proposing new methods to close the gaps in Islamic screening. Our search has not yielded any literature discussing screening in South Africa. The only reference to screening in South Africa comes from a United Kingdom incorporated advisory company called Yasaar. Their understanding of the South African context has never been tested in the literature. The lack of a South African context presents a huge opportunity for a study of this nature to fill the literature gap. It would be prudent to test the assumptions made to ensure that the screening methodology is indeed complete for South Africa. For example, weapons and alcohol trade for medicinal use is legal in South Africa. However, the current literature does

not expand on these industries. Hence, analysing South African screening is a contribution to the literature.

The next gap identified is empirical. The current literature on performance focuses on two main groups of countries. The first group are predominately Muslim ruled countries mentioned above (Ashraf, 2013; Ashraf & Mohammad, 2014; Rizaldy & Ahmed, 2019). The other literature is based on large economies like the United States of America and Europe (Alam & Rajjaque, 2010; Ashraf & Mohammad, 2014; Hassan & Antoniou, 2005; Kok, Giorgioni, & Laws, 2009). Literature in South Africa is sparse. The literature found is reliant on established indexes and does not explore South African Shariah screening. The most relevant literature is an empirical study conducted in 2004, where South Africa is grouped with other countries in a global FTSE Islamic index (Hussein, 2004).

The purpose of that study was to make an empirical evaluation. It does not deal with specific investing interpretations in each country. Therefore, although South Africa is mentioned, it is not discussed in depth. While Hussein's study may introduce the South African context, it stops short of assessing the unique attributes South Africa may present when analysed. Their criterion was based on current screening practice. Hence, it does not wholly reflect South Africa's environment since weapons trade is considered forbidden. Thus, an in-depth analysis of the screening helps establish what a realistic South African Index is.

Similarly, other screening criteria, like financial ratios, differ between countries. These are not discussed in depth. It was found and discussed in the literature review that South Africa's ratio interpretation is more conservative than international practice. Therefore, since Hussein's study only deals with empirical evidence, it offers only an introduction to the subject. There is no discussion on improving performance, and this study builds on performance improvements by relooking at screening.

When trying to study performance, the data we sought was not found in the literature. Current portfolios are predominantly equity-based without considering the other asset classes. There is a dearth of literature discussing portfolios that include other asset classes. This untested observation offered rich discussion on different Shariah screening reasoning and yielded improved efficient portfolios. Since adding these assets to historical investment portfolios simulations yielded positive results, they could add Utility to future portfolios.

In studying these other classes, a standard measurement tool was needed. Risk/returns ratios offer standard comparisons across asset classes. Hence, it was possible to analyse improvements over the existing conventional and Shariah indexes. A standard method for calculating efficient portfolios based on these comparisons is Modern Portfolio Theory (MPT) (Hawley & Lukomnik, 2017). This theory finds an efficient frontier for a selection of stocks using risk/returns ratios (Markowitz, 1952a). In economic terms, returns are an example of Utility, where Utility Theory defines it as a gain for the investor (Markowitz, 1952b; Robinson, 2017; Stigler, 1950). The MPT model seeks to maximise this gain with the least amount of risk. Hence, by applying the risk/return models for comparison, we can empirically evaluate if screening assets under our newly defined *Riba* yields better performance and offers Muslims feasible alternatives to the current Shariah and conventional offerings.

This introduction has presented several concepts that define Shariah Investing. The last pertinent concept uncovered in the discussion is risk. Islamic text recounts that there are two types of reviewing risk. Acceptable risk review includes operational risk in day-to-day activity, while unacceptable risk review involves speculation or other gambling equivalent risks (see: Dewandaru, Bacha, Masih, & Masih, 2015; Imad & bin Osman, 2017; Waemustafa & Sukri, 2015). In Shariah, understanding and managing risk in trade is fundamental (Waemustafa & Sukri, 2015). Historically, Muslims were not allowed to trade in anything (like goods or commodities) that they did not own or had not evaluated for their quality. This is applied in today's investment world, where assets in a portfolio must be owned, and the quality of goods must be established. Beyond equities, which deals with company ownership, commodities trading offers an excellent example of a modern-day adaptation. Commodities' quality is verified remotely at a warehouse, and commodity traders are charged for storage while never seeing the goods. They rely on agents at the warehouse. These processes contribute to Islamic acceptance and include day-to-day operational risks.

Since MPT minimises risk, it is an ideal platform for evaluating the performance of Shariah investments. The model is not perfect. MPT optimisation often proposes short selling while Shariah forbids it (see: Dusuki, 2008; Naughton & Naughton, 2000; Sifat & Mohamad, 2016; Sochi & Swidler, 2018). Short selling is effectively exercising more rights over an asset than one has (i.e. selling borrowed shares) and is contrary to Islamic teaching. Short selling is analogous to taking insurance against portfolio loss or speculating against a risky position. This

constitutes an unacceptable form of risk management. Therefore, MPT will have to be adapted to remove short selling for Shariah portfolio optimisation. MPT can be constrained to accommodate the same. At the same time, we propose that risk/return models offer a common evaluation medium. Since MPT uses risk/return models for investment performance across all portfolios, Shariah Investments can be evaluated against each other and against conventional ones. This approach shares similarities with studies conducted in other countries (Ashraf, 2013; Ashraf & Mohammad, 2014). Lastly, since comprehensive portfolio performance literature across all asset classes was not found, this proposal offers to test performance across the various asset classes. As proposed, MPT was used to evaluate performance using interpretations of four risk/return ratios, namely the Sharpe, Sortino, Sterling and Treynor ratios.

## 1.2 The Problem Statement

The problem statement is centred on three major themes discussed below:

### 1.2.1 Shariah screening in South Africa

The first theme concerns Shariah screening. The common practice is to conduct Shariah screening in two stages. The first stage is a qualitative evaluation analysing business activity and the second stage is quantitative, where various benchmarks and financial ratios are analysed (Ashraf & Khawaja, 2016; Ho, 2015; Waris et al., 2018). Shariah Screening is based on Riba. Hence, the etymology of *Riba* must be discussed first. Thereafter, the current two screening stages are discussed.

***Riba***[7] is a central Islamic concept (Farooq, 2009). Islam is a global religion with universal beliefs (Esposito, 2002). Hence, the prohibition of *Riba* is a global challenge for Muslims. *Riba* is an Arabic word meaning to grow, expand or inflate (Ahmad & Hassan, 2007). It is also used as the Arabic word for interest and usury (Farooq, 2009). Both interest and usury are prohibited in Islam (*The Holy Qur'aan (Translation and Commentary)*, 1993). However, etymologically this translation limiting it to interest or usury is incomplete. When translating and discussing the Quraan, Ali's (*The Holy Qur'aan (Translation and Commentary)*, 1993) commentary advises that there is difficulty in defining *Riba*.

[7] The comprehensive list of bibliographic references serves to understand the theological and jurisprudence nature of *Riba*.

Islam accepts that the interpretation of Shariah may differ in different countries, depending on the environment. The narration (below) where Abu Burda (a notable Muslim historical figurehead) cautions that the exchange of gifts in some countries could be questionable emphasises the point:

Al-Bukhari, Book 63, Number 39:

> Narrated Abu Burda: When I came to Medina, I met Abdullah bin Salam. He said, "Will you come to me so that I may serve you with Sawiq (i.e., powdered barley) and dates, and let you enter a (blessed) house that in which the Prophet entered?" Then he added, "You are in a country where the practice of *Riba* (i.e. usury) is prevalent; so if somebody owe(s) you something and he sends you a present of a load of chopped straw or a load of barley or a load of provender then do not take it, as it is *Riba*" (al-Bukhari, 2020c).

This historical account cautions that one must be aware of the environment in which one conducts business activity. In the case above, accepting gifts in a country where widespread interest is practised, taking gifts would be construed as partaking in *Riba*. This example shows that beyond usury and interest, some everyday business activities in a country can be questionable. A topical example in vehicle finance is gifting the vehicle at the end of the lease (ABSA Bank Ltd, 2019c; Al Baraka Bank Ltd (South Africa), 2021b). To the best of our knowledge, no literature discussing this practice exists in South Africa. Therefore, using this example, this study attempts to discuss other issues in business activity that are not covered in the South African context. The study fills this gap of the paucity of research on Shariah compliance screening in South Africa.

The discussion develops a concept of Islamic Utility as a Shariah governed concept within Utility Theory. Utility Theory defines Utility as a return expected by adding a (risky) asset to a portfolio (Fishburn, 2013). We propose that Islamic Utility is the same, provided the added asset meets Islamic permissibility. The argument for developing and defining Islamic Utility stems from the comment, "Money has no intrinsic utility. It cannot be utilised for fulfilling human needs directly. It can only be used for acquiring some goods or service." ((Taqī ‘Uṣmānī, 2005):112). While this comment discusses money only, it expresses the philosophy of fulfilling human needs. In line with this thinking, any industry that does not fulfil a Muslim’s need has no utility. We propose that if it has no utility, it has no value to the Shariah portfolio

investor and cannot be included in a Shariah Investment portfolio. Furqani (2015) explains that Islamic concepts may be defined in economics once their Shariah governance is established. Hence, once Shariah's guidelines of Utility are understood, Islamic Utility may be defined. This principle was relevantly used when Choudhury (1986) discussed an Islamically permissible utility function. To our knowledge, discussing the function as a philosophy defining Islamic Utility was never discussed in the literature. This study reviews Islamic Utility holistically and philosophically to make this definition more concrete. Islamic Utility contributes to both stages of Shariah Compliance Screening:

#### *1.2.1.1 Stage One - Islamic business activity*

Islam has prohibited the consumption of alcoholic drinks and pork products. Similarly, Islam has prohibited participation in certain entertainment types, such as gambling and the intermingling of sexes (Ho, 2015). It can be seen from the examples that the theme intended by this prohibition is designed to prevent any socially degenerative behaviour. Based on this generalisation, Muslims are prohibited from investing in industries that promote socially degenerative behaviour. Unlike South Africa, Muslim countries have national advisory councils that ban prohibited industries (Zainal, Zulkifli, & Saleh, 2013). So, in South Africa, the onus falls on the investor to decide what to include.

South Africa is less prohibitive, and companies have their own advisory committees (ABSA Bank Ltd, 2019b; First National Bank, 2019a; Oasis Group Holdings Ltd, 2019; Standard Bank Ltd, 2019; Yasaar, 2019). The problem with this approach is that the companies may have different interpretations. Contradictory interpretations may cause confusion in business activity and screening. Therefore, these interpretations will be collected and rationalised into an applicable view of Islamic business activity in South Africa.

Furthermore, investment practices such as derivatives, hedges, day trading, and short-selling are commonly accepted investment strategies in South Africa (Republic of South Africa, 2015c). These instruments are highly speculative and risky. Islam prohibits highly speculative trading and short-selling (Dewandaru, Bacha, Masih, & Masih, 2015; Imad & bin Osman, 2017). Therefore, these instruments' effects on portfolios must be noted and discussed when evaluating Shariah Investments' performance. Additionally, we must consider Islam's obligatory alms called Zakat when considering investment strategies. *Zakat* must be paid

annually from all investment capital (Al-Suhaibani & Almuhanna, 2018). Therefore, *Zakat* was deducted when considering growth and evaluating performance and its net effect on growth (Utility) noted.

As a result of these considerations, applying the Shariah rulings may affect Shariah investments' performance and performance compared to secular investment strategies. Hence, when defining Islamic Utility, we considered adopting a more conservative Islamic approach and all the Islamic requirements that may affect performance.

#### *1.2.1.2 Stage Two - financial screening*

Companies are first screened for their business activity. Companies whose activity includes alcohol trade and gambling are removed. Thereafter, financial screening that further reviews a company's income generation and leverage is applied. As with the other screening tools, the acceptable Shariah benchmarks and financial ratios[8] (Rizaldy & Ahmed, 2019; Waris et al., 2018) will be employed to interpret financial screening in the South African environment. Ideally, financial screening would not be applicable in a Shariah governed company, or Shariah ruled countries. However, this may not be the case in South Africa, and financial screening needs to be discussed. Dividend screening is a topical idea that has started appearing in companies' explanations of Shariah Screening (see: i-VCAP Management Sdn. Bhd., 2019; MCCA Ltd, 2019). We searched the literature and did not find anything on dividend screening. Therefore, our evidence is based on topical ideas. There are two methods of dividend screening. The first one uses dividend screening as a yield comparison tool. The second one involves selecting investments with minimal prohibited income. In addition to this, prohibited portions are removed from dividend pay-outs. The second method aligns with managing Shariah investments. Ho (2015) suggests that this is practised to some degree where some investors invest in non-compliant companies and remove prohibited portions from their returns. These approaches appear to have Islamic underpinnings and can offer research opportunities as the practice grows.

8 The benchmarks and ratios are discussed in the Literature Review.

### 1.2.2 Screening asset classes

The second central theme of the problem stems from understanding screening in various asset classes. Islam specifies that trade is only acceptable if islamically permissible goods and services are traded (Wahab, Lewis, & Hassan, 2007). Therefore, in the first theme, we propose that only Islamic permissible goods and services have an Islamic Utility. Moreover, Islam accepts that there is risk in any undertaking (Masih, Kamil, & Bacha, 2018). Before taking any investment position, it is mandatory to consider the risks (Ashraf & Khawaja, 2016; Ho, 2015; Waris et al., 2018). Shariah compliance screening literature focuses mainly on equities. However, Muslims are permitted to invest in other asset classes as well. In terms of different asset classes, South Africa offers Shariah-compliant bonds called *Sukuk* (Republic of South Africa, 2014), Tax-deductible investments (FA News, 2018), cash-based accounts, commodities and real estate. The Shariah rules that apply to equities do not necessarily apply to the other asset classes. For example, holding cash or cash equivalents as an investment has no utility in a Shariah portfolio (Farooq, 2009; Shafi & Taqī ʻUs̲mānī, 1997) even though there is no risk. Further, in real estate, income permissibility is subject to the nature of operations conducted on the premises where these operations must conform to Shariah (Hasan & Sulaiman, 2016).

In addition to the above, dividend screening, as found in practice, removes portions of prohibited income. Once this practice is examined thoroughly, it could inform other asset classes. Lastly, cryptocurrencies are a new medium of exchange. They can be asset-backed on a full reserve basis (Abdeldayem, Al Dulaimi, & Al Dulaimi, 2021) instead of an islamically prohibited fractional reserve system (Meera & Larbani, 2009). Their merit as being islamically permissible is under discussion (Abdeldayem et al., 2021; Abubakar, Ogunbado, & Saidi, 2018) and makes them viable for consideration in Shariah Investments. Literature discussing each asset class is vast and generally treated as separate subjects (see: Abbasher Hassan, 2012; Hasan & Sulaiman, 2016; Pasternack, 2008; Prinsloo, 2009; Republic of South Africa, 2014). However, literature discussing Shariah portfolio screening, including all asset classes as part of a portfolio, is sparse, making this an opportune time to review the practice. These asset classes may be considered in a Shariah Investment portfolio.

### 1.2.3 Performance evaluation of Shariah investments in South Africa

The previous section's discussion shows that Shariah Investments, with all their restrictions, could lag behind other portfolio types in performance. Hence, performance introduces Shariah Investments' evaluation in South Africa as the third central theme of the problem. The subject is topical in other parts of the world (Alam & Rajjaque, 2010; Ashraf, 2013; Ashraf & Mohammad, 2014; Kok et al., 2009). The literature provides Shariah Investment performance insight in Shariah and secularly ruled countries, and further, under diverse economies. As discussed in the previous problem statement themes, little to no literature discussing South Africa was found. South African Shariah Investment practice is fragmented in that companies have their own decision boards, and it appears that methodologies are not standard.

Further, it appears that there is negligible portfolio diversification where other asset classes are included. Therefore, it is unknown how well current Shariah Investments perform in South Africa. As a result, it is unknown if it would be possible to improve performance. This study evaluates current products' performance and investigates if there is an opportunity to improve performance.

## 1.3 Objectives of the study

This study explores the following objectives:

1. To examine Islamic Utility as a theory that allows investors to evaluate assets for Shariah compliance.
2. To extend Islamic Utility theory to include all asset classes.
3. To analyse the performance of the current Shariah Investments.
4. To evaluate portfolio performance improvement of Islamic Utility using new MPT models.

## 1.4 The Research Questions

The problem statement draws several points that distinguish the performance of Shariah Investments in South Africa. This study seeks to provide a comprehensive study of this performance evaluation by answering the following research questions:

1. To what extent do Shariah compliance screening assumptions apply in South Africa in the context of defining Islamic Utility?
2. What is the difference between Shariah compliance screening among the various asset classes in South Africa?
3. How do the current Shariah-compliant investment products risk and returns compare with indexes and current Shariah funds?
4. How does the performance of Shariah-compliant investments risk and returns improve relative to traditional investment products when applying Islamic Utility and MPT?

## 1.5 Definitions

This is a list of definitions used in this study. The definitions are derived from the literature referenced with the definition. Historic Islamic text English translations were used. Where available, the translator was named. The list of definitions does not include discussion on the redefined terms *Riba* and Islamic Utility.

Business Activity: We define business activity as any activity a business undertakes. It could be sales, services, administration or social responsibilities.

Risk: Risk is broadly categorised as the chance that an outcome or investment's actual return will differ from the expected outcome or return (Gerber & Pafum, 1998).

Alpha: Alpha is used in finance as a measure of performance of the excess return of an investment relative to the return of a benchmark index (De Carvalho, Lu, & Moulin, 2012).

Beta: Beta measures the volatility, or systematic risk, of a security or portfolio compared to the market as a whole. Beta is used in the capital asset pricing model (CAPM), which calculates

the expected return of an asset based on its beta and expected market returns (De Carvalho et al., 2012).

Day trading: Day trading is the act of buying and selling an asset within the same day or even multiple times over the course of a day (Turner, 2007).

Gharar: Gharar is an Arabic word associated with uncertainty, deception and risk. It is a significant concept in Islamic finance and is used to measure the legitimacy of a hazardous sale or risky investment pertaining to short selling, selling goods or assets of uncertain quality or delivery, gambling or contracts that are not drawn out completely. Gharar is generally prohibited under Islam; there are strict rules in Islamic finance against highly uncertain transactions that may cause any injustice or deceit against any of the parties (Uddin, 2015).

Hurdle Rate: A hurdle rate is the minimum rate of return on a project or investment required by a manager or investor. The hurdle rate denotes appropriate compensation for the level of risk present; riskier projects generally have higher hurdle rates than less risky ones (Meier & Tarhan, 2007).

Mukhatarah: Mukhatarah is defined as The permissible risk that exists and is inevitable in everyday transactions (Waemustafa & Sukri, 2015).

Utility: The utility of a reasonable good or service is essential to understand because it will directly influence the demand, and therefore price, of that good or service (Norstad, 2011).

Zakat: Zakat is a compulsory alms Muslims have to discharge (Owoyemi, 2020).

## 1.6 Contribution to Literature

Selection screening literature for Shariah Investing covers Muslim ruled countries or countries with large economies. South Africa does not fit either of these criteria. Further, Islam prescribes different conditions in countries where interest and usury are standard practice. Literature explaining selection in other countries is available. However, the literature does not explicitly discuss the South African context or discuss how *Riba* is explicitly treated in different countries. Common Islamic legislative practice is to obey a country's law and conduct business within an Islamic context. Since countries' laws can differ, one country's assumptions are not necessarily transferrable to other countries. Therefore, while screening literature is available in other countries, the rules and models applied may not be transferrable to South Africa. We

contribute to Shariah Screening literature by looking at the South African context and extending the thinking to Riba's broader context in investing. It appears that the literature assumes the simplest of meanings, namely that *Riba* is Interest only. This translation may not suffice, and current literature may have circumvented the more philosophical understanding of Shariah investing as a form of ethical investing.

After exploring the etymology of *Riba*, Shariah screening is examined under this new understanding. The concept of Islamic Utility is defined, drawing on the understanding that *Riba* guides what has Utility for a Muslim. The second critical factor to consider is the Risk associated with the Utility. Islam recognises reviewing some types of Risk while prohibiting reviewing others. Benchmarks and financial ratios are assessed in terms of Utility and Risk. Examining these factors allows us to consider the conflicting findings where screening differs in different countries. We offer a philosophical look at what is acceptable in Shariah Investing portfolios. We consider further that Shariah Investing portfolios may extend across the various asset classes. The established Islamic Utility philosophy expands to all asset classes. To the best of our knowledge, this has not been done. Therefore, regarding the various asset classes, we contribute to the body of knowledge in two ways. Firstly, we discuss each asset class under the definition of Islamic Utility and secondly, we discuss including all asset classes in an efficient Shariah Investment Portfolio.

South Africa's current Shariah investments performance is evaluated once the basis for understanding Shariah Investing has been discussed. No literature discussing this could be found. The evaluation considers both Islamic Utility (growth) and Risk. Firstly, the current Shariah products are evaluated against the market, where *Zakat* and dividend screening is considered. Secondly, the other asset classes are introduced to test their effect on investment performance. Performance could have either higher returns (Utility) for some determined risk or lower Risk for some determined utility. As far as we know, performance has not been considered in terms of Shariah Investments in this manner.

Finally, this study's theoretical contribution includes a comprehensive understanding of Shariah Screening through theological interpretation. The theological framework used is based on the Islamic Sciences of interpretation and established with current practice. Multiple sources were used to establish the correct manner of interpretation and practice, including work by

(Abubakar et al., 2018; Alam et al., 2017; Alam & Rajjaque, 2010; Ashraf & Khawaja, 2016; At-Tijaarah, 2007; Rizaldy & Ahmed, 2019; Taliep, Hassan, & Yusoff, 2012). The study expands on Shariah screening across multiple asset classes leading to a more detailed understanding of Islamic Utility.

# Chapter 2: Literature Review of Islamic theology

## 2.1 Introduction

The literature review section is separated into two chapters. Chapter Two (this chapter) analyses the first two research questions, and Chapter Three analyses the last two. In this way, the applicable theology is discussed first, and the performance evaluation second. The theological questions are:

1. Do the Shariah compliance screening assumptions in other countries apply in South Africa and in defining Islamic Utility?
2. How does Shariah compliance screening differ in the various asset classes in South Africa?

This chapter reviews the current two-stage screening practice, the history of interest and Islamic theology to establish our new *Riba* and Islamic Utility definitions. Firstly, the literature describing the current global screening practice is analysed, identifying the gaps. Secondly, the broader history of interest from before the birth of Islam is discussed. Thirdly, Quraan and Hadith sciences of Interpretation are introduced to familiarise the reader with the methodology. Lastly, *Riba* is redefined and expanded to define Islamic Utility.

The rest of the chapter uses the new definitions and analyses their effect on the various asset classes.

## 2.2 Current Two-Stage screening practice conceptual framework

This section introduces and explains the current Shariah investment practice based on *Riba's* current definition. Shariah investing is based on Shariah law. Shariah law is developed from the Islamic science of interpretation using the Quraan and Hadith as bodies of knowledge (Aa-isha, 2005; Hasan, 1994). The same bodies of knowledge and sciences of interpretation were used in this study. To date, Shariah investment practice shows that there appears to be a standard set of asset class exclusions like the alcohol or weapons trade and that *Riba* is interpreted as interest (see: Hussein, 2004; Imad & bin Osman, 2017). There is no literature defining the South African environment, and investors generally use the UK based Yasaar method. Further, the literature shows that *Riba* is commonly defined as interest, whereas,

historically, the definition is considered incomplete. Therefore, we find that this study is warranted.

The Yasaar model is not a worldwide standard. Other countries have their own models designed to suit their environments. A universal theme drawn from the literature is to establish a Shariah advisory council (see: Grassa, 2015; Bank Negara Malaysia, 2019; Muhamad Sori et al., 2015; Swartz, 2012; Taliep et al., 2012) . Generally, in Muslim ruled countries, these councils are at a national level, while in secular countries like South Africa, they are housed within companies. As an example of a national council, Malaysian authorities use a national advisory model governed by their Islamic Financial Services Act and the Central Bank of Malaysia's Shariah Governance Framework (Bank Negara Malaysia, 2013, 2019). Their governance framework is well developed with defined Islamic Finance roles and duties. National models are criticised for lacking diversity and innovation. However, they are guided by highly qualified and reputable Islamic theologians who sit on committees and boards (Muhamad Sori et al., 2015). These theologians are well versed in the Islamic sciences and have the Islamic character that the population accepts. Hence, the Malaysian model benefits by adopting the practice where the population will accept the rulings defined by the committee.

The national council model is not unanimously applied. Grassa (2015) surveyed 25 countries, investigating various approaches to providing governance and council. They found that regulation ranges from a national level to independent council bodies appointed within organisations. The advantages and pitfalls of the national model are that regulation enhances uniform governance and alignment with Shariah law. At the same time, the model can be restrictive to competitor entry and innovation (Grassa, 2015). At the other end of the spectrum, individual bodies may allow flexibility at the expense of consumer acceptance, where the competing independent councils' views may differ (Salah & Rautenbach, 2015). This practice casts doubt in consumers' minds (Farooq, 2006; Gumata & Mokoena, 2005; Islam & Rahman, 2017; Kholvadia, 2017; Randeree, 2000). This is where subjectivity would be applied, and investors can decide if the organisation's views are acceptable. South African banks consult individual bodies (see: Ashraf, 2013).

There are many interpretations of Shariah pertaining to investments. The differences in interpretation revolve around what is permissible and what percentage of impermissible

business activity may be accepted. They are broadly the same and stipulated in Shariah. However, the changes come from what is acceptable in a country. For example, different goods and services (like weapons sales) are legal in some countries, and advisory committees specify adherence to financial ratios and percentages, whereas some countries allow for a variance around a prescribed percentage (see: Ho, 2015). The thinking behind the interpretations is fleshed out in this chapter, supported by our proposed definitions.

The Johannesburg Stock Exchange uses Yasaar's Shariah Advisory board to screen Shariah permissible assets (see: JSE Marketing, 2021c). The two issues mentioned in the introductory chapter point to a gap in using advisory boards as they are currently constituted. The first issue concerns living in a country where *Riba* practice is prevalent. While every country has a fractional reserve baking system, all countries use Interest. If we accept *Riba* as interest, we could apply a UK based policy in South Africa. However, considering *Riba* more comprehensively, as Hadhrat' Umar (ra) suggests, the case may change. We would have to consider Business Activity and see how South African Companies operate to understand *Riba* in South Africa.

The second issue relates to what goods are permissible in trade. Globally, it appears that weapons trade is forbidden. Literature shows that it is prohibited in Malaysia (see: Ashraf & Khawaja, 2016; Waris et al., 2018), and it appears that this trend has become global. Malaysian law may prescribe this. However, historical evidence indicates that the Prophet (pbuh) traded in weapons and armour (at-Tirmidhi, 2020d). Hence, applying any global advisory policy in South Africa without considering the country's laws is superficial.

The literature on Shariah investing points to a two-stage screening process. The first stage validates if the asset passes Islamic permissibility, while the second assesses financial permissibility (Ho, 2015; MCCA Ltd, 2019; Rizaldy & Ahmed, 2019; Waris et al., 2018). Using the examples discussed so far, inclusion is based on what Islam deems socially beneficial goods and services.

Stage 1 considers the nature of the goods and services. For example, Islam bans goods like alcohol or pork and services like prostitution. Literature shows a trend that provides a list that investors should follow. There seems to be a gap between the original thinking (the Quraan and Hadith) and the list applicable today. Specifically, there is no literature on Stage 1

considerations or why the Yasaar board's advice is applicable in South Africa. The following sections of this study address this gap by reviewing business activity according to the bodies of knowledge using the applicable Shariah science of interpretation.

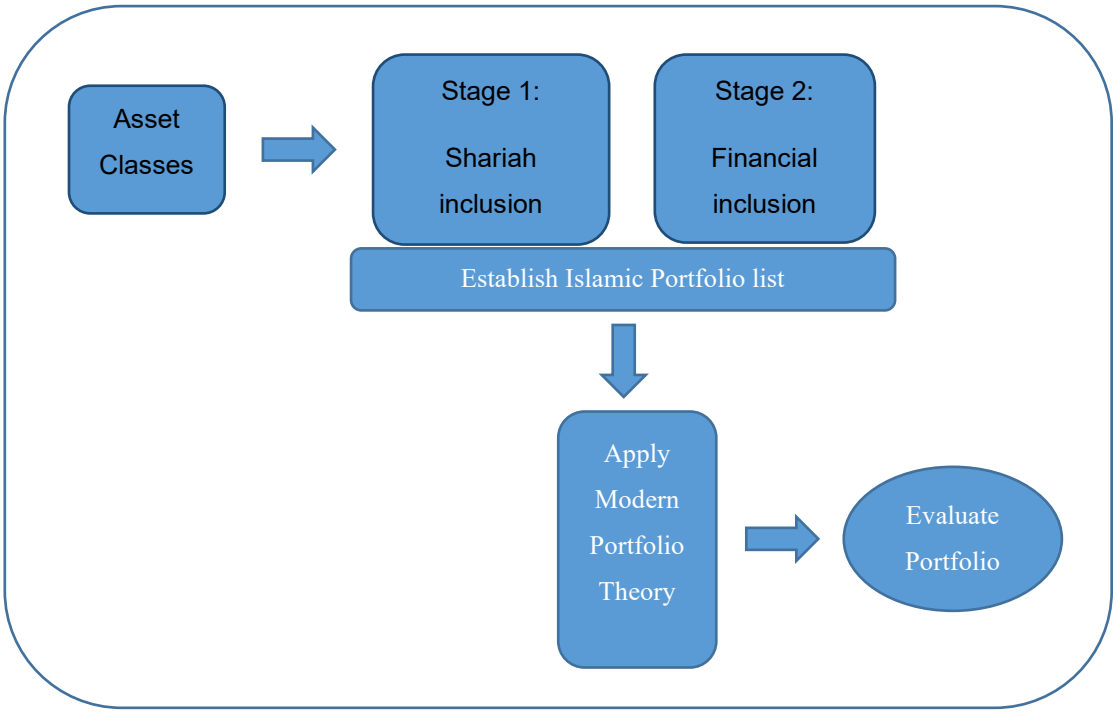
Stage 2 screening, as drawn from the literature, focuses on financial evaluation. The difference between the two stages is that the first focuses on social acceptability and the second stage on financial acceptability. Financial acceptability uses *Riba,* defined as interest and creates a set of rules for inclusion and exclusion. According to historical records, Islam does not specify any universal rules for all countries, meaning what is applicable in the UK may differ from South Africa. In the same way, the argument for weapons trade was made. Therefore, analogical reasoning was used in Chapter Four to identify gaps in the two-stage model.

Returning to current practice, once the two-stage screening is complete and the investor has a list of assets for their portfolio, investors try to maximise potential returns while minimising risk. There are many ways of selecting portfolio candidates, like investing in assets based on the news, reviewing the organisations' behaviour, or conducting financial analysis (Schulmerich, Leporcher, & Eu, 2015). These methods give investors an idea of the potential future growth of the asset and any associated risks. With regards to managing risk, Islam recognises two types of Risk in business activity. The first is force majour (by an act of Allah) and cannot be avoided. The second is operational risks that investors can review and attempt to minimise (Waemustafa & Sukri, 2015). Section 3.2 and 3.3 explores risk further and makes a case for using statistical volatility as operational Risk and using Modern Portfolio Theory (MPT) as a tool for selecting assets.

The two-stage screening process that leads to portfolio selection is represented in the conceptual framework below in Figure 1.

In line with Islamic theology, investors would gather various asset pools across several classes and apply the rules in stages one and two. The current rules were found to lack an in-depth understanding of Islamic theology applicable in South Africa, where the rules follow the UK based Yasaar interpretation. However, once the rules within these two stages are applied, Utility and Risk are evaluated depending on the investor's method. Risk/returns ratios are used in the MPT model, where the two variables used in the ratios are derived from periodic closing price data.

**Figure 1: Overview of the two-stage Conceptual Framework**




With the current practice established and gaps identified, we turn to analysing what Islam is saying about investing. At the root of the discussion are *Riba* and interest. Hence, the history of interest is recounted to provide the platform for redefining *Riba.*

## 2.3 The history of interest

This section traces historical interest and usury from its origin. The discussion follows the thread of support and objection throughout history to current practice. The similarities between *Riba* and Interest are explored and analysed. The problem identified in this study is that *Riba* is not clearly defined in Shariah Investments. Hence, it may not be applied correctly in all circumstances in portfolio screening.

Interest is one of the oldest moral and economic problems facing civilisation. Interest as a charge for the time value of loans dates back to about 2000BC.In his essay, Zarenga (2010) relates that it is thought that once man discovered the plough and the ability to write, loans were advanced to farmers in the form of seed grain, tools or farm animals. After the harvest had been reaped, the seed grain was repaid with some extra.

This transaction's reasoning was that sowed grain or bred animals increased in number. Hence, part of that increase should go to the investor. Zarenga (2010) mentions that, since just so much seed grain could be used, there were natural limits to this lending activity and that the items loaned could regenerate or grow. There is no mention of sharing the risk of farming. During the Ancient Orient timeframe, lawmakers dismissed the importance of commodities' natural ability to increase naturally. This action further removed the concept of the relationship between growth and risk. Over time, the system developed into one where metal by weight was exchanged to manage trade and advance seeds and livestock for more metal by weight after the harvest. The conceptual error found here is that metal is "barren" and unable to increase or grow naturally (Zarenga, 2010). Hence, any extra metal would have to be found elsewhere (mined or traded for), implying additional utility for the farmer. Standardised exchange rates were imposed to make trade easier. However, even in this standardisation, the conceptual error of metal being barren was not addressed.

Jones (2008) builds on the history of interest and focuses on how various civilisations interpret interest and use the law to legalise interest. Jones (2008) states, "The Greeks argued about usury, Hebrews denounced it, Roman law controlled it, and Christians began pondering it in the late Roman Empire." Christian theology developed law banning usury but allowing interest at any rates less than usury. To date, global financial systems are interest-based, while Islam upholds the complete ban on interest. As a result, Muslim scholars struggle to define an Islamic financial system under the global interest-based financial system.

The debate of what usury is, revolves around two main themes. The first is the moral issue of oppressing the poor. The second is economic in that usury defines an indiscriminate time value to money (Jones, 2008). Throughout the ages, concerns about the utility of money and the charging of interest are oft debated. The most notable arguments before Islam are Aristotle’s argument, Roman law and how Christianity approaches it.

Aristotle argued that by defining money as a consumable good, it could not be loaned to earn interest. Other assets are consumed on use, unlike money, which only holds value when exchanged. Aristotle argued that consumables could not be rented. Hence, since money is different, it should not be rented, only exchanged for goods and services. He maintained that money does not naturally reproduce, so renting money to grow one's wealth is unnatural (Jones,

2008). Central to Aristotle's argument is social well-being, a theme that appears to be predominant throughout history. Since the origins of interest appear to be a tax on farmers, it makes sense. Farmers are integral to sustaining society. Hence burdening farmers interrupts society's well-being at a most basic level. Therefore, Aristotle's concerns have practical value.

Roman lawmakers countered that rented money is a cost to the owner since the owner has given up the right to use his money. Hence, roman lawyers justified a specified return (they called it the *mutuum*) (Jones, 2008). The rate specification appears to be the first imposition of interest. Contrary to Aristotle's thinking, Roman law allowed the renting of consumable goods, provided they were returned in equal kind and quality. If there were any increases (interest), they were agreed to in an upfront contract. Any contracts earning interest without risk were called *foenus* and were illegal. *Foenus* bears a resemblance to the contracts later defined in Islam. Hence one can see a consistent application of social well-being in ethical, legal and religious systems. *Foenus* was used interchangeably with *usuram* in Latin biblical translations. Generally, throughout history, where interest was charged, usurious rates were changed to meet the needs of the people. The same is evident today. Christianity developed from the Roman era, and biblical references to the religion's treatment of interest and usury are well recorded.

Jones (2008) recounts that early Christianity condemned the charging of interest, and the Bible cites several verses opposing it:

i. Exodus 22:25 forbids oppressing one's neighbour with usury.

ii. Deuteronomy 23:20-21 states that you cannot charge your brother usury.

iii. Ezekiel 18:7-8: 13 clarifies that the righteous do not lend at usury; and that usurers "shall not live."

iv. Leviticus 25:35-36 says if your brother is poor, do not charge him usury.

v. The Old Testament's words on the issue came from the Psalmist, who charged the godly to aid their neighbours and not to charge interest on loans

vi. Luke 6:35, where He (Christ) says, "Lend, hoping for nothing in return."

The biblical references promote social well-being and embrace the same ethos as Islam. Amongst the recorded texts, both interest and usury are denounced. The similarities between

Christianity and Islam are not perchance since Islam accepts the teachings of Christ, and Muslims believe that Prophet Muhammad (pbuh) would take his understanding of the history of humanity when giving guidance.

Christians maintained that interest was illegal and damnable throughout the Middle Ages. Loans were allowed if lenders shared the risk in business. However, the risks were not always clearly defined. The law made it legal for lenders to guarantee capital by charging for losses. The charge was called *interesse* (Jones, 2008). Islam similarly maintains that the risk of trade should not affect the lender. His risk, though, is that the borrower may be unable to repay the loan. A Muslim lender always has the full right to his capital, while a Muslim investor shares profits and losses.

As civilisation progressed, controlling loans and repayments became more complex, and contracts were manipulated to include interest. Legal wording introduced various charges (high prices or insurance) to cover interest losses (Jones, 2008). However, from a religious standpoint, usury was still condemned. Islam manages permissible trade where contracts need to be agreed to beforehand without any ambiguity or change during the contract, and contracts cannot have any unrelated clauses (Taqī ʻUs̲mānī, 2005). In this way, it appears that Islam recognises some of the issues and loopholes created in history and attempts to rectify them. This is discussed further in the sections looking at the Prophet's (pbuh) guidance (section 2.4 and 2.5).

By the 15$^{th}$ century, laws controlling interest relaxed in the non-Islamic world (Jones, 2008). Theologians had to rethink the purpose of interest in a world where business was becoming more complex. This period saw the first clear separation between interest and usury, where the former started becoming a business finance instrument. In 1545, John Calvin argued that Christ's words "lend hoping for nothing in return" allowed a legitimate increase for the time value loss. Calvin argued further that there were two Hebrew words for usury. *Neshek* means "to bite" and *tarbit,* meaning "to take a legitimate increase". Calvin said that only "biting" loans should be forbidden. Islamic text was more organised with collections of the Prophet's (pbuh) advice. Islamic scholars interpreted that from the Quraan, any increase earned from credit was Interest and forbidden. Further, in Islam, partnerships and investing were encouraged rather than loaning.

Calvin's interpretation became the mainstay of business activity. His interpretation suggested a way forward where one could lend businesses funds at some interest rate. At the same time, loans to people in their personal capacity could not incur interest. Lastly, he suggested that one should give to the impoverished without expecting repayment. We can see that separation between business and social well-being started around this time. Scholars defined a secular business world more clearly, separate from social well-being where theology governed relationships. This approach's advantage was that different belief systems would no longer clash under a democratised governed business relationship. However, this could come at a risk where historical concerns protecting sustainability could be threatened regardless of the sources (ethical or theological).

Relaxation of interest charges in contracts continued in the latter part of the 16th century. Catholics and Protestants softened their view concerning two parties agreeing to a loan incurring interest. Theologians carefully approved interest practice, while commercial law embraced the idea. The state governed and supported agreements as long as the said agreements were not considered usurious (Jones, 2008). The distinction between religious and secular law appears to increase, removing the initial concerns of sustainability and social well-being.

From the 17th century onwards, the pace at which interest was accepted as common practice grew. As secular law replaced religious law, the debate turned from acceptance to acceptable interest rates (Jones, 2008). In the 18th century, concerns about interest and usury diminished, and lending at interest became the norm. From the 19th century onwards, the laws of interest and usury were refined into the form generally used today. While there was some interaction between Islam and Secular Europe, Islam was still ruled by the Ottoman Empire with strict religious governance. There is little record of how the two civilisations transacted and settled theological differences. However, in the 20th century, when fractional reserve banking was introduced, it appears that Islamic countries did not have a viable developed alternative and adopted fractional reserve banking. Fractional reserve banking is an interest-based instrument; thus, it is forbidden in Islam (Meera & Larbani, 2009; Tekdoğan & Saraç, 2020). Fractional reserve banking promotes the trade of promissory notes and extends rights over assets so that some parties have unequal rights over others. In the latter part of the 20th century, Muslim scholars and businesspeople started seeing the Muslim population's concern and began

developing Shariah-based financial systems. These were hybrids incorporating aspects from secular systems and applying Islamic thinking.

As scholars tried to adapt to the complex modern world, *Riba* and interest became contentious issues that are still the subject of heated debate. As a starting point, all scholars agree on the two classifications of *Riba*: (Adapted from two sources: (Farooq, 2009) and (Vadilho, 2007)). Riba's first classification is from the Quraan (also classified as Riba An-Nasiah or Riba Al-Jahiliyyah) and is defined as *Riba* incurred due to payment delays. This type of *Riba* is the same as secular interest. The second classification is *Riba* of the Sunnah (also classified as *Riba Al-Fadl, Riba An-Naqd* or *Riba Al Bai*). According to Sunnah*, Riba* is incurred when there is a disparity in sharing or income is earned from some forbidden goods or services.

In response to *Riba* being incompletely defined and Muslims worldwide wanting a more comprehensive understanding of *Riba* and Islamic Finance, recent attempts have been made to redefine *Riba* and the Islamic banking system. These definitions are debated since *Riba* was not clearly defined by the Prophet (pbuh). Egyptian scholars "tried to change the definition of *Riba* in order to accommodate the banking practices of their day" (Vadillo, 2007,p. 26). Mohammed Abduh (Grand Mufti of Egypt) issued an Islamic ruling (called a *fawta*) allowing interest-earning in savings funds. Egypt was governed by the British, and the more advanced British secular banking practice could have been an influence. However, his ruling appears to contradict the general Islamic understanding that savings cannot be used for any investment purpose without permission.

Further, returns cannot be guaranteed as it is with Interest. So, either the savings were being used and exposed to risk, or unnatural growth was added. In this case, while it appeared favourable to the Muslim population, there is a dissociation from social well-being where people did not know how the savings increased. While debatable, the Grand Mufti's fatwa formed the basis of profit-sharing contracts. These contracts have become the mainstay in creating an Islamic Finance industry.

Mohammed Rashid Reda claimed that *Riba* only applied to usury and allowed for interest received from banks or the post office (Vadilho, 2007). It appears that banks and the post office were given the status of social offices supporting society. The essence of their nature changed in the sophisticated developing society. For example, they are profit-driven in South Africa's

case, and thus their role as a social well-being office is debatable. Mohammed Rashid Reda further defines the *Riba* discussed in the Quraan as compound interest and *Riba* of the Sunnah as interest used as a convenient alternative to trade. This observation regarding *Riba* of the Sunnah supports establishing an Islamic Finance Industry as a viable alternative to a secular industry.

There is no distinction between simple and compound interest in Islam. Hence, it appears that while Mohammed Rashid Reda may have had good intentions, he implied a solution with no theological backing. His second definition allowing interest under a case of necessity (duress), has become a mainstay for Muslims in many countries. It uses the Arabic principle "Darurah", which allows Muslims to temporarily do something unlawful (for example, using alcohol-based medicine) for the sake of survival. However, Muslims should always seek acceptable alternatives.

This brief account of the history of interest and Islamic scholars' attempts to modernise the understanding of *Riba* provides a basis for the complex environment in which this study prepared to evaluate Shariah investment practice in South Africa. This history shows what appears to be a catch-up situation where, for better or worse, secular fractional reserve banking has developed and encompasses the world. In recent years, Islamic banking has only started gaining attention and has to find its place inside the fractional reserve banking system. Scholars have made *fatwas* that are still debated. Under this auspice, we propose that investors need to apply their minds when screening portfolio candidates. To do so, they need to understand Islamic theology and the difference between the mandatory rules and interpretive solutions. To do that, an understanding of the Islamic interpretive sciences is necessary:

## 2.4 Quraan and Hadith science of interpretation

As a background to understanding the Shariah rules of investing, this section briefly introduces the Islamic Science of Interpretation[9]. The discussion briefly differentiates Shariah Law from South African law before explaining its origin and jurisprudence.

9 Please see the Appendix for the Islamic Science interpretation guidelines.

South African law is derived from Roman-Dutch law, which adheres to the English law of evidence. Roman-Dutch law has roots in the 17th century, whereas Shariah Law has a much longer history, having first been developed in Saudi Arabia in the 6th century. Muslims consider Shariah as divine revelation. The source is the Quraan and Hadith. These sources are considered the recorded collection of the divine revelation. Shariah law is developed from these divine sources. *Fiqh* is the Arabic equivalent to jurisprudence and is centred on defining law based on the Quraan and Hadith sciences of interpretation. The process is thorough, where even the narrator's Islamic character is examined (Aa-isha, 2005). With civilisation's progress since the 6th century, there are bound to be scenarios not considered by established Shariah Law. There are no direct rulings for these new scenarios. Thus, scholars apply analogous reasoning (called *Qiyas*) to provide a rule. *Qiyas* is based on interpreting Quraan and Hadith according to the defined Islamic science of interpretation to derive modern society's application (Al-Omar & Haq, 1996; Hasan, 1994). Interpretation is epistemological using established Islamic Scientific analysis of the Quraan and supported by universally recognised Hadith libraries (Hasan, 1994).

In this study, we have suggested that investors may make subjective decisions when choosing a portfolio. In line with *Qiyas,* investors are expected to understand the Islamic Sciences. However, to be subjective, investors should apply their Islamic character. Islamic character in investments is not covered in the literature and is developed in this study. The current literature conceptually applies a two-stage screening process. By allowing subjective decision making, our study proposes a three-stage screening process. Our study attempts to remedy this by allowing investor choice. Rationally, investor subjectivity makes sense. The established Shariah theology advises that the Quraan and collection of authentic Hadith are complete. *Qiyas* allows Muslims to interpret their situation. Hence it seems rational that Muslim investors who are adopting Shariah investing are doing so in good faith and should be allowed to apply subjective thinking.

In applying subjectivity, this study used Shariah law (a theological concept) and defined Islamic Utility (an economic concept). Islamic Utility is defined and explored in section 2.7. The interpretation relies on *Qiyas* as defined in theology. Since Shariah Law developed separately and before Roman-Dutch law, the Islamic sciences of interpretation are reviewed in

this section. This section concludes with a review of the current use of *Qiyas* in modern Shariah Investing.

### 2.4.1 Tafsir (interpretation) and Qiyas of Quraan and Hadith

This section focuses on developing the use of *Tafsir* (interpretation) and *Qiyas. Tafsir* and *Qiyas* are comprehensive interpretation tools developed over 1400 years. The discussion is structured to explain the science from the highest level to the deepest. Each paragraph focuses on the intricacies of a certain level. The understanding at one level is needed to understand the next more in-depth level.

To apply *Tafsir*, one needs to have an in-depth knowledge of Islamic jurisprudence and know the rules of Quraan and Hadith Science (*Quraan Made Easy: Project Supervisor: Mufti Afzal Hoosen Elias*, 2005). There is a single accepted Arabic Quraan[10], and there are many translations into most languages. We extracted Verses from the online Quraan website (https://quran.com/) for this study. The website has Arabic and several English translations. Hadith were extracted from the Sunnah website (https://sunnah.com/)[11]. All six recognised Hadith libraries are available, and Arabic and several English translations can be found. To aid in understanding, we read all available translations of the Quraan and Hadith.

Shariah Law was revealed to guide people. The guidance often had to be explained practically. Malik's Muwatta is a collection of day-to-day practices on Hadith guidance (Al-Andalusi, 2005). Malik's collection is recognised and a reliable source of Hadith and practice. Together with the Quraanic verses and the six Hadith collections, we have a platform for applying subjective interpretation (*Tafsir*). Using the Hadith on exchanging gifts[12] in countries where *Riba* practice is common, we posit that Muslim investors in South Africa should apply

10 There are 7 dialects, attributed to the seven main tribes around the time of the birth of Islam. The wording and meaning, are the same.

11 The collections appear complete. However, it must be noted that in some cases there were less translations than in other.

12 "You are In a country where the practice of *Riba* (i.e. usury) is prevalent; so if somebody owe(s) you something and he sends you a present of a load of chopped straw or a load of barley or a load of provender then do not take it, as it is *Riba*" (al-Bukhari, 2020c).

themselves subjectively and consider how South Africa is in some ways the same as the rest of the world but in other ways unique.

It is essential to understand the depth of knowledge required to undertake *Tafsir*. Muslims believe that only the Prophet (pbuh) was given a complete understanding of the revelation and its interpretation (Aa-isha, 2005; Farooq, 2006; Hasan, 1994). Scholars may not have this same level of understanding (Farooq, 2006). Hence, they must apply their minds to make the best interpretation. Therefore, when deriving rulings, scholars must understand the Islamic Sciences. These include understanding the etymology and philology of the words and quotes, the historical events that preceded the text, the state of understanding of the people at the time of the revelation, and they must have a thorough understanding of the prior jurisprudence. One would have to be cognisant of which standard rules would apply universally and which may be interpreted according to the local culture. Several of the examples cited in this study explain this phenomenon. For example, universally, *Riba* is forbidden. However, Riba's definition changes depending on a country's trade practices. Further, common trading practices in Muslim countries may differ from countries like South Africa. Therefore, while not explicit in the *Tafsir*, when thinking about *Tafsir* in different countries, rules that appear natural in one country may not be in another. Hence, we posit that the science of interpretation needs to consider the local environment.

For *Tafsir* to be valid, interpretations must consider all Quraanic verses and Hadith with the same theme. Further, it makes sense that the theme must relate to the current situation being reviewed. In the past, scholars would rely on their memory of verses and Hadith collections when applying *Tafsir*. However, the collections consist of many volumes of books and thousands of, often repeated, Hadith. Modern library systems, driven by technology, make the process of finding related literature more comprehensive. These search systems allow researchers to look for keywords across the entire library. Hence, whereas researchers may find Hadith in one or two collections only in the past, we could search across all six collections and the Muwatta book.

The Muwatta book shares its name with a category of Hadeeth. Muwatta Hadeeth, in our contexts, refers to common practice and understanding. Regarding Hadith use, Aa-isha says: "In the science of Hadith, the muwathar (muwatta) represents conclusive evidence or

testimonies that provide unquestionable and final evidence in matters relating to the Prophet and the first community of Muslims." (2005,p. 8). Contextually, Aa-isha says that muwathar Hadith refers to several continuously and profusely narrated Hadith with well-known narrators. As a result, the knowledge becomes irrefutable, and *Qiyas,* based on this, would be sound. Only authentic Hadith were used to complete this discussion on investment screening and *Riba*.

Farooq (2006) conducted a study using algorithms to search for related Hadith across collections. His findings provide a platform for the keyword search method used here. The Key Words (*Riba*, *interest, trade, investment, usury, and credit)* were searched across the Quraan, the six collections and the Muwatta. Thirty verses and one hundred and seventy-four (174) Hadith relating to investments were found. In the Quraan, the themes were *forbiddance of Interest, trade of impermissible goods, and contractual obligations*. The Themes found in the Hadith mirrored those of the Quraan and increased in example and substance. Therefore, we considered that the search results gave a large set of verses and Hadith data, providing a comprehensive thematic view. Hence, the *Qiyas* in this study could be considered robust for the South African context, and the developed Islamic Utility theory is robust enough for investors to apply.

With regards to understanding jurisprudence and having an in-depth knowledge of Islam, revelation date and context are essential. Verses and Hadith may have been revealed at different times and may have been for different events. Parts of the Quraan and Hadith were revealed in Makkah in the Prophet (pbuh) earlier life and the others in Medina[13]. The Makkah and Medina periods were two distinct periods in Islamic history. Revelation in Makkah was authoritative and prescriptive as law. Conversely, revelation in Medina was more about guidance. Hence, when comparing the revelations, *Qiyas* is considered sound if it considers and explains the interpretation under these periods. Hadith support the Quraan by further explaining the context.

Hadith Science centres on establishing and using Hadith that can be legitimately traced back to the Prophet (pbuh) (Aa-isha, 2005). Hadith science is more complicated than that of Quraan Science. Unlike the Quraan, which is considered final and cannot be added to, Hadith are sometimes fabricated. Hence, scholars developed Hadith authentication analysis.

13 Additionally, some revelation occurred while the Prophet (pbuh) traveled.

Predominantly, the analysis focuses on verifying the chains of narration. The narrators' Islamic character and the essence (tone and choice of words) of the language used are considered when determining the Hadith's authenticity. Under this rapport, if the analysis of the Hadith's authenticity reveals anything unclear, the Hadith could be considered *Da'if* (weak), and extreme caution should be used when extracting guidance from it (Hasan, 1994). This analysis leads to Hadith being grouped as authentic solitary, authentic numerous (*Muwatta*) or weak (*Da'if*) Hadith (Farooq, 2006). The use of the Hadith body of knowledge is subject to understanding the purpose and form of the narration. The purpose would cover the circumstance under which the Hadith was given, while the form regards the nature of narration. The Hadith could be a direct instruction to an analogous example.

There are 41 rules regarding the use of Hadith that one needs to know when drawing on the body of knowledge (Hasan, 1994). Since we searched with many keywords, many more related Hadith were found in the collections. Thus, the likelihood of finding weak Hadith was minimised. Additionally, the website classifies Hadith according to the groupings (solitary, authentic numerous or weak), supporting that the final set used in this study is valid. Many of the mentioned historical texts have chapters on business activity (see: al-Bukhari, 2020a; at-Tirmidhi, 2020a; Malik, 2020; Muslim, 2020a). Hence, there is a consolidated theme of acceptable business practice.

Since there is consensus on the sciences and bodies of knowledge, there are rarely divergent views on understanding the theology. Interpretations differ for practical reasons and the reasons for this need to be investigated. Therefore, we do not evaluate the bodies of knowledge in constructing our argument but use them conservatively and eliminate any weak Hadith. Instead, the study's contribution is to verify the current portfolio screening practice and examine where the practice could be reviewed. We built on it where we thought it was lacking, i.e., subjective screening.

With regards to collating the Quraan and Hadith collections together into a path of following Islam, four scholars (the Four Imams) are recognised in the course of Islamic History. Qiyas today is based predominantly on four Islamic scholars' work (Murad, 2008). They studied the Quraan and Hadith to formalise four (very similar) versions of Shariah Law (Maẓāhirī, 2005). Many South Africans follow the law as prescribed by the Four Imams. Hence, any rulings

derived from *Qiyas* should conform to laws one of the Four Imams described. As mentioned, there is subjectivity in the *Qiyas*.

It should be noted that I (the author) follow the Hanafi teaching (one of the Four Imams). I have done an in-depth reading of the Four Imams' teachings beyond the scope of this study. Hanafi teaches that one must always be cognisant of peoples' needs. In this regard, I play a leadership role in the Muslim community at the University (Wits). The Muslim population at the University is diverse, and many Muslims follow the teachings of the various Imams, while some prefer to study the Quraan and Hadith directly. Therefore, I have taken it upon myself to understand the differences in order to be a better leader. This undertaking would naturally come out in my *Qiyas*. Hence, my disposition should be noted in this study's discussion when considering Islamic Character. My Islamic character would emerge when I refer to subjectivity in portfolio screening. Every effort to explain the decision process is made.

## 2.5 Redefining Riba

There is no literature defining *Riba* in South Africa. The Islamic financial industry hinges on the prohibition of *Riba* in any transaction (Al-Omar & Haq, 1996; Al Baraka Bank Ltd (South Africa), 2021a; Randeree, 2000; Shafi & Taqī 'Usmānī, 1997). It is, therefore, paramount that the current definition of *Riba* and the issues with the definition are understood. The Arabic word *Riba* is translated into the English words grow, expand or inflate (Ahmad & Hassan, 2007), as well as for Interest and Usury (Farooq, 2009). However, when considering the etymology of *Riba*, interpreting *Riba* as interest or usury is incomplete. (Repeated here to help reading. The concept of *Riba* is introduced in section 1 and discussed in detail in section 2.3 to 2.5).

((*The Holy Qur'aan (Translation and Commentary)*) translated by Ali, A. Y. (1993) states:

> When we come to the definition of usury, there is room for difference of opinion. Hadhrat' Umar, according to Ibn Kathar, felt some difficulty in the matter, as the Apostle left the world before the details of the question were settled.

The ambiguity referred to by Ali stems from authenticated historic literature where Umar (ra) expresses his concern based on business activity in their lifetime. His comments about *Riba* were made just after the Prophet (pbuh) passed away, implying no temporal change in

understanding. Therefore, Umar's (ra) statement is the earliest reference indicating that *Riba* is not entirely defined and opens *Riba* to *Qiyas*. Section 2.3 recounts the history of Interest and where the definition of *Riba* entered the debate. Stepping forward to our modern era, scholars maintain that *Riba* is still not completely defined.

Shafi and Taqī ʻUs̲mānī state,

> The gist of the matter is that the obvious meaning of Riba, i.e., charging of an extra sum in the case of loans or credit was well known. The said Hadith specified a new dimension to the issue and explained that certain types of purchase/sale transactions also fall under the domain of Riba (Shafi & Taqī ʻUs̲mānī, 1997).

The issue of *Riba* in loans and credit is covered and agreed on. Interest must be removed from credit sales to make it permissible (Shafi & Taqī ʻUs̲mānī, 1997). However, as discussed by Shafi and Taqī ʻUs̲mānī, *Riba* is not discussed in all business activity. The authors speak of purchase/sale transactions. Their observation can be applied in two ways in investments. Firstly, assets (like equity shares) are bought and sold in a portfolio, and secondly, the companies themselves buy or sell goods and services. Hence, Shariah investors need to be cognisant of *Riba* at both levels and will have to apply *Qiyas* when screening assets. *Qiyas* is noted in the literature as the primary method employed in Shariah Screening (Ashraf & Khawaja, 2016; Ho, 2015; Waris et al., 2018) and is therefore used to derive the subjective screening methodology used in this study.

Quraanic verses and grouped Hadith that explain Shariah screening's analogy were extracted to provide a discussion basis. The case for exchanging gifts in a country where interest-driven economies exist has already been discussed in Chapter One. With the further understanding of Hadith Science developed in the previous section (2.4), it should now be noted that the Hadith's narrator regarding gifts was a close companion of the Prophet (pbuh), and the Hadith was recorded in three Hadith collections, giving the Hadith credibility. Further, analogies on investment are drawn from the following Hadith[14] extracted using the Key Words. Grouping

14 Hadith are recorded in a specific manner. The Hadith used above are taken from common sources and represented in the common specific manner as per the sources. There are no page numbers.

the Quraan Verses and Hadith together presented distinct themes that discuss trade and how screening can be applied, as explained below.

The Quraan contains fairly general comments and guidance around *Riba* and trade. The Quraan forbids *Riba* as interest and usury in its most basic form and prescribes fair trade. However, there is no explanation of what constitutes fair trade. We think the lack of detail regarding fair trade is because of the undefined *Riba* that Umar (ra) spoke about. The themes were grouped and discussed in terms of how many times the theme appeared in the Hadith. This is not to say that one theme is more important than the other, but that, in line with the thinking of common themed Hadith, some themes were discussed and came up in practice more often.

The first theme, captured in at least forty-four Hadith, relates to legitimate trade and investment. Similar narrations were found in all the authentic texts and Malik's Muwatta. Since we are discussing Islamic theology from Islamic sources, the original translated texts are presented in this review. It is followed by a discussion on how the Hadith applies to screening. The most comprehensive and descriptive Hadith are presented. The first central theme relates to maintaining equal quantities of identical goods.

Jami` at-Tirmidhi, Book 14, Hadith 41:

Narrated Nafi':

> "Ibn 'Umar and I went to Abu Sa’eed, and he narrated to us: 'the Messenger of Allah (pbuh) said - and I heard him with these [two] ears: "Do not sell gold for gold except kind for kind, nor silver for silver except kind for kind, do not exchange more of one than the other, and do not sell what is not present from them for what is present."
>
> [Abu 'Eisa said:] There are narrations on this topic from Abu Bakr, 'Umar, 'Uthman, Abu Hurairah, Hisham bin 'Amir, Al-Bara', Zaid bin Arqam, Fadalah bin 'Ubaid, Abu Bakrah, Ibn 'Umar, Abu Ad-Darda', and Bilal.
>
> [He said:] The Hadith of Abu Sa'eed, from the Prophet (pbuh) [about Riba] is a Hasan Sahih Hadith.
>
> This is acted upon according to the people of knowledge among the Companions of the Prophet (pbuh) and others, except for what has been related from Ibn 'Abbas. He did

not see any harm in exchanging gold for gold or silver for silver, more for less, when it is done hand in hand, and he said: "Riba' is only in credit." Similarly, it has been related from some of his companions. It has been related that Ibn 'Abbas changed his opinion when Abu Sa'eed narrated it to him from the Prophet (pbuh). The first view is more correct.

And this is acted upon according to the people of knowledge [among the Companions of the Prophet (pbuh) and others]. It is the view of Sufyan Ath-Thawri, Ibn Al-Mubarak, Ash-Shafi'i, Ahmad, and Ishaq. It has been reported that Ibn Al-Mubarak said: “There is no difference over exchange” (at-Tirmidhi, 2020c).

This comprehensive Hadith presents and explains two of the most common themes found in the literature. The first is trading on the spot and in equal amounts, while the second is that there are risks in trading on credit. Credit is explained as starting a trade now and completing it later, where the goods or funds are separately exchanged over time.

There appears to be an issue in the fourth paragraph, where the narrator says that funds may be exchanged in unequal amounts and that *Riba* only exists in credit. Other Hadith grouped with this one do not report that part. Reading through the Hadith shows that the narrator considers that the unequal exchange is recorded in a solitary manner. In *Qiyas,* it should be treated differently from the first part of the Hadith that is given as *Hasan* (acceptable). This gives a brief practical example of the interpretive complexities. Little was found to explain this Hadith. However, it appears that the first part of the Hadith talks about trading on the spot to remove any element of credit and time value of money for which interest is charged. Other similar Hadith add that all inherent ambiguity in a trade must be settled before the parties’ part ways. Applying this thinking in investing indicates that Muslims cannot loan money for interest and that all agreements must be made upfront. By extension, it makes sense that if Muslims cannot earn interest, they cannot gain from any business that earns interest. Hence, under Shariah screening, any company that earns interest or fees from interest-based activity would fail screening.

Inherent in this Hadith's guidance, futures trading is forbidden, where the Hadith says that one cannot trade what is not present for what is present. Other versions of this Hadith guide that there is *Riba* in delayed transactions. This excludes futures that propose a fixed price for a

futures contract. The Hadith implies that something can happen between now and then that affects the transaction. The other similar Hadith add to the precious metals “on the spot” example by including commodities. The Hadith adds that traders must sell one quality of a commodity and buy the other in a separate transaction. Forcing sales instead of swaps implies that goods of different quality could have different prices that are not linked to goods of another quality. It implies that there could be unfair earnings by equating different qualities against each other. In section 2.8, we discuss investing in different asset classes. Precious materials (metals and gemstones) and commodities are discussed in depth.

From this collection of Hadith, it is clear that when investing in Companies or other Assets, their business activity is subject to Shariah screening. If companies deal in credit, swaps or futures, they should be excluded from a Shariah Portfolio as having *Riba*.

The next most commonly recorded Hadith (twenty-eight references were found) is about the command forbidding *Riba* and alcohol trade. Forbidding *Riba* is given in a verse of the Quraan (verse 2:278), while forbidding alcohol is a narrated Hadith. The typical record of the Hadith is:

Sunan an-Nasa'i, Book 44, Hadith 33

Narrated `Aisha:

> When the verses of Surat "Al-Baqara" about the usury Riba were revealed, the Prophet (ﷺ) went to the mosque and recited them in front of the people and then banned the trade of alcohol (an-Nasa'i, 2020b).

The verse referred to in this Hadith was one of the last verses to be revealed. The verse explicitly bans *Riba*. When relating this revelation to the community, the Prophet (pbuh) banned alcohol trade as well. At first glance, the two may appear to be disparate. However, since Muslims believe that the Prophet (pbuh) was guided and given a complete understanding of revelation, his sermon joining the two cannot be coincidental. He banned alcohol trade at the same time when *Riba* was banned. In applying *Qiyas,* there are several records of this Hadith across the various Libraries, classing it as numerous. Therefore, one can interpret that any earnings from alcohol trade will be forbidden. Hence, the relationship between *Riba* and the ban on alcohol trade contributes to defining *Riba*. By extension, banning alcohol trade

would imply that investment in the alcohol industry is forbidden. The exception to this ruling would be where alcohol is used for medicinal purposes. Under careful screening, investors may consider pharmaceutical companies.

The Hadith give examples of goods and services that are banned. There are no Hadith that specify every kind of banned trade. Neither are there Hadith that specify all the types of banned services[15]. The closest Hadith with this theme of banned trade reports on seven forbidden practices.

Muslim, Book 1, Hadith 168:

It is reported on the authority of Abu Huraira that the Messenger of Allah (ﷺ) observed:

> Avoid the seven noxious things. It was said (by the hearers): What are they, Messenger of Allah? He (the Holy Prophet) replied: Associating anything with Allah, magic, killing of one whom God has declared inviolate without a just cause, consuming the property of an orphan, and consuming of usury, turning back when the army advances, and slandering chaste women who are believers, but unwary (Muslim, 2020c).

Nineteen similar records of this Hadith were found in the libraries. Again, it appears that there are disparate (noxious) things grouped together. Some advice directly applies to finance and investment (consuming an orphan's property and consuming usury). This Hadith adds to the definition of *Riba* in two ways. Firstly, it clarifies that Muslims cannot use funds without permission. While this Hadith talks about orphans, numerous Hadith extended this advice to any funds given to someone in trust (in Arabic, this is called an *Amaanath*). Hence, the business should be excluded if a business like a bank earns income from using funds held in trust. Secondly, this Hadith refers to the illegality of usury. Once again, the correlation between *Riba* and forbidden practice becomes evident. Extending the thinking to investments, any investment earnings using impermissible funds incur *Riba* and such companies would fail screening. Hence, any bank that uses deposits as loans is excluded whether they earn interest or not.

15 Banned services include and are not limited to prostitution, profits from selling dogs, fortune telling. (https://sunnah.com/bukhari/68/91).

The Hadith enunciates the severity of consuming usury by recording it together with completely forbidden practice. It is common in Islam to draw principles together in this way. This Hadith starts with the fundamental ideology of what it means to be Muslim (accepting monotheism). The grievous weight of their harm is emphasised by associating the other six things with monotheism in the same Hadith. The Hadith further, groups consuming forbidden funds and usury together, while still mentioning them separately and distinctly. One way to apply Qiyas is by reading the language and tone of the Hadith. This example provided evidence for this type of *Qiyas*. Understanding this distinction supports the philosophy of interpreting *Riba* as more than just interest or usury but as any form of islamically perceived ill-gotten gains.

Other versions of this Hadith add that trustees may use orphan's funds as part of the administration costs, including a salary. This provides the platform for treating professional services similarly to the trade of goods. Fund managers and trustees may draw salaries from the fund. Hence, investors may choose to invest in companies that earn income from administration and consulting.

The next most common theme with seventeen instances describes the issues of transacting in and recording *Riba*-based transactions.

Jami` at-Tirmidhi, Book 13, Hadith 3:

Ibn Mas'ud narrated:

> "The Messenger of Allah (ﷺ) cursed the one who consumed Riba, and the one who charged it, those who witnessed it, and the one who recorded it."
>
> He said: There are narrations on this topic from 'Umar, 'Ali, Jabir [and Abu Juhaifah].
>
> The Hadith of 'Abdullah (bin Mas'ud) is a Hasan Sahih Hadith (at-Tirmidhi, 2020b).

Other versions translate the Hadith to include the one who also paid *Riba*. Many Muslims use finance and pay interest based on needs and necessity (the Darurah principle). The Hadith expresses the complete nature of guidance and abstention from using *Riba.* The Hadith states that any party involved is warned against the practice. In terms of Investment strategies, any trade, swap, futures, hedge or derivative must be excluded if there is an element of *Riba*. In

many cases, since these types of investment instruments include credit, they could include *Riba.* Hence, credit-based business activity should be scrutinised under portfolio screening under the Hadith interpretations.

The case of *Darurah* is applied in investments and companies that use interest-bearing loans for funding. Debt is cheaper than equity and an integral part of remaining competitive. Islamic scholars have allowed for this. Section 2.8.2 on equity screening discusses international practice in this regard. The types of goods and services that may be traded are a broadly dynamic issue worldwide. Arms may not be sold in Malaysia. Similarly, insurance may or may not be islamically acceptable in different countries. Hence, using it or investing in insurance companies is criteria dependent. The theme of permissibility is collectively represented by twelve Hadith that describe what goods are permissible for trade. The relevant Hadith is:

Jami` at-Tirmidhi, Book 14, Hadith 13:

Narrated Ibn 'Abbas:

> "The Prophet (ﷺ) died while his armour was pawned for twenty sa' (sa' is a unit of measure like kilogram) of food that he got for his family."
>
> [Abu 'Eisa said:] This Hadith is Hasan Sahih (at-Tirmidhi, 2020d).

The Hadith brings to light issues about trade. First, armour and weapons trade is not forbidden as interpreted in the literature. Hence, investors can apply subjective thinking when deciding on goods like weapons or services like armed security they want to invest in. Secondly, the trading instrument used here is pawned armour. It shows that trade is not limited to sales only. Just as the Hadith is not exhaustive of the types of goods, the types of trade are not exhaustively listed in the Hadith. Hence, they may be considered permissible provided that there is no *Riba* in the type of trade. From the previous discussion, islamically permissible trading, swapping or trading futures could be found and invested in. The key takeout from the discussion is that Hadeeth group the permissible types of goods and services and the allowable trade instruments. Hence, both the type of good or service and the nature of the agreement need to be permissible.

The following few themes of Hadith advise on actual trading. The most prominent theme with eleven Hadith refers to separating two trades. The Hadeeth advise that swaps of various quality goods would not be allowed.

Muslim, Book 22, Number 122:

> Abd Sa'id reported:
>
> Bilal (Allah be pleased with him) came with fine quality of dates. Allah's Messenger (ﷺ) said to him: From where (you have brought them)? Bilal said: We had inferior quality of dates and I exchanged two sa's (of inferior quality) with one sa' (of fine quality) as food for Allah's Apostle (ﷺ), whereupon Allah's Messenger (ﷺ) said: Woe! it is in fact usury; therefore, don't do that. But when you intend to buy dates (of superior quality), sell (the inferior quality) in a separate bargain and then buy (the superior quality). And in the hadith transmitted by Ibn Sahl there is no mention of "whereupon" (Muslim, 2020d).

In the investment market, debtor books with various quality debtors are often bought, sold, or swapped. The Hadith above prohibits this practice. Interpreting this in a complex financial environment emphasises that each debtor book should be evaluated separately and tested in the market. This Hadith theme is supported by another, which prohibits the trade of receipts only.

Muslim, Book 21, Hadith 48:

> Abu Huraira (Allah be pleased with him) is reported to have said to Marwan: Have you made lawful the transactions involving interest? Thereupon Marwan said: “I have not done that”. Thereupon Abu Huraira (Allah be pleased with him) said: “You have made lawful the transactions with the help of documents only, whereas Allah’s Messenger (may peace be upon him) forbade the transaction of food grains until full possession is taken of them”. Marwan then addressed the people and forbade them to enter into such transactions (as are done with the help of documents). Sulaiman said: “I saw the sentinels snatching (these documents) from the people” (Muslim, 2020b).

This record occurred after the death of the Prophet (pbuh) and is presented here as it shows *Qiyas* based on Hadith. Traders swapped notes (the documents) of goods held in storage without evaluating the quality and taking ownership of the goods. Islamic scholars referred to the Prophet’s (pbuh) advice in correcting the mistake. The event advises on two issues that apply to investing. The first issue is that the event prohibits day-trading. In modern equity

investing, share certificates (as proof of ownership) are only issued overnight. One must interpret (apply *Qiyas*) the similarities and differences between a current share certificate and the documents mentioned in the recorded event. If traders open and close positions during a single day, they effectively buy and sell shares before taking ownership.

Moreover, the document mentioned in the event refers to a note advising ownership of some goods of unknown quality. A share certificate is proof of ownership of a part of a large organisation. In this case, ownership is implied, and the investor has possession of part of a larger organisation once the certificate is issued. In this case, quality is assessed when screening the organisation, and the investor chooses to buy shares. Therefore, when applying the *Qiyas* in share investing, investors have to screen and accept the share in their portfolio and have proof of ownership (the share certificate) before selling the share. Inherently, this event also unequivocally prohibits short-selling, as short-selling allows investors to sell borrowed shares, whereas the Hadith specifically mentions taking possession. The second issue is where the Hadith applies in commodities investing or companies that deal in commodities. Investors need to evaluate the trade methods of quality assessment and ownership practised. The current commodity trading industry is explored and discussed in depth in section 2.8.5.

The last theme recorded in at least seven Hadith explains the importance of transparent and honest dealing. This theme provides a manner of *Qiyas* involving Hadith that bring different advice but the same theme. The first of the group of Hadith within the theme talks about honesty.

Bukhari (800CE c), Volume 3, Book 48, Number 841:

> Narrated ‘Abdullah bin Abu Aufa: A man displayed some goods in the market and took a false oath that he had been offered so much for them (,) though he was not offered that amount. Then the following Divine Verse was revealed: -- “Verily! Those who purchase a little gain at the cost of Allah’s covenant and their oaths. Will get painful punishment.” (3.77) Ibn Abu Aufa added, “Such person as described above is a treacherous *Riba*-eater (i.e. eater of usury)” (al-Bukhari, 2020d).

The Hadith advises on the trader's character when selling goods or services. The discussion can be expanded in the modern environment to exclude collusion, price-fixing and false

financial reporting. There is a trading incident between two people where advice was given (see: an-Nasa'i, 2020a, 2020b). The incident involved two traders who attempted to leave a meeting when the trade was not fully discussed. They were advised that either there was no agreement or that they should agree to all the terms between themselves. The theme translates to investing in several ways. While actual meetings may not always be possible, investors must undertake to understand the nature (honesty and transparency) of the investment and the dealings the organisation undertakes. Company business activity, Stock Exchange News Service (SENS) data and company annual financials provide this data (collectively called the company data for this study). The company data will be used to assess each asset when explaining subjective screening.

The collection of Hadith grouped into themes in this section describe *Riba* as more than just interest. While undefined, *Riba* seems to be about earning an increase (Utility) in a way that Shariah will not approve. Therefore, general interest-free investments do not automatically equate to Shariah-based investing. Interest has become common practice in today's secular world (Chong & Liu, 2009; Shafi & Taqī 'Usmānī, 1997). Holding to its ethical code, Islam has not acknowledged the secular division in business activity and social well-being. Instead, Islam denounces interest as a form of *Riba* and looks for alternatives (Kholvadia, 2017; Taqī 'Usmānī, 2005). Further, eliminating *Riba* has become fairly rule-based (Alam et al., 2017; Islam & Rahman, 2017; Kholvadia, 2017; Masih et al., 2018). However, we discussed that it is about taking an ethical stance. Hence, we posit that *Riba* is about applying Shariah and subjectively evaluating earnings to remove any islamically prohibited income.

In conclusion, the definition of *Riba* is broader than financial interest. If income is generated as interest, is obtained via speculative assumptions, or any part of an agreement is not transparent, contrary to Islamic business activity, or involves the trade of receipts, it will have no utility in Islam. Hence ***Riba*** is redefined as any income contrary to Islamic belief.

The following sections develop *Riba* further based on the investment environment. That follows with a discussion and definition of Islamic Utility. The more comprehensive Islamic Utility is the tool used to introduce subjectivity in screening.

## 2.6 Other factors affecting Shariah investments

There was no literature found defining Islamic Utility. An Islamic Utility function found in Literature discusses a typical utility function gauging increased utility for any added asset (see: Choudhury, 1986). The author uses the standard definition of interest as *Riba* and does not explore *Riba* or Islamic Business Activity to the extent we did in this study. This section explores how Islam interprets risk differently from secular finance, discusses the obligatory alms called *Zakat* and how they affect investing. Once these two subjects are discussed, we propose a comprehensive Islamic Utility definition that would include a utility function.

Islam is built on the belief that Allah is all-knowing and has power over every event, including what we deem as a risk. Investors cannot only take a position on any random asset relying on Allah's power for a favourable outcome. Instead, Muslims accept that their decisions must be made in good faith and accept the outcome. Expanding on that, Islam defines two types of risk. *Gharar* is speculative risk (Dewandaru et al., 2015; Imad & bin Osman, 2017), and *Mukhatarah* is described as a day-to-day risk (Waemustafa & Sukri, 2015). An example of *Gharar* was a practice where people would throw a pebble into a shop and buy whatever it landed on. There are variations of the practice where they paid up-front, meaning they would over or underpay for an item. In investing, it would be defined as the prohibition against any speculative trading or investing. Speculative investing would include taking a short position on permissible assets expecting them to drop in value. While the practice is rife in South Africa, Shariah investors can opt not to take short positions. Hence, they are islamically prohibited from exposing themselves to it.

The day-to-day risk (*Mukhatarah* in Arabic) could definitively be called operational risk. This risk occurs under regular business activity and may be unavoidable. Islamically Investors should assess the risk of their portfolio options when selecting between assets. To the best of our knowledge, Islam is not specific on how to measure operational risk scientifically. Therefore, we propose that closing price volatility could be used as a measure of operational risk. This proposal is supported by studies where volatility was used in a comparative analysis between conventional and Islamic investing. For example, Dewandaru et al. (2015) write that portfolios can be diversified to reduce risk. Empirical evidence shows that Shariah Investments perform better in low-volatility periods (Ashraf & Khawaja, 2016). Since there is no Islamic

evidence against using volatility, and volatility analysis in Shariah-based investing is common in literature, volatility is used in this study.

Volatility in the markets could include the behaviour of other speculative investors. However, since Muslim investors would not know every investor's intention, they could subjectively use volatility in MPT and maintain Islamic Utility. In investment terms, two types of risks are defined. Beta is the market's systematic risk, while Alpha is the risk inherent in an asset that is not explained by the Beta risk. They are calculated on historical data of the market. Since it is historic, it is no longer speculative (*Gharar*) and can be used to determine Shariah Investments.

The second factor differentiating Shariah investing is removing the obligatory alms called *Zakat*. *Zakat* is a lunar annual religious obligation for all Muslims with wealth over a certain amount. The required minimum depends on an individual's school of thought (Senawi, Isa, Kamarul-zaman, & Husain, 2018). However, if an individual has enough wealth above their daily needs, they must pay *Zakat*. *Zakat* is payable on any asset that is held for trade and investment. It is universally agreed that investment portfolios would attract *Zakat* (Al-Suhaibani & Almuhanna, 2018). Withholding *Zakat* is considered a major sin, rendering one's wealth impermissible. However, discharging *Zakat* has a spiritual and religious benefit. Hence, while it does decrease investment earnings when calculating growth, Muslims would accept it as the cost of investing.

There are specific criteria about *Zakat* that may complicate how we include it when investing. Firstly, *Zakat* is payable every lunar year. The Lunar year is approximately ten days shorter than the current Julian year. Hence, *Zakat* could occur twice in a Julian year. Secondly, *Zakat* is calculated on the minimum net financial worth in the lunar year. Ideally, if the only assets an investor had were a portfolio, the initial investment amount or negative earning below the initial investment would be the lowest portfolio value. Figure 2 demonstrates the scenario.

**Figure 2: Sample of portfolio growth over three years showing the effects of paying Zakat**

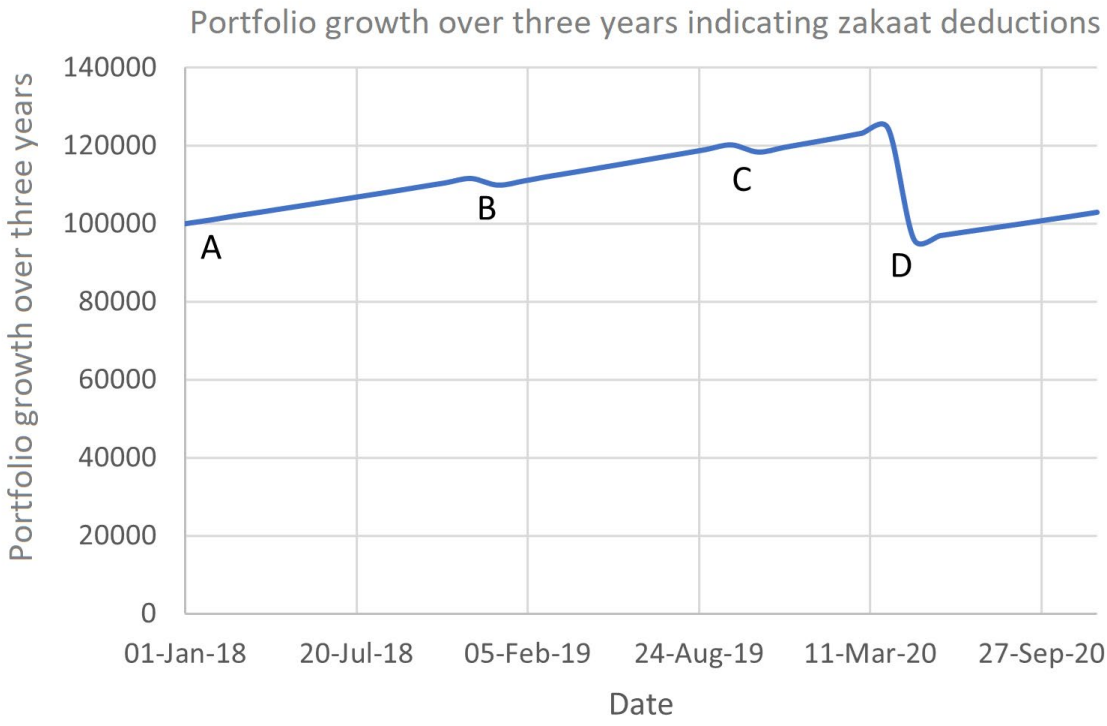



Figure 2 depicts the scenario of how *Zakat* affects returns. Assuming 100 000 (any currency unit) was invested initially and grew consistently during the year (2018). Point A is the minimum portfolio value for 2018. Zakat was removed at the end of the lunar year cycle at Point B. The portfolio continued to grow through 2019, and *zakat* became due at point C, somewhere in 2020. The portfolio lost value as depicted at point D. In that year, the investor would have paid *Zakat* on the value at point D, which was lower than the initial investment amount. Hypothetically, since the lunar year is shorter than the Julian year, points B and C could occur in 2019. The investor would have used Point B as the lowest portfolio value for the first Zakat payment and point C for the second *Zakat* payment.

Since investing is used to increase net worth, investors need to consider selecting a portfolio that outperforms the *Zakat* expense on top of the market proxy rate. The risk-free interest rate is usually the market proxy. As far as we found, this consideration is not covered in the literature, and the indexes and reference funds used as a comparison do not account for *Zakat*. We propose that *Zakat* be treated as a fee along with all the other investment fees and deducted from the initial annual capital. The initial investment could be considered the beginning of the investor's *Zakat* Cycle, and *Zakat* could be withdrawn at this point. Alternatively, investors can

monitor the portfolio to find the minimum capital amount (assuming temporary loss) during the period and draw the *Zakat* on that amount at the end of the period. This approach would be more efficient since the investor could withdraw too much at the beginning of the cycle. The commonly recognised 2.5% Zakat rate was used for both the hurdle rate and deductions.

## 2.7 Defining Islamic Utility

*Riba* was defined more comprehensively in the previous two sections, and additional contributing factors (risk and *Zakat*) affecting Shariah Investments were discussed. In this section, we combine *Riba* and factors to define Islamic Utility.

Our interpretation of *Riba* is more conservative than the current industry's definition. We added that any form of islamically prohibited investment income like speculative trading, Islamically questionable or vague business activity, and intraday trading is also *Riba*. Section 2.6 expands on two factors that are not directly related to the Keywords but further define how Muslims view investments differently from secular models. With this preface, we are at a point where we can discuss and define Islamic Utility.

"Money has no intrinsic utility. It cannot be utilised for fulfilling human need directly. It can only be used for acquiring some goods or service." (Taqī 'Uṣmānī, 2005,p. 112). While this quote discusses money only, it expresses the philosophy of fulfilling human need. In Islam, money should not be used for any islamically prohibited goods or services (like alcohol) since they are not fit for Muslim consumption, i.e., fulfilling a Muslim's need. If they are not fit for Muslim consumption, they have no utility for Muslims. In line with this thinking, any industry that does not fulfil a Muslim's need has no utility for her/him. Therefore, it follows that if the goods or service has no utility, the supplying organisation has no utility. Hence, it has no value to the Shariah portfolio investor. Therefore, Islamic Utility must screen for permissible goods or services as well as permissible business activity.

The groups of Hadith expand on acceptable business activity in historical Islam, and through *Qiyas,* we applied them in the current environment. As it stands, the current investment standards focus on eliminating speculative investing, minimising credit use and interest, and restricting goods and services to those that comply with Shariah (Nazeer Ahmed Jhaveri & Co, 2019). These standards provide a list of screening rules that are easily applied. Our investigation found themes that add to the standards and include subjectivity that investors

should apply. Hence, while only some goods and services are described in the themes, the thinking behind the prohibition allows investors to consider their environment and discern the prohibition.

Similarly, the business activity behind the assets can equally be considered. In such cases, the goods and services may be acceptable if the nature of using the goods and services (medicinal alcohol), or the country's laws (weapons trade) makes it acceptable. Moreover, acceptability changes depending on the asset class and whereas intraday trading is generally forbidden, traders may use discretion when the quality of goods is essential. That is, they can day trade perishable goods to maintain quality. Furthermore, the themes emphasized that trustworthiness is paramount. The current rules do not fully explore this, whereas our study considered trust and further evaluated business activity.

In conclusion, this section outlines the Islamic philosophy regarding Utility. The distinction between Utility and Islamic Utility was made using the Quraan and Hadith. The discussion points us to a definition that **Islamic Utility** is utility earned by engaging in islamically permissible business activity. When income is earned from prohibited business activities, there is no Islamic Utility. As covered so far, Islamic business activity needs to be interpreted differently in each asset class. Therefore, Riba and Islamic Utility issues are discussed separately in each asset class, developing a deeper understanding of *Riba* and Islamic Utility as portfolio screening tools.

## 2.8 Principles for Shariah screening of various asset classes

This section uses Islamic Utility to analyse the screening of the various asset classes. The details of what is acceptable are discussed, where they differ from current practice.

In Islam, trade specifies that islamically permissible goods and services may be traded (Wahab et al., 2007). Investors in broad portfolios would screen all asset classes (Masri, 2018; Uppal & Zaffaroni, 2016). Therefore, investors can choose islamically permissible goods and services regardless of asset classes. Secondly, Islam accepts that there is risk in any undertaking (Masih et al., 2018). Investors must review the risk and identify what is speculative and operational risk when screening. Islam does not specify a scientific method of measuring risk. Therefore, Shariah investing principles may be viewed under the lens of investment risk (statistical volatility) theory. The previous section defined Islamic Utility as Utility earned by engaging in

islamically permissible business activity. Therefore, utility is the earnings received by taking a risky position on an asset. Making this distinction is purposeful. Once asset screening is discussed, Modern Portfolio Theory (MPT) was used to evaluate performance. This section outlines the principles of portfolio screening. Each subsection's discussion relates to a separate asset class. The terms used going forward are Islamic Utility for earnings and Risk as is used with MPT.

Investing is generally buying assets wholly or in part to earn a utility. In Shariah, business partnerships are supported, and the partners share in risks and rewards without any of the partners receiving preferential treatment (Taqī 'Uṣmānī, 2005). Profit and loss is shared in proportion to the investor's contribution (Abbasher Hassan, 2012; Taqī 'Uṣmānī, 2005). Shariah investors cannot buy preferential shares. Lastly, the trading periods must demonstrate a change in ownership between trades to prevent trading of receipts as covered in the Hadith. The Hadith further showed that Business Activity might manifest differently in various asset classes.

Applying these principles in the South African environment is challenging. South Africa is a secular country that allows interest-based business activity and only controls usury (Republic of South Africa, 1968). Day trading and short-selling is common practice (Republic of South Africa, 2015c). South African legislation allows for industries that do not have Islamic Utility. Interest use is an established global and South African practice. It is almost impossible to conduct business in South Africa without encountering interest. Modern Islamic jurists understand this and the pressures on Muslims participating in the secular business world (Ashraf & Khawaja, 2016; Ho, 2015). Therefore, Muslims may temporarily participate in interest-based activity under a Shariah legal instrument called *Darurah* (Vadilho, 2007). Considering that South Africa is a country with an interest-based financial system, *Darurah* is applicable. Primarily, *Darurah* is employed to allow investors to invest in companies that use interest-bearing loans up to 33% (debt/equity) of their capitalisation (Alam et al., 2017). However, Darurah cannot, for example, be employed to change the status of prohibited industries. Investors have to subjectively apply Islamic Utility to consider these allowances.

South Africa differs from international practice. For example, the 33% debt/equity ratio is managed differently elsewhere (see: Ho, 2015). Globally, the Organisation of Islamic

Cooperation (OIC) governs participation in the world's financial markets. It comprises 53 majority Muslim countries with a shared interest in Islamic well-being (Alam et al., 2017). South Africa is neither a member of OIC nor a country with a majority Muslim population. Therefore, South Africa may not share the Islamic investment principles observed globally. South African Investors are governed by South African Law. South Africa's Investments Act of 2015 is less restrictive than Shariah. Hence, there is more freedom, albeit confusion, in local Shariah-based practice. Firstly, impermissible assets could pass Shariah screening, where holding companies have stakes in various industries. Secondly, secular investors may conduct speculative risk strategies like day trading or short-selling over the same assets Shariah-based investors consider in their portfolios. All these strategies affect asset prices.

Further, some invalid religious assumptions may be made when constructing portfolios, like considering an asset whose business activity is questionable, but its debt/equity ratio passed screening. Each asset class may be affected by the above discussion differently. Therefore, the Islamic Utility for each asset class needs to be considered individually.

The South African market currently offers several Shariah-based investment products (see: ABSA Shari'ah Top 40 Exchange Traded Fund, 2020; Al Baraka Bank Ltd (South Africa), 2019; First National Bank, 2019a; Oasis Group Holdings Ltd, 2019; Standard Bank Ltd, 2019). In contrast to international practice, each of these companies subscribe to their own Shariah Boards' rulings. These boards are responsible for portfolio screening and governance. The board's constitution and prescription to Shariah are not the focus of this report. They are mentioned to contextualise the status of the South African industry. These current products will be used as benchmarks to evaluate the performance of the proposed Shariah-constrained MPT.

The discussion thus far has prepared the basis for investors to apply subjective Shariah screening criteria in each asset class. To summarise, for each class, investors have to consider if companies earn income from any interest-based activity, offer social degenerative products and services, ambiguous trade practices or encourage speculative behaviour. Noting the *Darurah* instrument, investors must consider companies whose debt/equity ratio is capped at 33%. These criteria will be used to establish Islamic Utility for each asset.

The asset classes are cash, equities, bonds, real estate, commodities, and precious metals. A case for each asset class is made under the Islamic Utility and risk lens in the subsections below.

Thereafter, for each asset class, rules are developed in the following subsections, guiding the study's data selection.

### 2.8.1 Cash

Holding cash as an investment has no Islamic Utility since the interest income is forbidden in Islam. In secular countries, Cash is generally invested in three ways. The three ways are bank accounts, money market accounts or fixed deposits. These types of investments are interest-bearing and hence prohibited in Islam. If a Shariah portfolio investor holds cash, the original amount (excluding interest) may be used for investment purposes in other asset classes, while any interest earned should be discarded. Therefore, while cash may be used to acquire other assets, it has no Islamic Utility and cannot be included in MPT analysis.

The current two-stage screening excludes cash investments. However, foreign exchange trading (forex trading) is legal in Islam (Omar & Jones, 2015) and South Africa (see: Business Day, 2019). It has to be spot traded (Obaidullah, 2015) and free of *Riba*. Hence, these two factors are considered as fundamental for Islamic Utility. When looking at cash type assets, cryptocurrencies were mentioned in the literature. Cryptocurrency trading is a form of foreign exchange trading and is permitted in South Africa (Seforo, 2014). Cryptocurrencies are a new medium of exchange that appears to fit in the Cash asset class. At first glance, the current two-stage screening practice does not appear to accommodate cryptocurrencies. Since it is a digital asset, it differs in some sense from standard currencies. They are not controlled by central banks and are not subject to fractional reserve banking.

The local theologians discussed the merit of cryptocurrencies being islamically permissible, and they were made legal for Muslim use (Abdeldayem et al., 2021; Abubakar et al., 2018; Grassa, 2015). Shariah requires that cryptocurrencies be asset-backed on a full reserve basis (see: Abdeldayem et al., 2021; Abubakar et al., 2018). Hence, since Islam allows foreign exchange trading as investments, cryptocurrencies are viable for Shariah Investments. Muslim clerics approved cryptocurrency use in 2018 (see: Abubakar et al., 2018). Therefore, we accept that they have Islamic Utility and included them in the performance evaluation data in 2018. There was a boom in cryptocurrency prices in 2018, which anomalously affected markets and may not occur again. Hence, while cryptocurrencies are featured in our simulated portfolios, it does not guarantee they will feature in portfolios in future.

### 2.8.2 Equities

Equities are the most sophisticated class of assets. The discussion shows that the failure of the Two-stage screening is most evident in equities. The first stage is for qualitative evaluation, while the second is quantitative, based on Shariah-based rules. The **first stage** evaluates the permissibility in terms of Islamic standards. First and foremost, the nature of business must be socially responsible and permissible in Islam (Masih et al., 2018). This requirement rules out most financial, most entertainment, alcohol or unlawful animal-based industries (Alam et al., 2017). Literature does not discuss unique scenarios within these rules. In each of the examples provided, there could be permissible equities. For example, Shariah-based banks offer finance, where investors may invest.

Similarly, South Africa has a robust permissible meat-based industry in which investors may invest. Moreover, investors may consider investing in alcohol companies that manufacture alcohol for medicinal purposes. These examples describe scenarios where the standard two-stage screening could reject the equities without considering the companies' social responsibility or permissibility. Investors who want to consider these equities will have to decide permissibility beyond the two-stage screening method. The essence of determining social responsibility and permissibility would fall into an area of an individual's belief.

Identifying social responsibility is subjective, and investors need only consider what is within the company's control (Masih et al., 2018). For the case in this study, social responsibility is taken to be more generally social well-being. Whereas social responsibility has become specific causes a corporation undertakes, social well-being would be more general. For example, an alcohol company could have a responsible drinking campaign as their corporate social responsibility. However, Islam looks at social well-being and completely prohibits drinking alcohol. Hence, while there may be overlap, we are distinguishing the difference so that subjectivity in this regard does not become a rule-based screening.

With this distinction established, while the prohibition of some industries is clear-cut, others may be interpreted personally. The issue of weapons trade discussed in section 2.5 is a practical example. Waris et al. (2018) write that weapons trade is illegal in Shariah. It appears that Waris et al. generalised their finding in their Malaysian study since there is no generalised case in

history. Weapons trade is not prohibited in South Africa[16]. In line with what Masih et al. (2018) say, companies cannot control how the weapons are used. Hence, they should not be excluded based on that alone. However, if it is found that they do not take care of their business activity, they should be excluded.

Another example is smoking. Since it is considered socially irresponsible and unhealthy, investors should not invest in the tobacco industry. However, some Muslims smoke, and thus some investors may choose to invest in the industry. Under the standard stage-one rules, these industries should be excluded. However, the Islamic Utility of goods like medicinal alcohol, weapons, or tobacco may be individually considered. Based on such examples, establishing the Islamic Utility of equities where no formal, comprehensive ruling exists is complex. Utility income from these may be considered *Riba* by some investors, while permissible by others, and it would come down to personal subjectivity.

Further, as part of the stage-one screening, investors may consider how a company raises capital. While the company's business activity may be islamically permissible, it may receive funding from impermissible sources. In this scenario, using stage-one screening, it appears that investors cannot invest in these companies (Masih et al., 2018; Taqī ʻUsmānī, 2005). In the South African (secular) environment, banks often enter into Islamic finance partnerships, funding them through their conventional fractional reserve business[17]. In this case, the service rendered may support social well-being, and the core business may be islamically permissible even though the primary source of capital is not. As such, investors may want to support and invest in the business by treating it as a case of *Darurah* but want to help the business succeed. The expectation would be that the business would grow to a stage where it would not need the impermissible funds. Hence, in this case, there may be Islamic Utility even though the source of capital is questionable, and the literature does not discuss this.

16 South Africa has an Anti-Terrorism bill located at the website (https://www.gov.za/sites/default/files/gcis_document/201409/b12-030.pdf) and organized crime legislation (https://www.gov.za/documents/prevention-organised-crime-act) amended as the Criminal Matters Amendment Act 18 of 2015. Shariah portfolio investors would need to comply with South African Legislation when investing in the weapons and defense industries.

17 Fractional reserve banking is impermissible in Islam (Meera & Larbani, 2009; Tekdoğan & Saraç, 2020). See section 2.3 the history of interest.

So far, in this discussion, it has become evident that there is a gap in the first stage of screening. The current first stage is relatively rule-based, and it appears that in practice, a general global approach is taken in South Africa. As such, the rules may not provide a comprehensive answer to the different scenarios that a South African investor may face. Further, the global approach appears to be contrary to Hadith, which implies that different rules might apply in different countries. To address this gap, investors could apply subjectivity when choosing equities for a portfolio, where each fund would be evaluated on its merit.

The **second stage** of screening involves financial screening. Islam mandates that businesses may not participate in interest or islamically prohibited business activity. The modern secular environment makes this extremely difficult. Islamic Jurists applied *Qiyas* to allow investment in companies based on specific financial analysis (Alam et al., 2017; Ashraf & Khawaja, 2016; Ho, 2015; Rizaldy & Ahmed, 2019; Waris et al., 2018). There are varied methods of financial screening, including the AAOIFI, IFSB, IFA, Al-Meezan, MSCI, FTSE, DJ and S&P, to name a few (see: Ashraf & Khawaja, 2016; Nazeer Ahmed Jhaveri & Co, 2019; Waris et al., 2018).

Further, many countries set additional standards internally, like specifying illiquid asset or market share related ratios (Waris et al., 2018). South Africa does not have any of these additional standards. Instead, South Africa predominantly uses the UK based Yasaar Advisory Board for screening. Financial screening considers leverage, interest-bearing liabilities and Quick Asset ratios (Ashraf & Khawaja, 2016). Global practice differs where ratios are based on either Book Value of Total Assets (BVTA) or Market Value of Equity (MVE), and the allowable percentage ranges from 33.33% to 50% (Ashraf & Khawaja, 2016). 33.33% is considered the norm since, in Shariah, anything under 33.33% is considered trivial (Mohamed, 2014). The debt to total assets ratio is one of the main criteria. However, additional supporting financial screening includes allowances for up to 5% of income generated from prohibited business activity.

Further, unlike in South Africa, 20% variance for religious considerations account for environmental circumstances (Ho, 2015). This appears to accommodate the “Act of God” risk (*Gharar*) while not predicting it. South African investors should include this fundamental consideration since there would be a delay in what may have occurred and how an investor may respond. As it stands under stage two screening, many otherwise permissible equities

would be excluded as they conduct business during the year and could fall outside of this requirement for a short while during the year. Investors may be unable to review their portfolios while these organisations affect changes in that year.

In conclusion, the two-stage screening appears to contradict some historical records and limits investor subjectivity. There are prescriptive Shariah rulings and guidelines that should be open to individual belief and faith in both stages. Currently, this is lacking. The matter is further complicated by the complex nature of holding companies and their subsidiaries. Due to the sophisticated modern environment, Scholars have made some allowances in both stages. This gives a precedent for further allowance. Therefore, personal subjective screening has Islamic Utility and was considered in this study.

### 2.8.3 Bonds (Sukuk)

Internationally, Islamic Bonds are becoming a standard asset securitisation model based on acceptable Shariah models (Profit sharing, partnership, and agency-based models) (Ahmed, 2010). The key differences between Islamic and secular bonds are that Islamic Bonds must be asset-backed, and the owners bear all costs and risks of ownership. The *Sukuk* pays out profits instead of interest coupons (Abbasher Hassan, 2012). They exhibit the same Islamic criteria where they must have an islamically social purpose and not incur *Riba* (Azmat, Skully, & Brown, 2014). South Africa has amended the law to accommodate Islamic Bonds (Republic of South Africa, 2014). It appears that Islamic bonds have a place in investments as low-risk instruments. They are designed to pay out profit-based coupons instead of fixed interest rated coupons. Since they are asset-backed, the underlying asset and hence the Islamic bond should have Islamic Utility. If Islamic bonds are public issue and historical data is available, they would be viable analysis candidates for MPT.

It should be noted that there is a particular class of debt-based bonds meant for project funding. This bond is created to fund projects and is generally a special issue amortisation bond (Maurer, 2010; Vishwanath & Azmi, 2009). These types of bonds appear to be private instruments set up to manage specific projects. The project size and nature appear to be specific, implying that the performance data may not translate to another project. As such, they may not be suitable for MPT.

### 2.8.4 Real estate

There are two scenarios surrounding real estate investment. Direct purchase of the assets or Special Purpose Vehicles (SPV) trusts designed to manage real estate portfolios (Hasan & Sulaiman, 2016). Direct asset investment may require considerable capital where the investor provides all the capital and owns the whole asset. Secondly, there are inherent risks of ownership that make the predictability of the returns challenging to assess. These risks need to be evaluated according to Shariah. Investors need to assess if they are taking a speculative position on the asset, considering the asset's operational risk, earning rent, or capital growth. Property flipping, which entails buying run-down property and selling it at higher prices without improving it, could be prohibited since no value is added. Lastly, capital growth of real estate bought and sold cannot be factored into MPT since the data would not fit the model. Therefore, while Real Estate investments may have Islamic Utility if conducted correctly, direct asset investment is not an ideal candidate for this study since MPT determines efficient portfolios based on risk and returns.

The alternative investment model is to invest in Real Estate Investment Groups set up for that specific purpose. Special Purpose Vehicles (SPV) remove the higher single asset risks by controlling many assets (Prinsloo, 2009). Secondly, SPVs are managed on investors' behalf. Managing assets includes real estate trade and rental income. If they are traded, managers have to reasonably request a fair price and be transparent about the assets' issues as the Hadeeth themes dictate.

Similarly, if assets are rented, they must be maintained per the agreement. If the asset managers fail in this regard, the income would have no Islamic Utility. For several reasons, well-managed real estate portfolios would be more likely to attract investors. Firstly, their scope is well defined, and the risk is spread over a portfolio of assets. Secondly, investors buy into a share of the SPV and are not required to buy an asset as a whole. Therefore, individual investor risk is reduced, satisfying Islamic advice. However, since these are managed on an investor's behalf, there is the risk of mismanagement. The Shariah portfolio investor must review and accept the management risk to make this Islamic Utility compliant.

The two-stage model would not apply to the direct purchase scenario. It would, however, apply in the SPV scenario. Under stage one screening, the portfolio's social well-being will be

evaluated, and in the second stage, the financials. As such, screening SPVs is similar to equity screening, and the same thinking will apply.

### 2.8.5 Commodities

Commodities fall into the categories of perishable and non-perishable goods (Pasternack, 2008). Islam prescribes that when dealing in commodities, the quality thereof must be known (Taqī ʻUsmānī, 2005). Modern commodity trading platforms rate the quality of perishable goods. Hence, commodity investors know the quality beforehand. Perishable commodities degrade over time, and their expiry needs to be factored into their trade. Other than that, perishables and non-perishables are treated the same. Once bought, the goods are held under the buyer's name, and associated costs and ownership risks are transferred to the buyer. In the redefinition of *Riba*, the quality of goods is a central theme. The analysis of the historical record and current practice is pertinent.

Commodity markets are much more sophisticated, and investors may not be near commodity storerooms or clearinghouses. However, many commodity companies employ independent quality evaluators. Further, since the warehouses are remote from investors, they could appear to be trading receipts only. However, goods purchased are stored under the investor's name, and the investor becomes liable for costs. This simulates ownership as efficiently as possible while preventing trade by receipts only. The last consideration is the quality of goods and how they deteriorate. Modern commodity markets allow agents to manage goods on behalf of investors. Hence, the agent can inspect goods and facilitate fast trade while maintaining the quality of the goods. These attempts to maintain business activity appear the same as were conducted historically in the Islamic world; thus, it provides an acceptable platform.

In addition to the above, should the entire industry be deemed wrong islamically, Muslim consumers would not consume the goods. Based on the observation of business activity and social well-being offered in current commodity markets, these markets are generally acceptable, and investors may subjectively consider them. Therefore, the current platform satisfies Islamic Utility requirements.

The Commodities Futures contract, however, is one type of trade that Islam prohibits in standard form. It is interpreted as a debt-for-debt contract in Shariah law, and Islam prohibits selling something not owned (Kamali, 2007). However, Islam recognises that sellers may need

upfront surety in some cases. As a result, Islamic Futures trading was devised to comply with Shariah (Kamali, 2007). Islamic Futures trading requires that the commodity must be in existence or in production with an expected delivery date (Kamali, 2007; Taqī ʻUsmānī, 2005). Scholars suggest that deposits are paid to sanctify commitment to the trade. Since Islam prohibits contractual agreements for goods that do not exist, the parties enter into an Islamic Commercial Promise (Taqī ʻUsmānī, 2005). This Promise is considered binding. However, it does not enforce penalties. It is based on a person's (Muslim's) reputation to fulfil the promise or have acceptable reasons for breaking it. These specific requirements outlined above give commodity trading Islamic Utility. South African investors who wish to trade in commodity futures need an equivalent promise agreement in South Africa. The contract needs to abide by South Africa's Essentialia (essential legal elements) and have reasonable applicable Naturalia (natural elements that aid the trade) (Sharrock, 2011). As far as we could find, the current two-stage screening does not specifically discuss commodity trading. Hence it appears that there is a gap in the model that could be addressed.

### 2.8.6 Precious materials

In risk-managed portfolios, precious materials like stones, gold, and silver may be held for their intrinsic value. They are unlike other commodities that have utility value. *Zakat* is compulsory on precious metals held as an investment. In various denominated weights, the Islamic gold dinar is an asset class in Muslim Countries like Malaysia (Meera & Larbani, 2004). Studies advise that gold may be held in any physical form, an account form, as equity in mining companies or backing cryptocurrencies (see: Abdeldayem et al., 2021; Agha et al., 2015; Meera & Larbani, 2004). Equity and cryptocurrencies are discussed in sections (2.8.1 and 2.8.2) above. Hence, this section discusses the physical materials or account forms. Since gold may be held in physical or account form and Islam treats all precious metals investments in the same way, it stands to reason that all precious materials may be owned in account form. In Malaysia, gold investments are held for owners under structured fees (Agha et al., 2015). The South African parallels would be gold Krugerrand coins or holding accounts offered by investment companies and banks. Krugerrands have denominated weights, and the accounts and structured fee models are similar to the Malaysian practice (see: First National Bank, 2019b). Investments in gold offer a hedge against market volatility (Agha et al., 2015). This hedge implies that gold investments help manage risk. The current two-stage screening appears to accommodate

precious metal investing. Hence, they have Islamic Utility. Moreover, a complete history of daily gold price data is usable in MPT analysis.

To conclude subsection 2.8, the six asset classes discussed above show how Shariah Investors may screen and invest in assets according to Shariah Screening principles. The discussion shows the gaps in the current two-stage model and how it manifests in the various classes. Investors could apply subjectivity that is not inherent in the two-stage model. Chapter Four reviews screening in South Africa and shows how we considered the data under the current two-stage model. After rigorous analysis, we show that the two-stage model can fail, and we propose a third stage to include subjective screening.

## 2.9 Proposed hypotheses based on research questions one and two

The proposed hypotheses are meant to answer the research questions. The research questions are:

1. Do the Shariah compliance screening assumptions in other countries apply in South Africa and in defining Islamic Utility?
2. How does Shariah compliance screening differ in the various asset classes in South Africa?

In this study so far, we have established that different Shariah rules are applicable in different countries. Further, the various asset classes are unique in some ways and need to be screened differently. Lastly, Shariah Screening involves two stages that treat inclusion differently.

This chapter reviews screening based on Islamic theology. After defining *Riba* and Islamic Utility, we considered the permissibility of the assets and asset classes in South Africa. For example, equity investing is permissible, but Islam must view the industry as offering social well-being. Not much is written about screening for the other asset classes. Therefore, each asset class in the South African context needed to be considered. These considerations proposed the first hypothesis.

*H1: The current screening methods do not apply to South Africa.*

We proposed that the subjective nature of Islamic Utility allows investor flexibility to consider investments in all asset classes. The screening in stage one is theological. The second stage

screening is based on financial ratio analysis, where the current literature details second stage equity screening in many countries. There are different approaches, and the South African approach may not be the best for the environment. Additionally, the same financial discussion could not be found for the other asset classes. Due to the lack of literature, it is unclear how to apply the second stage screening to these other classes, and this study discussed these classes to propose the second hypothesis. Considering the gaps in stage one and stage two screening, we proposed Islamic Utility to fill the gaps. Hence, we proposed the following hypothesis:

*H2: Islamic Utility allows investors to subjectively screen assets in various asset classes.*

In conclusion, Chapter Two reviewed the literature to consider the theological aspect of this study. We analysed the current investment practice gaps and proposed the first two hypotheses. We tested the hypotheses in the results section. However, we now need to test if there is an advantage to applying Islamic Utility. The discussion turns to the following two investment performance-related research questions posed. Chapter three discusses performance and proposes an improvement.

# Chapter 3: Literature Review of performance evaluation using Modern Portfolio Theory

## 3.1 Introduction

Chapter Two discussed the theological aspects of this study. This chapter analyses how investment performance can be improved based on the theological interpretation. The following two research questions are posed to evaluate performance:

3. How do the current Shariah-compliant investment products compare with secular indexes?
4. How can the performance of Shariah-compliant investment products be improved?

In order to propose an improved performance, the current environment needed to be evaluated. This chapter reviews the performance of the current Shariah-compliant investment products compared with secular indexes. We propose standardising the evaluation criteria to the four risk-reward ratios.

The chapter starts with analysing MPT and proposing how to interpret it to accommodate Islamic Utility. Next, we discuss the four risk-reward ratios and conclude the chapter by evaluating the current investment funds and indexes. At the end of the chapter, we can answer research question three. Moreover, we propose the third hypothesis based on question four.

## 3.2 The Modern Portfolio Theory model

Modern Portfolio Theory (MPT) uses utility and risk to find the most efficient investment portfolios. Utility Theory is an economic theory (Stigler, 1950), and in the case of investments, it is used to describe investment returns. MPT creates an efficient frontier derived by changing asset weightings ($\omega_i$), to create a portfolio whose total weighting is equal to one. The equation is $E(R_p) = \sum_{i=1}^{n} \omega_i E(R_i)$, where $E(R_p) = 1$.

Applying MPT with different risk-return ratios (for example, Sharpe, Sortino, Sterling and Treynor) results in different efficient frontiers for the same assets. While the standard terminology is risk-return (or risk-reward) ratio, the ratio's numerator is generally expected returns (utility). In contrast, the different risk-return ratios' denominator calculates the risk differently. MPT can be used in any multi-option portfolio where there is a trade-off between

choosing assets. MPT is used in social studies, agriculture and energy management (see: Chen, 2016; deLlano-Paz, Calvo-Silvosa, Antelo, & Soares, 2017). MPT is not specific in terms of the risk or return variables used. Hence, the definitions of Islamic Utility and risk were used in this study. MPT uses covariance between assets when calculating an efficient frontier and the associated optimal portfolio (Contreras et al., 2016; Markowitz, 1952a). The risk interpretation (denominator) was defined and calculated as described by the ratios. For example, the data was capped in some cases when calculating risk, so investors only calculate volatility when assets lose value. Hence, the resultant statistical inference changes to loss only or drawdown volatility. The results differed since overall volatility at times was found to be different from upward or drawdown volatility. Therefore, comparing the resultant efficient frontiers was not straightforward, and a common way of comparing the different ratios was found. These findings are discussed in the results chapter.

This study investigated how the different risk-reward ratio interpretations of the same data affected the MPT output (the Efficient Frontier and the Optimal Portfolio). The most widely used MPT analysis is with the Sharpe Ratio (Contreras et al., 2016). Both Markowitz (who created MPT) and Sharpe (the Sharpe Ratio) are Nobel Prize winners. While the literature does not indicate why their theories are the mainstay of industry, the fact that they won Nobel prizes could suggest why these models are used together. Investors could use subjectivity and sentiment when picking methods and theories, and the attention brought by having won Nobel Prizes could influence investor choice. We argue that MPT is a comprehensive analysis tool and test the Sharpe ratio against other risk-reward ratios.

There are other risk-reward ratios, such as the Sortino, Sterling and Treynor ratios (discussed in detail in section 3.5). Each interprets the risk-reward in different ways influencing how an investor's portfolio may grow (their alphas) with respect to the market (Goetzmann, Ingersoll, Spiegel, & Welch, 2002; Rollinger & Hoffman, 2013). Graphically, this is evident in the shapes of the efficient frontiers derived using the same data. The MPT efficient frontiers' shapes differed from the markets, indicating that the efficient frontiers had different risk elements, independent of the market. Current literature analysing ratios in this way could not be found. The results chapter shows a difference in predictability between the different ratios. The results are analysed, and this initial study could spearhead further studies in investments and other fields (social, agricultural, energy) using MPT with different risk-reward ratios.

The shapes of efficient frontiers represent the risk for all possible portfolios. The slope (tangent line) between the market proxy and the efficient frontier in MPT identifies the optimal portfolio. The slope offers an indication of sensitivity to risk fluctuation. The steeper line indicates more volatility in returns with a risk band. Further, if the market proxy were changed, the slope would change. Hence, the risk sensitivity and optimal portfolio would change. These correspond with the alpha and beta of the expected returns (Uppal & Zaffaroni, 2016). Ideally, the Market's efficient frontier is beta. Any change in the shape of the portfolio's efficient frontier could be considered their alpha.

In most cases, higher returns were predicted for a lower risk than the Market. Hence, since the efficient portfolios derived from the constraints and the various ratios offered the expected efficiencies, the Shariah-based MPT was found to be successful.

## 3.3 The rationale for using Modern Portfolio Theory

There are many ways investors can select portfolios. Some investors predict prices based on the news, while others use personal sentiment and financial data, such as balance sheets and income statement forecasting. Models such as the Capital Asset Pricing Model, Price/Earnings ratio models and multi-criteria decision aid models, to name a few, are also used (Basilio, de Freitas, Kämpffe, & Rego, 2018). Investors may employ a combination of several methods depending on their subjectivity. For this study, we chose Modern Portfolio Theory (MPT).

The rationale for the choice of MPT lies in one of the main factors that all investors consider. Investors evaluate elements of risk and assess the effect it will have on the asset's returns. In this way, investors try to find higher returns than a risk-free or some hurdle rate since they take on risk for no reason if returns are lower than the hurdle rate. Ideally, investors need to understand as many elements of risk (variables) as possible. Therefore, it becomes evident that essential risk information from other methods may be overlooked by applying one method, for example, interpreting the news. Hence, investors basing their portfolios on only the news may not have the same view as investors who base their portfolios on financial information.

Moreover, several investors may look at the same data and have different views based on investment horizons, strategies or personal subjectivity. Investors employing these methods could individually weigh variables differently when selecting assets. Hence, having a method that considers all investors' views (market sentiment) is advantageous.

MPT (using price volatility as risk) is indiscriminate of the number, weights, or types of variables used in other models. Moreover, since it considers the price volatility, MPT inherently takes the market sentiment's net effect. In this way, MPT has the broadest view of the market regarding what investors are thinking. However, MPT is not without fault. While Sharpe (1994) considers this approach a complete view of an asset's performance, it uses historical data when proposing a portfolio, which could be problematic (Rice, 2017; Schulmerich et al., 2015). MPT theory and Sharpe assume that investors agree that future returns are based on historical performance and that investor outcomes are all the same (homogenous). However, MPT may not account for how recent activity affects market sentiment, or investors' collective sentiment affects the price. Investors may not behave in the same way. They may view the weight of the variables differently. Hence, they may take different positions on the same asset.

Further, when used with the Sharpe Ratio, MPT is criticised for its assumptions that the volatility is normally distributed and that market sentiment can be assumed (see: Hawley & Lukomnik, 2017; Schulmerich et al., 2015). These additional assumptions have been tested. Many studies tested different statistical distributions like skew or kurtotic distributions (see: Elton & Gruber, 1997; Schulmerich et al., 2015).

Further studies have simulated distributions finding that negative skewness and leptokurtic (positive kurtosis) distributions are favourable (Xiong & Idzorek, 2011). This finding could translate into actual cases. Investors may find superior gains with negatively skewed distributions that tend to favour returns above the average and positive kurtotic distributions whose risk (volatility) appears lower. Xiong and Idzorek (2011) found that the tests with different distributions outperformed MPT with standard assumptions. However, their studies allowed short selling and assets that may not have Islamic Utility. Hence, their findings should be verified in the South African Market under the context of our study. This study provides a benchmark based on the standard MPT assumptions where future studies can test different distributions on the same data.

While indicating varied results in proposed portfolios, many studies did not significantly improve results over a longer period. This may not be the case using our data and Islamic definitions. Hence there is nothing to suggest that the original MPT assumption should be

dismissed. Moreover, MPT with the Sharpe Ratio appears to be a mainstay (see: Chen, 2016; Mangram, 2013). The Sharpe Ratio's strengths and weaknesses are thoroughly discussed in section 3.4. Since this is a first of its kind study in South Africa, we conducted our studies with the original MPT and Sharpe Ratio assumptions. We tested the distributions of our data and presented our findings in section 6.5.

Having established the parameters for using MPT, we move to use MPT in Shariah Investments. There is sufficient evidence that MPT was used as a Shariah Investment tool. Portfolios constructed using MPT are shown to outperform benchmarks (Contreras, Lizama, & Stein, 2016). In their study, Contreras et al. (2016) constrained MPT to eliminate short sales and still found that their model outperformed the benchmark funds, supporting the case proposed in this study that a constricted MPT may be used to construct high performing investment portfolios. Contreras's MPT approach was adapted in this study. Since there is no Shariah Investing literature in South Africa, constrained MPT used together with the Sharpe Ratio and standard assumptions appear to be a good starting point for a Shariah investment analysis in South Africa. Current studies have similarly used MPT with current screening methods and *Riba's* current definition (see: Sandwick & Collazzo, 2021). This study develops the knowledge base using our *Riba* and Islamic Utility definitions. The results section shows that the results were significant. Hence, it appeared fitting that the constrained MPT applied in this study was a reasonable choice for an initial study. Additional gaps in current practice were identified, and solutions are proposed in the results chapter.

## 3.4 MPT assumptions

Since MPT is a theoretical model, the theorists make several assumptions. Some assumptions hold for our constrained case discussed here, while others may not. MPT assumptions are discussed here, and the risk-reward ratio assumptions are discussed in the following subsection. MPT is a model designed to provide perpetual growth while minimising risk (Markowitz, 1952a).

*The MPT model is defined as:* *minimise* $\sum_{i=1}^{n}\sum_{j=1}^{n}\omega_i\,\omega_j\,\sigma_{ij}$ *(risk), and*

*maximise the expected return:* $E(R_p) = \sum_{i=1}^{n}\omega_i E(R_i)$

*Where:*

$R_x$ *: is the expected return (simplified notation for* $E(R_p)$ *as per above)*

$R_p$ *: is the return on the portfolio* $\mathrm{p}$*,*

$R_i$ *: is the return on asset* $i$ *and*

$\omega_i$ *: is the weighting* $\omega$ *of component asset* $i$

$\sigma_{ij}$*: is the covariance between assets i and j*

(Markowitz, 1952a)

The model assumes that all investors have homogeneous expectations and that this will not change over time. As discussed earlier in this literature review (section 3.2), MPT takes the net effect of market sentiment when evaluating risk, unlike other portfolio evaluation models. Risk is expressed statistically as volatility, and efficiency is calculated with the shared interaction (covariance, $\sigma_{ij}$) between assets. However, while interpreting the market's sentiment as volatility, there are some theoretical assumptions. The assumptions imply that investors' outcomes are homogenous, and they usually expect distributed probabilistic returns with the lowest normally distributed volatility (Hawley & Lukomnik, 2017; Rice, 2017; Schulmerich et al., 2015). Ideally, the assumptions are that all investors will calculate a risk-return portfolio for a single period (for all time, going forward).

Further, it assumes the volatility is normally distributed, and we can make statistical inferences assuming that the distributions are normal. However, historical data shows that the distributions may not be normal and that market sentiment changes over time (Hawley & Lukomnik, 2017). Just as Shariah investors create portfolios, other investors create portfolios like hedge funds with highly skewed or kurtotic data (Davies, Kat, & Lu, 2016). Even though Shariah investors will not use hedge funds, they are looking at the same base assets. Hence, market sentiment could influence how the distributions of the assets look. Studies have shown that the effects of correcting for normal distributions do not always yield significantly better results (Elton & Gruber, 1997; Schulmerich et al., 2015). Given that, investors who rely on MPT may subjectively choose to review the shapes of the distributions when picking portfolios. We looked at the shapes of the distributions in our study and found that they could enhance prediction.

Shariah portfolios cannot be held into perpetuity without reviewing their Islamic Utility. Ideally, they should be reviewed and rebalanced quarterly. When rebalancing, the latest pricing data must be added to the MPT model. In considering data, there are findings that high-frequency risk data can increase performance (Ma, Li, Liu, & Zhang, 2018). When rebalancing high-frequency data quarterly, there are approximately eighty daily and sixteen weekly data points. The number of data points addresses the probabilistic distribution assumptions. Sixteen data points is a small data set, and it is challenging to infer distribution types on a smaller set. Setting the assumption of a normal distribution aside for a moment, daily data was used to maximise the data set's size and to provide more accurate distributions. In that way, with more data, we have a more precise view to analyse the normality assumption when determining the skewness and kurtosis of the distribution. Since this is the first study of its type, it provides a basis for further studies, where this assumption may be tested, and studies that look at different frequencies and distributions are suggested.

Further, the model assumes that markets are large and efficient, and that market proxies do not fluctuate (Schulmerich et al., 2015). Our interpretation of the MPT differs in three ways. We did not simulate short selling the market, limited assets in their portfolio, and used Shariah indexes instead of a standard market proxy. Islamic Utility and *Zakat* deductions highlight the difference between the core MPT and its use in this study. Some studies tested the assumptions,

advising that investors have different return horizons (Hawley & Lukomnik, 2017). They found that the homogenous expectation could be disregarded, while MPT still yielded efficiencies.

Shariah investors have at most a year after which they have to adjust and rebalance their portfolios, creating a multi-period scenario that Markowitz's theory assumes over the original single (perpetuity) period. Their reasons for the rebalance are not always to maintain efficiency but are attributed to Islamic Utility. Hence, rebalancing in our case negates the assumption of maintaining an efficient single-period portfolio into perpetuity. Human bias influences rational investment decisions that could reduce efficiencies (Rice, 2017). Behavioural economics shows that investors extract short-term returns or withdraw funds if volatility deviates from their calculated results. Many other subjective reasons beyond Islamic Utility also affect the market. However, as argued in section 3.2, MPT looks at the net effect of all investor decisions and how their interaction influences asset prices. Therefore, investor subjectivity comes down to accepting MPT under these assumptions as a reliable investment forecasting tool. MPT may be changed to suit investor subjectivity, as is the case in this study.

The literature discusses using the risk-free rate as a common starting point when calculating an optimal portfolio. This is a homogenous expectation that does not directly apply to Islam. The risk-free rate is the expected interest return earned on funds in a bank account. There is no risk-free rate in Islam, as risk-free returns are considered *Riba*. However, as time passes, an investor's capital loses real value due to inflation and Zakat. Hence, it appears that there are some real yardsticks an investor should expect to beat. They could use alternative financial indicators like the Consumer Price Index (CPI). Additionally, they would have to remove *Zakat* from the capital and include this in their yardstick. In the case of this study, we resolved to the more generalised term hurdle rate. We chose to add *Zakat* and the previous year's annual *(CPI + 2.5)*. So, for 2015, we used 2014 CPI data. In this way, while we are not homogenous, we used a rate that allows us to, at minimum, equal inflation after removing *Zakat*.

There are some material inefficiencies with MPT that are not amongst the assumptions but affect the outcomes. MPT can suggest an asset whose unit cost is above what MPT calculates. The asset will be excluded in such cases, or the MPT model will be changed to accommodate the asset. In both cases, the net model is not the MPT calculated, efficient model. Further, MPT relies on market sentiment to deduce net volatility. Recent data may not yet fully account for

the current phenomenon. Hence the suggestions MPT makes could be incorrect. Additionally, since MPT uses historical data, it does not forecast future events. Some become known, and market sentiment corrects for these events, while others remain unknown until they severely affect the market. Investors have to be aware that this could happen and affect their portfolios.

In concluding the discussion on MPT assumptions, while MPT remains one of the tools at the disposal of investors, it is governed by assumptions, material inefficiencies and human bias. It is claimed that Sentiment models (in behavioural economics) are more adept at incorporating human bias (see: Simo-Kengne, Ababio, Mba, & Koumba, 2018). However, we argue that these are implied in the net effect of the volatility. MPT fails like most models in making speculative assumptions or utilising the latest market information. We argue that Islamic Utility accounts for this and still promotes MPT as a reliable Shariah investment tool once made to accommodate Shariah. To use MPT as an investment tool, investors must accept the principle and assumptions on which MPT is built. That is to say, all price changes are reflected in the volatility (Markowitz, 1952a). It is up to the investor to consider what affects an asset's price volatility. If an investor can accept these assumptions, they should be able to rationalise using risk-reward ratios and MPT.

## 3.5 Risk-returns ratios

This section explains the importance of risk-reward ratios in MPT. Each ratio is discussed in detail, and the interpretation to make them applicable for MPT is explained.

MPT is an optimisation theory that can be applied to any data where a utility return can be earned at the cost of some risk (the risk-reward ratio). Originally, MPT was devised as an economic theory. In economics, MPT optimises possible risk for any additional utility earned. Moreover, MPT used with risk-return ratios is among the most popular quantitative investment methods. The risk-return ratio terminology has become a common understanding. However, the ratios construction is ($\frac{returns}{volatility}$), where the returns and risk (volatility) interpretation may be changed to suit an investor's subjectivity.

This section discusses the various ratios that can be used with MPT. The main departure from the standard MPT assumption is in our interpretation of the risk-free (hurdle) rate. We used *(CPI + Zakat)* as our hurdle rate.

Therefore, the Sharpe Ratio becomes:

### 3.5.1 Sharpe Ratio

$$Sharpe\ Ratio = \frac{(R_x - R_f)}{\sigma_x}$$

$R_x$ *: is the Expected Return*

$R_f$ *: hurdle rate (CPI + Zakat)*

$\sigma_x$ *: is the standard deviation of the Expected Return*

(Sharpe, 1994)

The Sharpe Ratio gives investors a means of understanding the utility they gain for their risk exposition (Sharpe, 1994). Sharpe first proposed the ratio in 1966 and refined it in 1994. The essence of the ratio is that it unifies historical returns for some historical risk for any asset. While it is classed as a risk-reward ratio, Sharpe's denominator measures total volatility (up and down price movement). In this way, the Sharpe Ratio becomes a universal way of comparing assets against each other.

The Sharpe Ratio uses historical data and gives a summary statistical ratio. Therefore, the Sharpe Ratio is not expected to predict sudden movements. However, while the Sharpe Ratio may not predict sudden movement, it influences market sentiment where investors buy assets with higher Sharpe Ratios (Kaplanski, Levy, Veld, & Veld-Merkoulova, 2016). To recapitulate the discussion on market sentiment, the standard deviation is the summary statistic based on all the fluctuations imposed by all investors. Hence while it is a numerical indicator for each asset, it summarises the thoughts of many investors. Hence, the Sharpe Ratio with the flaws highlighted is a feasible candidate for MPT in investments.

Observing the numerator and denominator individually allows investors to assess the investment options in two ways. Firstly, they can observe and find the lowest risk for any given utility, and conversely, they can find the highest utility for a set risk. It is a summary statistic based on a calculated period return and the associated periodic fluctuations. When used with MPT, the standard normal distribution MPT assumptions apply. Investors may analyse the results to review further the distribution shapes and their effect on predicted performance when rebalancing portfolios.

Data shows that the returns and fluctuations are not necessarily normally distributed (Scholz, 2007). Hence, MPT and Sharpe's assumptions are constantly under review (see: Goetzmann et al., 2002; Rollinger & Hoffman, 2013; Scholz, 2007). Some criticisms made are valid, while others are not. Particularly, volatility interpretation could be problematic. Harding (2002) proposed that significant returns can imply higher risk and a lower Sharpe Ratio. Some clarity is needed to verify the statement that "large positive returns increase the perception of risk". There are two issues with this. The first issue is that consistent significant returns could imply low volatility, and Harding should have expanded on his thinking by looking at the negative return behaviour. The volatility could have existed in the negative returns, and since there are consistent significant returns, volatility is low. The second issue is that he could easily have said that "small negative returns decrease the perception of risk". It would be valid that large or small movements, either way, could create false interpretations of the assets earning potential. Small, consistent negative returns could offset significant, consistent positive returns and vice versa. Hence, looking at volatility alone is not enough. A prudent method would be to look at the data and determine earnings trends to qualify these statements. Harding's critique should have included an analysis of the skewness and kurtosis of the distributions. It could have qualified his view about significant positive returns and their effect on volatility. We looked at the distributions of our simulations in the results section.

This may be the case if the Sharpe Ratio variables are separated since volatility alone does not say much about earnings. Similarly, earnings alone do not say much about the viability of the asset. Whereas the Sharpe Ratio gives a comparison between assets to pick the most consistent positive performing assets. Harding's contribution shows that there could be a misinterpretation of the variables in the industry. Hence the first step is to understand the variable.

The Numerator for this study is the average daily[18] returns earnings net of the hurdle rate. Average daily returns were calculated as $average(ln\left(\frac{closing\ price_t}{closing\ price_{(t-1)}}\right))$, where $t$ is the date.

18 Daily was conveniently chosen to create large data sets. It is easier to determine distribution normality on larger data sets. Daily could have been any subjective period like a weekly period.

The denominator is $\sqrt{\frac{\sum(cp_t - average(cp))^2}{count(cp)}}$, for all *t.* These two variables give us the Sharpe Ratio. The numerator shows that assets with significant average daily returns would be favoured over smaller ones. The standard deviation (denominator) will be high if the individual data points are far from the average. Conversely, if the daily movements are consistent, the average will be close to the daily changes. Hence when comparing assets, those with less volatility will be favoured over those with more volatility. However, this comparison is problematic since the scale of the earnings could be vastly different. The movements could be a few Cents for some assets, while for others, it could be Rands (South African currencies). Hence, the Sharpe Ratio creates a comparison since it removes this Rands and Cents scale.

### 3.5.2 Sortino Ratio

The Sortino Ratio is very similar to the Sharpe Ratio and has many of its strengths and weaknesses. The Sortino Ratio's key difference is that it considers only the drawdown or downside standard deviation, which provides a better view of risk for loss (Rollinger & Hoffman, 2013). In this way, only the negative volatility that would indicate the potential drawdown risk of an asset is considered. Since Islam prohibits short selling, understanding drawdown risk may have an advantage in Shariah investing, where assets that are shorted for their volatile losses are excluded.

Our research shows that drawdown risk is not specified in the literature as *Gharar*. It is therefore considered as *Mukhatarah* (operational risk). The Sortino Ratio is calculated as:

$$Sortino\ Ratio = \frac{(R_x - R_f)}{drawdown(\sigma_x)};\ where:$$

$R_x$ *: is the Expected Return*

$R_f$ *: hurdle rate (CPI + Zakat)*

$drawdown(\sigma_x)$ *: is the standard deviation of the negative returns*

The numerator remains the same as in the Sharpe Ratio *(CPI + Zakat).* The critical difference is that the denominator is calculated on negative returns only. In this way, any efficiency simulations will not be influenced by positive returns volatility. Whether Harding's (2002) critique is correct or not, the Sortino Ratio would circumvent his drawdown volatility dilemma.

This is the general thinking behind the Sortino Ratio. Investors more concerned about the drawdown risk of their expected returns should consider the Sortino Ratio. This ratio suits Shariah-based investing in considering risk management.

When using the Sortino ratio instead of the Sharpe Ratio, there are three key differences when looking at the data. First, the assets under screening may not have the same drawdown cycles. Hence the volatility considered may not have consistent overlapping timelines. Second, the drawdown volatility and the upside (positive) volatility may not be the same and must be considered, and third, the skewness and kurtosis of the distributions may be different. These affect the portfolio's performance and, as far as we could find, have not been analysed under the circumstances we prescribed in this study. These observations were analysed and are discussed in the results chapter.

### 3.5.3 Sterling Ratio

Ordinarily, the Sterling Ratio is used at the end of a period and not used in MPT. We reinterpreted the ratio to test it in our study. There are several interpretations of the Sterling Ratio (see: Kolbadi & Ahmadinia, 2011; Magdon-Ismail & Atiya, 2004). The Ratio is similar to the Sortino Ratio in that it uses drawdown data for the denominator. However, the numerator or expected return is interpreted differently. The Sterling Ratio used in this study is adapted from:

$$\textit{Sterling Ratio} = \frac{CARR}{|ALD|}; \textit{ where:}$$

*CARR: compound annualised rate of return*

*ALD: Average Largest Drawdown* (Magdon-Ismail & Atiya, 2004)

The Ratio proposes that the Compound Annual Rate of Returns ($CARR$) is used to measure the returns instead of ($R_x - R_f$) as with the previous two ratios discussed. The risk is measured as the period's Average Largest Drawdown (ALD). In some cases, 10% is subtracted from the *ALD* to account for bond yield rates. Sterling proposed this when the ratio was defined (Kolbadi & Ahmadinia, 2011). Generally, the authors leave out the 10% subtraction.

Further, the original period was defined as one year. However, the periods used within the numerator and denominator are flexible, provided both are calculated within a fixed analysis

period (Kolbadi & Ahmadinia, 2011; Magdon-Ismail & Atiya, 2004). For example, investors could use daily data for the numerator while using the first and last date of the denominator's analysis period.

No research detailing the interpretation of the Sterling Ratio in MPT could be found. Therefore, the Ratio was adapted to work in MPT. Firstly, since we rebalanced portfolios, $CARR$ was reinterpreted to a monthly period and repeated for the analysis period. Therefore, for a one-year analysis period, there were twelve $CARR$ values. We would not calculate covariance if we used the standard Sterling Ratio with the entire period in our calculations. Therefore, when calculating the ratio, we chose separate calculation periods for $CARR$, and *ALD* to create covariance. Hence, we calculated *CARR* monthly and *ADL* daily. We chose to use daily drawdown since we used daily data in our analysis and the previous two ratios. The models would not have converged on a weighted portfolio. Hence, calculating $CARR$ and *ALD* over separate periods introduces volatility and supports using the Sterling Ratio in MPT. Using daily data is in line with the finding that high-frequency risk data supports better portfolio performance.

To create covariate returns and test the Sterling Ratio in MPT, the same daily drawdown data was used for *ALD*. Effectively, the daily data is the shortest time frame. As a result, the only difference between the Sterling Ratio and the Sortino Ratio is in the numerator, where the analysis used $CARR$ instead of $(R_x - R_f)$. Interpreting the Ratio in this way maintains the purpose behind the Sterling Ratio. $CARR$ smooths out the returns and expresses the expected returns as a compound return of the investment.

$$CARR = frequency\left(\left(\frac{end\ price}{start\ price}\right)^{1/(t*frequency)} - 1\right);\ where:$$

*t: the number of years*

$CARR$ could be calculated intra-day, in line with daily returns as used to calculate returns. This way, we calculate the daily compounded rate throughout the data. By calculating $CARR$, in this manner, we are using the Sterling Ratio to minimise drawdown volatility of compounded annualized returns. According to Ma et al. (2018), different frequency data is recommended to create further efficiency. Therefore, the periods for $CARR$ and *ALD* are not prescriptive and

were chosen to simulate risk-reward ratios for MPT analysis. Since the Sterling Ratio outperformed the other ratios in some cases, further studies with different frequencies is warranted.

In conclusion, the Sterling Ratio has the effect of smoothing out the volatility of the returns by taking an average drawdown. In terms of Islamic Utility, both *Gharar* Risk and *Mukhatarah* Risk could be averaged out. This smoothing may make an otherwise risky (*Gharar*) investment appear islamically permissible. Many interpretations of the Sterling ratio use different numerator and denominator periods (Kolbadi & Ahmadinia, 2011). Since Shariah is not specific to scientific analysis, the flexibility in ratio interpretation offers a practical Shariah Screening tool.

### 3.5.4 Treynor Ratio

The Treynor ratio evaluates a portfolio's performance against market risk (Hübner, 2005). Ideally, the market will have a specific Treynor Ratio over some period where the Treynor Ratio measures the portfolio's susceptibility to changes in the market. Similarly, to the other ratios, if an investor's portfolio had a higher ratio, it could outperform the market for the same risk as the market or conversely earn equivalent returns while reducing the effect of the market's risk (Beta risk). Beta is calculated as $\beta_a = \frac{cov(R_a,R_m)}{var(R_m)}$, where $R_a$ is the Returns of the Asset and $R_m$ is the returns of the market. When calculating the Treynor Ratio, each assets Beta is calculated, and the weighted portfolio has the combined Beta risk ($\beta_x$) of all the candidates. Each asset's Beta may be unique and depending on their weight, contribute uniquely to the portfolios Beta. Beta is calculated using both upside and drawdown volatility, so the interpretation suffers from the same issues the Sharpe Ratio does, where upside volatility may increase total volatility. Further studies could look at a drawdown equivalent to Beta. Similarly, ratios using Alpha may also be considered in further studies.

For this study, the Treynor ratio uses the standard Beta, and the ratio is:

$$Treynor\ Ratio = \frac{(R_x - R_f)}{\beta_x};\ where:$$

$R_x$ *: is the Expected Return*

$R_f$ *: is the risk-free rate (market proxy)*

$\beta_x$ *: is the portfolios Beta of the Expected Return*

(Hübner, 2005)

The Treynor Ratio also needed to be interpreted for use in MPT since Betas are generally calculated over a whole period. Betas were taken at monthly intervals over an (up to one year) period to derive a covariance of Betas. A covariance matrix was calculated as the Betas for a portfolio. The MPT optimisation follows by adjusting weights to maximise the Treynor ratio. Calculating Betas for a weighted portfolio is common practice (Pettengill, Sundaram, & Mathur, 1995). However, no evidence could be found to calculate (up to 12) Betas within a period. When using the Treynor Ratio, our study is optimizing Beta risk-adjusted returns, where the Treynor Ratio $= \frac{(R_x - R_f)}{covariance\ (\beta_x)}$.

In conclusion, the critical difference in the Treynor Ratio is that it uses systematic risk or Beta. By minimising Beta only, the MPT model allows any level of Alpha risk. General performance yields vary in different markets (Ashraf, 2013; Masih et al., 2018) or the bull or bear economic environments (Ashraf & Mohammad, 2014). Without knowing Alpha, an investor may take on an islamically unacceptable risk that they would not have taken by reviewing the total risk. Alternatively, if assets are highly correlated to Beta, Treynor results will be similar to the Index (South Africa Shariah Index in our case), yielding similar results. Therefore, we compare all proposed portfolios' ratios to test these considerations.

## 3.6 Summary of the risk-return ratios

This section describes four risk-reward ratios we used in our study. Each ratio has specific merit in quantifying portfolio performance. All the ratios may be used for Islamic screening. They all are subject to the same criticism, namely that they imply that previous performance predicts future performance. Using these ratios in screening portfolios, investors may find that

recent activity is not reflected correctly in forecasting performance and that the ratios fail to predict sudden moves. However, even though these criticisms are valid, the ratios consider market sentiment and give investors a view of all the ways other investors may view assets.

At a high level, all four ratios discussed in this section consider assets similarly. That is, they suggest what additional return can be earned for the additional risk. The differences between the ratios come in how returns are viewed and how investors may consider the risk of earning those returns. The Sharpe, Sortino and Treynor Ratios consider the average growth over a period, while the Sterling ratio considers a compounded return. Both can be used to calculate returns over future periods. These calculations are subject to risk (the denominator). Each ratio has a fairly unique interpretation of risk. Volatility calculated with upside and downside data gives an unbiased view of the asset's overall performance while possibly misstating the drawdown risk. Volatility calculated on drawdown data only helps identify volatile negative returns, while used with returns suggests profitable assets. Hence, it is a better measure for long-only portfolios where investors cannot take advantage of shorting negative return stocks. However, they do not give information about the upside volatility, which could affect investor sentiment. We found that different ratios were better predictors in different periods of our analysis. The results discuss the findings and suggest when to use the results of the different ratios.

## 3.7 Applying Modern Portfolio Theory

This section explains how Modern Portfolio Theory (MPT) developed over the years, and it can be used with Islamic Utility.

Harry Markowitz developed the MPT theory in 1952. This theory uses utility and risk to find investment portfolios that suggest an optimal utility with the lowest historical risk (see: Markowitz, 1959; Markowitz, 1952a, 1952b; Markowitz, 1991). MPT is widely used and is very relevant in modern-day portfolio planning. The most widely used risk-return optimisation ratio is the Sharpe Ratio, developed in 1966 (see: Sharpe, 1994). However, through the years, there have been many studies debating the assumptions. MPT is often criticised for causing a lack of diversity when a portfolio is selected. (Allen, McAleer, Powell, & Singh, 2016; Contreras et al., 2016). MPT uses the historical covariance of assets risk when optimising portfolios. Hence, having more assets in a portfolio may help reduce the risk of loss when

holding more assets. However, MPT generally favours a portfolio with the minimum number of assets possible. The resulting smaller portfolio may be more susceptible to future loss. Adding more assets could diversify the portfolio and protect it against future risk. This diversification comes at a cost in investment fees. This criticism will be amplified after Shariah screening is applied since the input assets list is smaller than the complete market list. Further, the types of assets are limited by Islamic Utility screening, where the financial exclusions that make some assets attractive fail screening. Therefore, the diversification criticism is valid and could affect expected investment results.

The primary variable used in MPT is periodic asset prices (for example, daily or weekly price data). The data is available for all the asset classes discussed in the previous chapter, and data management is detailed in Chapter Four, where we explain how data for each asset class was used. Hence, MPT could be used when considering other asset classes as part of a portfolio. These findings about using MPT collectively provide a platform for evaluating Shariah Investments' performance in South Africa. This section explores the literature on MPT and how MPT may be used to evaluate this performance.

MPT is indiscriminate in which assets may be used as input data (see: Markowitz, 1959). Further, MPT, if not constrained, is indiscriminate when suggesting short sell weights ($-\omega_i$). Islamic Utility is more discriminate in both input data choices and short selling. Therefore, in terms of efficiency, it would appear that Islamic Utility offers less efficient portfolios than portfolios using all available data. We found high-performing portfolios suggesting results worthy of analysis. Further, using different ratios and constraining MPT affects the shapes and position of the efficient frontier. The tangent line's[19] slope offers an indication of sensitivity to risk fluctuation. If the slope changes, the risk sensitivity and optimal portfolio would change[20]. These correspond with the Alpha and Beta of the expected returns (Uppal & Zaffaroni, 2016).

19 The tangent line is the line drawn from the efficient frontier to a benchmark utility rate. The benchmark generally used is the interest free earning rate. The point where the tangent touches the efficient frontier is considered the optimal portfolio.

20 A preview of the different efficient frontiers and tangent lines is given is section 5.10, where the analysis process is discussed further.

Since no literature covering these inefficiencies could be found, we propose hypotheses 3 and 4 when concluding this chapter.

The interpretation of utility and risk in Islam was discussed in the preceding sections and was found to be compatible with MPT. MPT uses the covariance of the asset when calculating an efficient frontier and its corresponding optimal portfolio $E(R_p) = \sum_{i=1}^{n} \omega_i E(R_i)$ [21] (Contreras et al., 2016; Markowitz, 1952a). Optimisation can be achieved by maximizing returns for some risk or minimising risk for some returns. Modern computers can apply optimisation algorithms to change risks and returns to achieve optimal solutions dynamically. Various interpretations of risk and returns were used in this study. These interpretations have been discussed in the literature. They are Sharpe (Sharpe, 1994) and Sortino (Rollinger & Hoffman, 2013). Additionally, the Sterling (Magdon-Ismail & Atiya, 2004) and Treynor (Hübner, 2005) ratios were interpreted to manipulate data into a form that can be used in MPT. This method, discussed in detail in Chapter Seven, was not found in the literature.

Each ratio interprets risk or returns differently, making the resultant statistical inference different. Each ratio created a different efficient frontier curve and proposed a different optimal portfolio. Due to the ratios' interpretations being different, comparing the efficient frontiers was also not straightforward. In order to compare the results, we calculated all the ratios for the resultant portfolios. The effects and results are discussed in Chapter Seven.

In applying MPT, daily closing prices for up to five years were used. This aligns with other similar analyses when reviewing historical performance (see: Contreras et al., 2016). Discussion on performance revolves around either higher returns or lower risk (Alam & Rajjaque, 2010; Ashraf, 2013; Ashraf & Mohammad, 2014). In practical terms, investors usually fix one of the variables and optimise the other. Modern computational software like Microsoft Excel allows investors to dynamically adjust both variables simultaneously, finding a more efficient solution. Hence, MPT was interpreted in Microsoft Excel.

In practice, portfolios may be rebalanced either monthly, quarterly, semi-annually or annually, depending on the investment horizon (Contreras et al., 2016). Other factors like administrative costs or availability of SENS data and financial reports could determine the frequency of

21 The full expected returns equation is explained in section 3.2.

rebalancing to keep the portfolio efficient, and rebalancing to maintain Shariah compliance needed to be considered. (Ho, 2015; Rizaldy & Ahmed, 2019). When Islamic Utility was applied, acceptable assets for one period had to be excluded in another. In such cases, we simulated how Shariah investors would remove the asset and rebalance their portfolios even if the resulting portfolios were less efficient.

MPT can be constrained to ensure minimum thresholds (Schulmerich et al., 2015). There are three ways of achieving this in general MPT. The Same constraints are applicable in Shariah. The first constraint is to force MPT to include a certain number of assets in the resultant portfolio. By forcing a minimum number of assets, $(i \geq n, for\ n > 0)$, diversification is ensured, and the historical risk and reward can still be optimised. The resultant portfolio may be more expensive but have a lower chance of loss. The second way is to force MPT to include a minimum weighting greater than zero $(\omega_i > 0)$ for assets. In this way, diversification is ensured by having a substantial amount invested in an asset. The third way is a combination of the first two. In all cases, diversity can be ensured, regardless of the efficiency of the resultant portfolio. However, changing the constraints affects the primary optimisation that MPT proposes. Also, it is not required by Shariah. Since this is the first study of its kind in South Africa, none of these constraints was imposed. Future studies could investigate the effect of applying these constraints.

Sortino, Sterling and Treynor are alternative risk-return ratios that yield different results (see: Hübner, 2005; Magdon-Ismail & Atiya, 2004; Rollinger & Hoffman, 2013). Studies show that Shariah indexes perform better in bear market conditions (see: Ashraf & Mohammad, 2014). Since these three ratios use either drawdown or market systematic volatility, they offer alternative efficient portfolios to the mainstay Sharpe Ratio under bear conditions. Hence, MPT analysis was conducted with these ratios as well. Since each ratio uses different variables, comparing results directly becomes challenging since the variables are different. However, all the ratios were calculated for all simulations to facilitate a common analysis background. No literature analysing various portfolios in this way could be found. Hence this study was exploratory and could be refined by future studies.

## 3.8 Indexes and funds

This section focuses on presenting the historical data of current indexes and funds. We draw on the literature to show that the comparisons we make are bedded in literature and relevant for our purposes. We conclude the section a comparison of the current indexes and funds to prepare for discussing our analysis and results.

There are many ways of comparing the performance of portfolios. Two standard tests are, to benchmark against current Indexes and funds (discussed in this section) and to test robustness (discussed in section 3.9). This section compares South African Shariah indexes and funds with the FTSE-JSE indexes over five years (02 January 2015 to 31 December 2019). CPI during the period was 4.99%[22]. Effectively, any investment would need to grow more than 25% to beat CPI. To make an easy comparison, all the indexes and funds were normalized to ZAR1,00 on 2 January 2015. On 31 December 2019, the ZAR1,00 should be ZAR1,25 considering CPI.

Shariah-based funds are often compared with conventional funds and indexes (see: Ashraf, 2013; Grinblatt, Titman, & Wermers, 1995; Kok et al., 2009). However, results comparing Shariah screening and conventional fund performance are inconclusive (Ashraf, 2013; Masih et al., 2018). Ashraf (2013) showed empirically that in a Muslim country (Saudi Arabia), Shariah-based portfolios perform better in bear markets. Masih (2018) consolidated the findings of several studies worldwide and found that generally, in Muslim countries, Shariah portfolios outperform other portfolios. In contrast, in secular markets, Shariah portfolios perform better in bear markets. The findings of Ashraf and Masih show that portfolio sizes contribute to performance, wherein Muslim countries' Shariah portfolios' market capitalization outweighs other funds. This would be the opposite in South Africa, where the larger shares (JSE Top 40) include banks, entertainment companies and *Riba*-based financial services, thus limiting the Shariah portfolios candidates.

In South Africa, the Muslim population is small, indicating smaller fund contributions. Moreover, companies and other investors do not have to subscribe to Islamic Utility. Hence, they may short-sell or day-trade assets, influencing a share price. Therefore, Shariah Portfolios

22 Calculated from the statistics South Africa data, located at the website: http://www.statssa.gov.za/publications/P0141/CPIHistory.pdf?

are subject to the influence of general business practice and market sentiment. Masih further attributed the better performance to lower systematic (Beta) risk in Muslim Countries. Systematic risk in South Africa may not be the same as in other countries and could influence performance. The literature generally advises that Shariah portfolios perform on par with secular portfolios, and this study's results determined the South African case. Our results show that it is possible to find efficient Shariah portfolios that outperform the market.

Performance is dependent on several factors like screening methodologies (Kok et al., 2009), diversification and market timing (Ashraf, 2013), economic (bull or bear) environments (Ashraf & Mohammad, 2014) and industry type (Hassan & Antoniou, 2005). Literature shows that these factors tend to be universal, whereas Kok et al. (2009) found the effects in the London and NY Stock Markets, and Ashraf (2013) found the same in Saudi Arabia. Later Ashraf and Mohammad (2014) looked at the Americas, Europe and Asia, and most recently, Waris et al. (2018) looked at Pakistan and Malaysia. The references here show the length and breadth of research conducted on the factors that influence performance. We debated and made the case that investors have sufficient leeway to subjectively screen and find Islamic portfolios. Coupled with that, our analytical simulation (our research results) showed that with rebalancing and considering risk through various economic uncertainties, Shariah investors could outperform the market and CPI. Therefore, based on literature and our findings, investors cannot use *Darurah* (using something forbidden since there is no alternative) to argue for investing in non-compliant assets. Doing so would have no Islamic Utility.

Literature and data on factors that describe performance in the South African context are not available. Therefore, the available daily data was extracted for ten years to draw some preliminary comparisons. The comparison is constructed at an index level and then at an investment fund level. When looking for reliable, freely available data on the FTSE JSE All-share Index, JSE Top 40, Shariah All-share Index (SASI) and the JSE Alternative Board (AltX), the Kagiso Islamic Equity Fund and ABSA Shariah ETF were used.

Table 1 presents the summary statistics of the indexes. The ratios discussed in section 3.5. The Statistics are calculated in line with the ratios.

**Table 1: Summary performance statistics for the South African indexes**

| | **FTSE_JSE All-share** | **FTSE_JSE Top 40** | **SASI** | **AltX** |
|---|---|---|---|---|
| *Value on 31 December 2019* | ZAR 1,15 | ZAR 1,16 | ZAR 1,23 | ZAR 0,71 |
| *average Daily Returns* | -0,002% | -0,002% | 0,003% | -0,042% |
| *Std Dev* | 0,95% | 1,03% | 1,14% | 1,22% |
| *Drawdown (σ)* | 0,59% | 0,64% | 0,69% | 0,95% |
| *Sharpe Ratio* | -0,24% | -0,15% | 0,24% | -3,42% |
| *Sortino Ratio* | -0,39% | -0,25% | 0,39% | -4,41% |
| *Sterling Ratio* | 7,85% | 7,87% | 5,83% | 6,76% |
| *Treynor Ratio* | -0,04% | -0,03% | 0,06% | 1,05% |
| *Kurtosis* | 1,0637 | 1,1349 | 1,2372 | 68,5308 |
| *Skewness* | -0,2268 | -0,2180 | -0,0844 | -4,1046 |

Table 1 shows the summary statistics and ratios for the four indexes. While the SASI was the best performing index, all four indexes underperformed relative to CPI inflation (ZAR1,25) over the period. If Investors tracked any of the indexes, they would have lost real value over the period even though the value on 31 December 2021 is higher than ZAR1,00 in most cases. The Ratios in the table show that the SASI outperforms the two JSE indexes while the AltX does not. The SASI had a high maximum drawdown, which affected the Sterling ratio, making the SASI's Sterling ratio lower than the FSTE ratios. Another particularity is that the AltX Treynor ratio is much higher than the others. This is due to the AltX being negatively correlated to the All-Share (benchmark). The AltX Beta was negative. Hence, its negative returns, divided by its negative beta, give a positive Treynor Value.

The ratios results also show that the ratios may not be directly compared since their variables and magnitudes are different (the sterling results are much higher in magnitude). Noting that the ratios may not be directly compared, the table shows that a high standard deviation cannot

imply lower returns. Similarly, drawdown volatility expresses the same. Further, the standard deviation and drawdown volatility similarly trend together where, as standard deviation increases, drawdown volatility increases. This shows consistency: the lower the ratio, the lower the performance. The table presents all the ratio statistics. In the results, we found that different ratios predicted better performance at various times during rebalancing. Hence, we present all the ratios in the results Chapter (Seven) to compare the results.

The literature further advises that distributions are not normal and may influence performance. To recapitulate, positive kurtosis implies that the future returns would be more predictable. Negative skewness implies that the future returns would be above the mean. Since investors using MPT presume normality, they prefer the more predictive (positive kurtotic), higher than average environment (negatively skew) distributions when forecasting. The South African Indexes all present favourable distributions. The SASI has lower results than the FTSE indexes and supports the literature with a lower performance. The more extreme results of the AltX seem to contradict the negative returns. A more in-depth look shows that the average returns are negative. Hence, the highly positive kurtotic distribution means that the returns are very close to this negative average even though they tend to be higher than the mean.

**Figure 3: Performance of the South African JSE indexes**

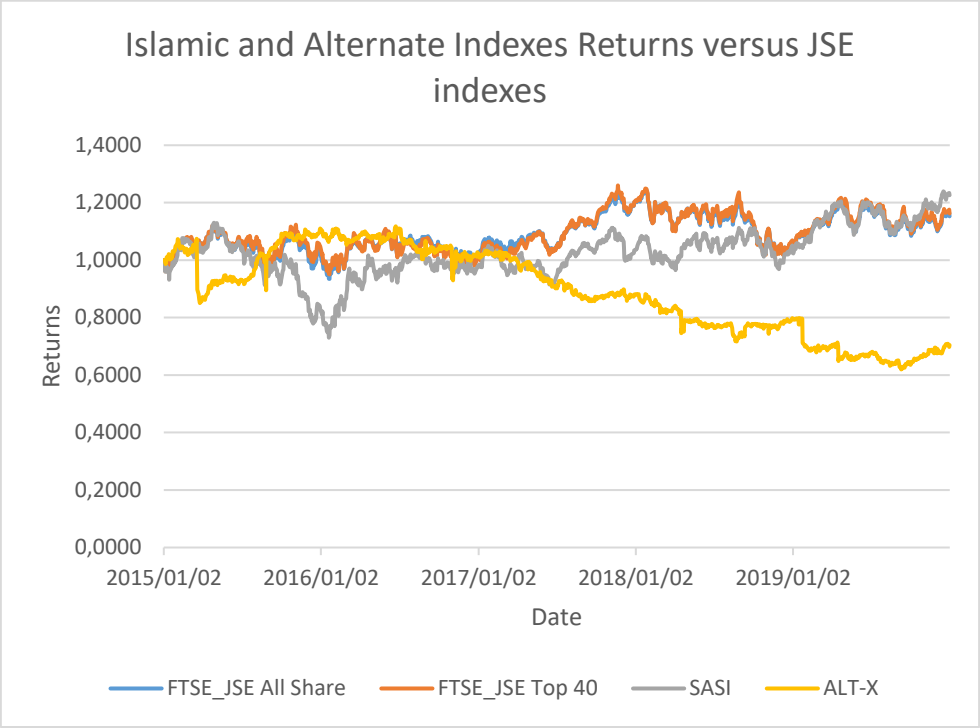


Figure 3 graphs the returns of the four indexes. As per industry standard, if one (1) unit was bought at the beginning of the period (2 January 2015) the unit increases and decrease and depicted in the graph. For example, 1 unit of the AltX was valued at 0,7 at the end of the period. A t-test (assuming unequal variance) using the All-Share as the benchmark confirmed that the All-share and the Top 40 were the same, while the SASI and AltX were different. The p-value and the t-stat for the SASI and AltX supported that we reject the null hypothesis. This observation supports that viable portfolios as subsets of the All-share may be found. These portfolios could have different volatility and efficiencies. Similar analysis was conducted on the Kagiso Islamic Equity and ABSA Shariah funds. These two funds were compared to the SASI as a benchmark.

Graphically the performance over five (5) years shows that the performance of the two FTSE indexes was almost identical. The SASI graphically is similar while showing more volatile returns. There were times when the SASI drew down more than the FTSE indexes, and when the markets recovered, the SASI did not recover as well as the FTSE indexes. The AltX appears to follow a separate returns curve. At times the AltX appears to be inversely related to the other three indexes. It shows that the AltX assets appear to be inversely correlated to the All-Share benchmark and could add to an investor's efficient portfolio. Lastly, this appears to be a bear period where the market underperformed CPI. The literature indicates that Shariah portfolios perform better under these conditions. The SASI performance apparently confirmed this observation and, towards the end, outperformed the other indexes. However, the graph shows that most of the time, it underperformed the other indexes. This could indicate that the Shariah funds pickup in performance lags behind the bear market condition. This was not discussed in the literature and could be an avenue for future study.

**Table 2: Summary performance statistics for Shariah funds.**

| | SASI | Kagiso Islamic Equity | ABSA Shariah Top 40 |
|---|---|---|---|
| *Value on 31 December 2019* | ZAR 1,23 | ZAR 1,27 | ZAR 0,97 |
| *average Daily Returns* | 0,003% | 0,006% | -0,016% |
| *Standard (std) Dev* | 1,14% | 0,64% | 2,16% |
| *Drawdown (σ)* | 0,69% | 0,38% | 1,45% |
| *Sharpe Ratio* | 0,24% | 0,87% | -0,75% |
| *Sortino Ratio* | 0,39% | 1,47% | -1,11% |
| *Sterling Ratio* | 5,83% | 9,16% | 0,65% |
| *Treynor Ratio* | 0,06% | 0,11% | -0,91% |
| *Kurtosis* | 1,24 | 2,06 | 141,33 |
| *Skewness* | -0,08 | -0,03 | -0,30 |

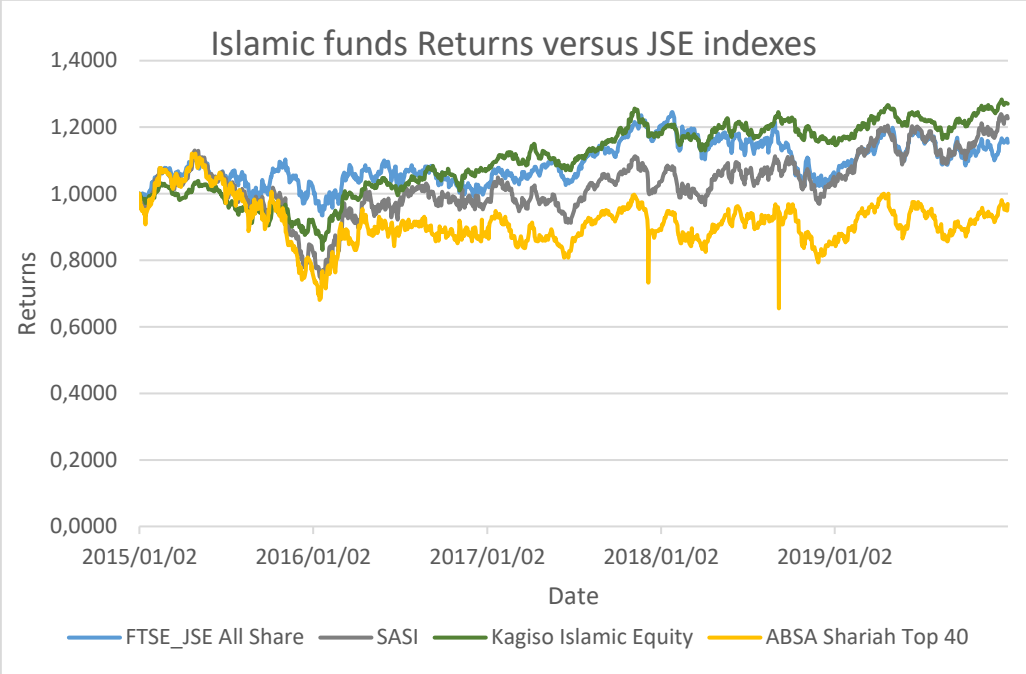
Table 2 presents the data comparing two South African Shariah funds against the SASI index. We explained above that the SASI outperformed the FTSE Indexes. Hence, we now use the SASI as the benchmark for comparing the Shariah-based funds. Kagiso outperformed the SASI, while the ABSA fund did not. Kagiso's average daily returns were higher, while standard deviation and drawdown volatility was lower than the benchmark. These observations support two findings. Firstly, it supports the finding that Shariah funds historically perform on par or better than secular indexes in South Africa. This is borne out in the general literature findings. Secondly, there are efficiencies in selecting portfolios as subsets of the indexes. In this review, the case made that risk reduction is a valid result of the study where returns are the same appears validated by this data when looking at Kagiso vs the SASI. The volatility statistics also show that the poor-performing ABSA fund had a higher risk. This supports our earlier observation that higher risk implies lower returns. Hence, finding low volatility portfolios is validated.

The Kurtosis and Skewness of the funds show that they favour what investors want (lower volatility and fatter above-average returns). Therefore, assumptions made on normal distributions would appear conservative in terms of both expected returns and volatility. Moreover, we made the point that in South Africa, the smaller Shariah fund could follow

market sentiment instead of leading it. The data shows that the Kagiso fund gave higher market returns at lower than market risk even though the Shariah fund follows South African markets. This finding is supported by the ratios, where Kagiso outperformed the Indexes for three ratios.

The ABSA fund tracks the SASI (NewFunds Shari'ah Top 40 ETF, 2021). It pays out quarterly dividends and has a 0.42% annualised fee. Therefore, graphically, while the ABSA fund's performance looks similar to the SASI, its earnings appear to be lower. The portfolio candidates are a subset of the SASI and are rebalanced quarterly. Hence there is some dissimilarity to the SASI as reflected in the graph and the tabled descriptive statistics. Figure 4 shows that the Kagiso fund also appears to track the All-Share. However, compared to the All-Share (benchmark), there are cases of underperformance (around 2015) and over-performance (towards the end of 2017), showing that it has its own volatility. The Kagiso fund is also derived from the SASI, but the fund managers do not track the SASI as the ABSA fund managers do.

**Figure 4: Performance of Shariah-based funds compared to JSE indexes**




Paired t-tests assuming unequal variance were conducted against the SASI, with the null hypothesis: the Shariah funds are the same as the SASI. In both cases, it was found that they were significantly different, supporting the view that portfolios based on a subset of the SASI can yield higher returns or lower risk. The MPT performance undertaken in this study will draw out a deeper understanding of Shariah funds' performance compared to the indexes.

This brief review of the South African market reveals similarities between the market and what is found in the literature. The literature reviewed uses daily frequency data. Contreras et al. (2016) found that different frequency data (for example, weekly data) could yield different efficient solutions. The risk comparison may change when reviewing other frequencies. This section on reviewing the South African market will be more comprehensive once the additional data is analysed in our results (Chapter Six).

## 3.9 Robustness

Risk and returns vary depending on the economic environment leading to renewed thinking about performance evaluation. This section discusses the second form of evaluation. The Capital Asset Pricing Model (CAPM) is modified with time-lagged variables. The modified CAPM takes the form:

$$R_{it} - Rf_t = \alpha_i + \beta_{i0}(Rm_t - Rf_t) + \beta_i' Z_{t-1}(Rm_t - Rf_t) + \varepsilon_{it};\ \textit{where:}$$

$R_{it}$: *excess return on asset* $i$ *in the period* $t$ *(net of the risk-free rate)*

$\alpha_i$: *abnormal performance of asset* $i$

$(R_{it} - Rf_t)$: *excess returns of the portfolio over a benchmark at time* $t$

$Rm_t$: *excess returns on the benchmark asset*

$(Rm_t - Rf_t)$: *excess return of the benchmark at time* $t$

$\beta_{i0}$: *systematic risk for the asset* $i$ *for the current period*

$(\beta_i' Z_{t-1})$: $\beta_i'$ *is the vector of conditional Beta related to the time-lagged predetermined instrument* $Z_{t-1}$.

$\varepsilon_{it}$: *forecast error for asset* $i$ *at time* $t$.

This evaluation allows us to assess an asset's performance compared to market indicators where risk (*Beta*) changes over time. The thinking is similar to our definition of the covariant matrix of betas for the Treynor Ratio. Betas change over time, affecting buy and hold strategies. Investors may choose to test different constraints (Allen et al., 2016; Goetzmann et al., 2002; Rollinger & Hoffman, 2013), affecting the *Beta* of a portfolio. Testing different constraints is akin to market sentiment, where all constraints give a net market sentiment effect.

CAPM is a practical evaluation method whereby investors apply their models periodically to review efficiency and rebalance their portfolio (Allen et al., 2016; Contreras et al., 2016). It is analogous to rebalancing using Beta. Should investors find a more efficient model, they would adopt the revised model.

In most cases, actual results may differ from predicted results. The unexplained difference is considered as forecast errors. Therefore, forecast errors of MPT and the Modified CAPM were compared as a test of robustness. The Modified CAPM may not minimise errors, but the errors (alpha values) help explain robustness (Hassan & Antoniou, 2005).

## 3.10 Proposed hypotheses

The third research question evaluates the performance of the current Shariah Investments in South Africa with portfolios suggested by this study's findings. The third research question is:

3. How do the current Shariah-compliant investment products compare with secular indexes?

The literature and data show mixed results. In some cases, like the ABSA fund, Shariah funds underperformed against all indexes barring dividend pay-out, which are not reported clearly, whereas others, like Kagiso, outperformed the indexes. Over the same period, the SASI underperformed against the secular funds. However, the Kagiso fund outperformed all indexes. Therefore, to answer the third research question, we propose the following hypothesis:

*H3: Current Shariah-compliant investments can outperform current South African funds and indexes*

This literature review answers the question. Moreover, the analysis shows that Shariah funds can offer higher returns for some given risk or similar returns at a lower risk. Thus, the discussion satisfies what MPT proposes and satisfies the argument we put forward. This finding validates asking the fourth Research Question:

4. How can the performance of Shariah-compliant investment products be improved?

In line with the findings in research question three, the four risk/returns ratios were used to find portfolios in question four. The four ratios were applied in MPT to propose portfolios. As such, the fourth hypothesis is proposed as:

*H4: Modern Portfolio Theory applied with the various ratios can outperform current South African Shariah-compliant funds and indexes.*

## 3.11 Literature Review conclusion

The literature review was divided into two sections. Chapter Two addressed the theological questions, and we proposed two hypotheses to test a new way of theologically screening South African data. Current definitions and practices were critiqued, and gaps were addressed. As a result, we have a deeper understanding of religious subjectivity in screening and answered the hypotheses in this study's remainder.

Chapter Three looked at portfolio optimisation and suggested that MPT can improve Shariah Investments' performance in South Africa. Hypotheses three and four address the performance evaluation research questions. The Literature review answered hypothesis three, and the rest of this study answers hypothesis four.

The hypotheses are:

*H1: The current screening methods do not apply to South Africa.*

*H2: Islamic Utility allows investors to subjectively screen assets in various asset classes.*

*H3: Current Shariah-compliant investments can outperform current South African funds and indexes*

*H4: Modern Portfolio Theory applied with the various ratios can outperform current South African Shariah-compliant funds and indexes.*

The following chapters lay out the research. Chapter Four reviews the limits of the current screening methodology. Drawing on the literature, we practically review how each asset class should be screened according to the current two-stage model. We discuss the shortfall of the model and propose an alternative model that aligns with Islamic theology.

We show that the current model does not consider all asset classes' intricacies or business activity. The methodology applied in Chapter Four is a practical qualitative interpretation of the data (the asset classes) based on the Islamic science of interpretation. We discuss how we interpreted the screening rules for both the Shariah and financial inclusions. We use our

findings to derive a three-stage screening model that includes subjective screening to address the shortfall found in the two-stage model.

# Chapter 4: Shariah Screening in South Africa

## 4.1 Introduction

The purpose of this chapter is to discuss the application of Shariah screening in South Africa. We conducted a mixed-methods research where the first method was a qualitative theological analysis, and the second method was a quantitative optimisation analysis.

This chapter uses the developed theological argument to analyse and screen the data. The Chapter opens with a review of the research methodology. This is followed by a discussion of the current two-stage screening method, as depicted in Figure 1 (page 21). We explain how the two-stage model failed and propose a solution. We applied our investor subjectivity proposal as a third-stage screening. The third stage answers the two failings found in the current model. The first failing is in the interpretation of business activity, and the second is in considering all asset classes that the two-stage model does not address. This chapter looked at various assets and discussed our holistic three-stage screening application in the South African context. The discussion sets out the principles used and defines our financial methodology and how we collected data and discusses the results of the MPT analysis (Chapter Five and Six).

## 4.2 Qualitative research methodology – Subjective screening

Islam has a specific research methodology based on the Quranic and Hadeeth sciences of interpretation. The literature review section explains how the Quraan and Hadeeth collections are analysed together to provide robust answers.

There is no collection of academic literature or data for our study. Therefore, we had to collect data from other sources. To ensure validity, we needed data from reliable sources. Therefore, we acquired data from primary data providers like the JSE and obtained audited financial reports from company websites. Thereafter the data was analysed according to content analysis techniques in line with Islamic interpretation as covered in the literature review.

## 4.3 Subjective screening in South Africa

In legal terms, South African Shariah investing has to align with South African law. Thereafter, investors can apply Shariah. Shariah allows for adapting the rules to address challenges that the country's law may present. In this way, the South African Shariah Investment Market adopted the Yasaar Capital screening model (see: Bloomberg, 2009; Hasan, 2020; JSE

Marketing, 2021c). Yasaar focuses predominantly on equities, real estate management and S*ukuk* implementation (Yasaar, 2019).

Since the Yasaar methodology appears to be the mainstay in South Africa, we consider it the standard screening model in this chapter. We found that Yasaar criteria are more conservative than global practice and that none of their criteria contradicts the literature. Hence, we accept that as a basis, they have Islamic Utility. Our screening interpretations are applied over the standard. To recapitulate, Yasaar outlines that any interest-based or speculative business activity must be avoided, and that products or services must be islamically socially beneficial. Thereafter, assets are quantitatively screened to comply with established financial rules and ratios. Yasaar advises that companies maintain a maximum debt/equity ratio of 33% or account receivables, and cash needs to be less than 50%.

Our interpretation includes 33.3% variance as applied in other countries. The variance is considered under subjective reasoning. Literature discussing subjectivity is sparse. Therefore, the subjectivity discussion is developed using our broader definition of *Riba* (where *Riba* is any form of islamically prohibited income). Using these subjective criteria, we established which assets have Islamic Utility in South Africa. The discussion builds towards answering hypotheses H1[23] and H2[24]. The asset classes are discussed holistically below to answer the hypotheses.

## 4.4 Cash

In South Africa, interest-based finance is standard practice. Hence, holding cash to earn interest is clearly prohibited. Additionally, as covered in the literature, any investments must be ethical by Islamic standards. Our broader definition of *Riba* is used to represent both types of *Riba*[25]. Since interest-based income is prohibited, earnings from companies like banks whose Business Activity is interest-based are prohibited. This prohibition explains a practical example encapsulating both types of *Riba*. Interest income is prohibited, and by extension, business

*23 H1: The current screening methods do not apply to South Africa.*

*24 H2: Islamic Utility allows investors to subjectively screen assets in various asset classes.*

25 Riba as described in the Quraan and Riba as described by the Sunnah**.**

activity that generates interest income is prohibited. Therefore, cash must be invested in other goods and services to earn income.

Firstly, we considered cash in the bank, fixed deposit and money market accounts. Like global markets, the South African market offers the accrual of interest in all these accounts. Hence, these accounts have no Islamic utility. As a result, investing in this asset class in this way is prohibited. By extension, any South African companies that earn returns from interest-based income were excluded from the data collection.

Secondly, we considered forex and cryptocurrency trading. It is legal in South Africa, and thus the Islamic perspective was considered. The literature confirms that forex trading is islamically permissible (Abdeldayem et al., 2021; Abubakar et al., 2018; Obaidullah, 2015), provided the investor spot trades the currencies and that investors do not hedge against interest-bearing loans. By extension, investing in companies that trade in forex is permissible and may be included in a portfolio, provided that they manage all other forms of impermissible income like interest. Forex trading is a simple form of trading with no additional qualitative or quantitative Shariah-based issues to consider. The literature explains that while spot traded forex is allowed, there may be an element of *Gharar* (speculative risk) (see: Ho, 2015). *Gharar* is subjective, and the investor will have to decide if they want to include forex in their portfolio.

Based on the findings in South Africa, it appears that cash may be used to buy other assets or for forex and cryptocurrency trading. If cash is used to buy other assets, the Islamic Utility of these assets should be considered. If cash is used in forex and cryptocurrency trading, the trade must be on the spot, and *Gharar* needs to be considered. The discussion shows that cash investing passes the permissibility and screening tests under these conditions. As such, the argument to answer hypotheses H1 and H2 are satisfied for cash investments. Therefore, forex and cryptocurrency trading data were considered in our MPT evaluation.

## 4.5 Equities

The Johannesburg Stock Exchange (JSE) is the leading South African stock exchange. The JSE offers investors exposure to equities, bonds, commodities and interest rate derivatives. There are three main trading boards: the Main Board, AltX and the Empowerment Segment (see: JSE Marketing, 2021b). The JSE All-share index is derived from the Main Board only (JSE Marketing, 2021a), and the Shariah All-share Index (SASI) is derived from the All-share Index

(JSE Marketing, 2021c). Hence, the SASI is derived from the Main Board only. SASI and AltX boards were screened for the equities class[26]. We found stocks (equities) with Islamic Utility in the AltX.

In terms of qualitative screening, the South African market allows many industries that do not have Islamic Utility. Initial screening eliminated those assets within the qualitative stage of the screening process. We excluded companies that marketed that their business activity included interest-based financial industry, alcohol, most entertainment, and islamically prohibited animal-based industries in the same way as cited in the literature. However, two additional observations need to be noted.

Firstly, as in other countries, companies cannot be held responsible for how others use their products or services. South Africa has a large mining industry. Some companies supply explosives for mining. We deemed that their income has Islamic Utility since products offer an islamically social good and the trade of mined goods is permissible. The companies have limited control over how it is used once outside their control. Therefore, they cannot be held responsible for the use. Secondly, the explosives and weapons trades are well-governed in South Africa. Hence, explosives and weapons supply companies have Islamic Utility. However, investors may want to pay attention to the company's other business activities. If companies sell permissible products or services unethically, earnings would be considered *Riba* and have no Islamic Utility. When applying subjectivity, we ensured that we did not use hearsay. In that way, we justify using company audited financial reports and SENS data to determine if the company acted ethically. Each company's social business activity was evaluated using formal reports and data.

With similar reasoning, investors can screen companies' financial business activity. While companies on the SASI board must comply with the Yasaar criteria, they can secure interest-based business loans. Investors need to consider if the *Darurah* (duress) instrument applies in taking the loans. Debt is cheaper than equity. Hence, it suits companies to take on debt. Before evaluating if the debt to total assets ratio is less than 33.33%, investors may want to consider

26 The JSE could not supply data on the empowerment fund, hence it was excluded from the analysis.

if the company has any other cost-effective alternatives. For example, Muslims may fund business activities at lower rates since they cannot earn interest.

Further, accounts receivable and cash must be less than 50% of total assets, and the total interest and non-compliant activities income should not exceed 5% of total revenue. Investors could evaluate the reasoning behind the percentages. For example, the debtor book may have been sold, which may change the overall ratio. The cash inflow could then affect the interest earnings of the company. However, selling the debtor book could be a prudent good practice. Hence, the business activity justifies Islamic Utility. In each case, an investor can review the standard rules and decide if they want to keep the asset or not. We used audited financial reports and SENS data to verify the financial business activity.

Yasaar's 33.3% criteria fall on the conservative side since international practice allows up to 50% for extraordinary circumstances. South African investors can use this to their advantage. Should a company go over a limit to 35% (for example), they would remain within the upper limits allowed in other countries where a variance is allowed for extraordinary factors outside the investor's control. While still erring on the conservative side, investors can be flexible rather than execute costly rebalancing too often to maintain a strict 33.33%. The literature advised 20% variance. We adopted this approach in our screening.

One aspect Yasaar does not discuss explicitly in their model is screening based on a company that is part of a group of companies. Reviewing companies in this way may be open to investor interpretation. Since it is not in the Yasaar model, the investor may choose to apply the screening to the company only or consider the company as part of a larger organisation (including any subsidiary, parent or a group of companies as a whole). This screening becomes particularly important when companies are bought or sold, as it could change their Islamic Utility. For example, the group may have taken out an interest-bearing loan to buy the company and then made the acquired company responsible for the loan.

Further, any new acquisitions could change the primary business activity of the group. These considerations are not specified, or as per Yasaar's screening methodology, not considered in South Africa. Since the 20% variance is grounded in practice in other countries, it could be applied in South Africa when considering companies and their groups to review whether the

investor should withdraw their funds or not. We queried business activity using financial records and SENS data in these cases.

In concluding the discussion on equity selection, it appears that the current screening criteria do not cover all situations in South Africa, and subjective screening can be applied to address issues. In South Africa, screening follows the more conservative practice, while some screening criteria implemented in other countries are not implemented in South Africa. However, the global practice may offer guidelines to answer investors' subjectivity and make it easier to screen equities. Therefore, based on the discussion above, not only is it permissible to invest in some equities in South Africa, but subjective screening would also lead to a broader pool of equity assets than suggested by Yasaar. As such, H1 and H2 are satisfied for equities.

## 4.6 Bonds (*Sukuk*)

Retail *Sukuks* were first issued in 2016 in South Africa by Al Baraka Bank. They differ from conventional retail bonds in that the *Sukuk* must back islamically permissible business activity and pay-out performance-based coupons or maturity settlements (see: RSA Retail Savings Bonds, 2019). Performance-based coupons are not tied to lending rates. As per the literature, international practice is similar (see: Azmat et al., 2014). It shows that if *Qiyas* were applied, any retail bond that conforms to the above requirements would have Islamic Utility, whether issued by an Islamic bank or not. This is similar to equities in that the company does not have to declare itself as Shariah compliant to have Islamic Utility. Instead, bonds can be subjectively screened to test their Islamic Utility. Additionally, secondary market *Sukuk* trading is allowed, provided that the primary Shariah principles of the *Sukuk* are abided by in the secondary market.

Retail *Sukuks* are relatively new in South Africa. At present, there is no secondary market. Hence, little can be said about South African practice. A key issue when considering *Sukuks* is compliance. International practice includes a phenomenon called "*Fatwa*[27] shopping", where *Sukuk* originators look for the most favourable Shariah ruling to maintain a competitive edge. *Fatwa* shopping could happen more often when Shariah compliance occurs at an organisational level rather than centrally at a government level. South African bond issuers and investors

27 Raised by Azmat et al. (2014). A Fatwa is an Islamic ruling given by a Muslim Scholar.

should be mindful of this. Subject to this discussion, *Sukuk* investing is permissible and passes screening in South Africa. The Shariah portfolio investor should review the compliance subjectively before including the *Sukuk*. Hence, H1 and H2 are satisfied for S*ukuks*. In the future, S*ukuks* may be included in the MPT model.

## 4.7 Real estate, commodities and precious metals

This section combines the last three asset classes and discusses them together. Each of these can be directly invested in or traded. However, direct investment or trading is generally a full-time job of experienced managers and traders (see: Rosenblum, 2003). Our research focuses on investors who want to diversify and optimise their portfolios over a broad range of assets without necessarily becoming experts in any specific asset trading discipline like a commodities trader[28]. Therefore, after discussing the intricacies of directly investing in these asset classes, we took the approach of investing in companies that specialise in these assets as a proxy to investing in them directly.

Investors may invest in real estate in South Africa by either buying properties or buying equity in a real estate company. Real estate companies that trade in and manage property in South Africa will be discussed in detail in the data collection chapter (Five). These companies diversify their property portfolio and manage the operational risk inherent in real estate investment. Shariah portfolio investors may screen real estate companies based on the properties they buy and to whom they rent them (the tenant's business activity). They can choose their tenants, unlike manufacturers, who cannot control how their products will be used. Hence, they can lease to tenants whose business activity is acceptable to Islam. However, lessors may not know the financial status of the tenant. Hence, lessors cannot be held responsible for their tenants' debt to total assets ratio or other financial criteria. In such cases, investor subjectivity would apply.

28 As covered in the literature, investors of broad portfolios may screen across asset classes rather than become traders directly in the class (Masri, 2018; Uppal & Zaffaroni, 2016).

Similarly, some companies trade in commodities and precious metals in South Africa. Some companies offer commodities and precious metals trading platforms (like Luno[29] and eToro[30]). These platforms offer Shariah-based accounts. Primarily the accounts are interest-free, and there are no swap options. However, commodities and precious metal trading in Islam may be more complicated. For example, as per the literature, Islam prohibits trading in perishable goods before they ripen and suggests how to deal with outcomes if, after harvest, the quality and quantity are different (see: al-Bukhari, 2020c; Malik, 2020). Ownership in line with Islamic principles may be an issue[31]. The Islamic recommendations are not common practice in South Africa. Hence, understanding the South African practice and Shariah law regarding trading becomes paramount. Islam recommends that the buyer takes physical ownership of the goods. However, the commodities markets offer storage services and agents that manage the goods on behalf of buyers (investors). This would maintain the quality of the goods and shorten the time to market. Hence, South African investors must assess if they are comfortable with this arrangement and that the Islamic requirements are sufficiently met.

Trades can be highly speculative or involve practices that Islam prohibits. Hence, investors will have to use their discretion. For example, Islam prohibits the sale of animals if it involves speculating on the animals' unborn offspring (al-Bukhari, 2020b; Malik, 2020). Business activity based on unborn offspring is considered *Gharar* and therefore has no Islamic Utility. No literature covering this practice in South Africa could be found. Another example involves settling trades entirely and ensuring that possession of the funds or commodities occurs when the negotiations are conducted to avoid unintentional R*iba*. Therefore, using *Qiyas* of Hadith about gifts (see: al-Bukhari, 2020c), which addresses countries where *Riba* is prevalent, further research into commodities and precious metal trading in countries where interest-based practice is widespread would be advantageous. Since this scenario was not encountered in the South African context, it was not considered. However, there could be similarities to the trade in fresh produce, and the scenario should be studied further.

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29 https://www.luno.com/en/za

30 https://www.etoro.com/

31 Islam requires transfer of ownership with all associated risk (Muslim, 2020b).

This section proposed finding data on companies specialising in real estate, commodities, or precious metals. It allowed investors to find optimal portfolios over a broad range of assets rather than become an expert in a specialised area. Many companies on the JSE boards earn income from commodity or precious metal trading and could have Islamic Utility. There is no Islamic futures commodity trading available in South Africa at the time of conducting this study. Hence, we looked at secular markets and found that, like equities and bonds, there could be secular commodities that have Islamic Utility. Hence, H1 and H2 can be satisfied for the remaining asset classes.

## 4.8 Conclusion

In conclusion, chapter Four reviews general screening practices holistically in South Africa. Qualitative Shariah-based and quantitative financial-based screening has some established rules that assist in selecting assets across all asset classes and some that are more conservative than global practice (see: Hasan, 2020). The established SASI does not consider all available assets, like cryptocurrencies, the AltX board or bonds. Hence, subjective screening adds additional portfolio candidates. The South African *Sukuk* market is relatively new. Retail bonds are available, and the Islamic screening rules may be applied to establish their Islamic Utility. A secondary Shariah-based *Sukuk* market is not yet established, and there is little experience of secondary *Sukuk* investment in South Africa.

As far as real estate, commodity and precious metal trading is concerned, investors may trade in them directly or invest in companies that trade in them. Directly trading in these assets is generally reserved for experienced traders. In contrast, the purpose of this study is to find an optimal portfolio across many asset classes and rebalance portfolios periodically. Hence, we do not discuss directly traded real estate, commodities and precious metals where ownership and risks when trading directly need to be considered differently (see: Malik, 2020; Sharpe, 1994). Instead, we consider the company's Business Activity when trading in these underlying assets. Therefore, for portfolio diversification, when screening the data, where possible, companies that trade in these assets regular data was used in the analysis. In this way, hypotheses H1 and H2 will be satisfied, and MPT may be applied to all asset classes.

Based on the discussion, the contextual two-stage framework (figure 1, page 21) can be reviewed to allow investor subjectivity. The newly defined *Riba* and Islamic Utility allow

investors to look for opportunities in other assets. The discussion shows that while all asset classes can be Shariah-compliant, the business activity of company groups and specific treatment of their assets can change the compliance. Thus, we propose adding a third subjectivity stage when establishing Islamic Utility.

In this third stage, the Shariah portfolio investor applies the standard Shariah and financial rulings. At the same time, the investor's subjective opinion influences his decision to include the assets in his portfolio even if they are not considered in stages one and two. Thus, figure 1 would be amended to include a third stage, as depicted in figure 5 below.

**Figure 5: Overview of the Conceptual Framework - Establishing Islamic Utility**

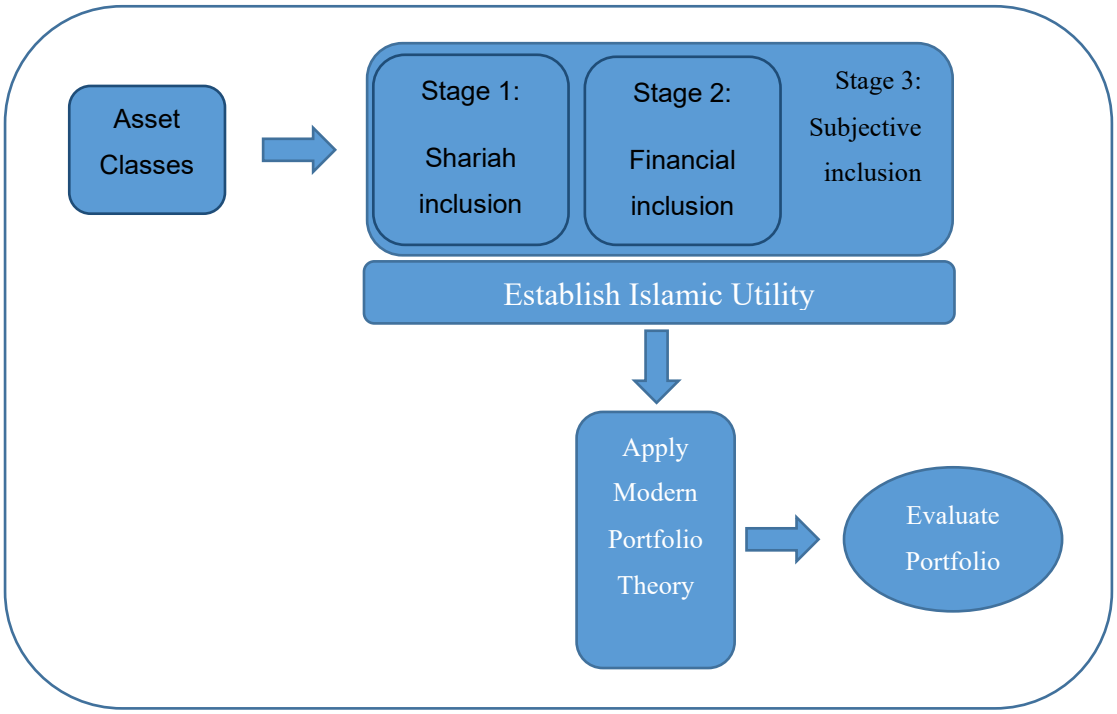



Figure 5 outlines the screening process we developed and applied in the following chapters. The subjective screening allows investors to select companies or other assets with Islamic Utility even though they may be rejected by basic stage one or two screening. As discussed, in stage 3, the investor can determine if the Stage 1 and 2 screening holds or not, allowing the investor to include previously excluded assets.

# Chapter 5: Quantitative research methodology

## 5.1 Introduction

Developing from chapter four, where we looked at the data at a class level, where we looked at each asset individually. We further qualify asset choice and explain the quantitative research methodology used. The chapter covers all asset types and explains where proxy assets were used. As a start, data from all companies that passed the Yasaar methodology (SASI constituents) was sought and retested against our subjectivity three-stage screening. Additional data that would fit an MPT model was sought to supplement the current set of SASI data. The new assets were subjected to all three screening stages as well.

The first step was to consider each asset's financial reports and Stock Exchange News (SENS) data. Once we found data (assets) that fit our subjective criterion, we cleaned the pricing data and imputed missing values. At the end of that process, we had a set of assets that had Islamic Utility. The data analysis showed that the two-stage screening would have eliminated more assets than our model. Further, when looking at how we treated each asset, we found similarities that allowed us to group them into themes. This is analogous to coding in qualitative research. The process led to screening scenarios that we tabulated as a practical guide to subjectively screen data. The new data set comprised 136 assets, including SASI, AltX, Cryptocurrencies and precious metals.

After the data preparation is discussed, the chapter concludes with the deriving data for the MPT model. The various ratios and their constituent calculations for MPT are discussed. The Chapter concludes with an explanation of the excel models we used for simulation and a discussion on how to analyse the results.

## 5.2 Quantitative research methodology – Understanding the primary data

The primary data used by MPT are asset closing prices ($p$), where the shortest period available is daily. The idea behind the study is to provide a way for the average investor to gather data and apply MPT. The data needs to be reliable to maintain validity. To ensure this, the same data that is publicly available was used. In most cases, asset data is freely available when investors open investment accounts. Since we compared portfolios against JSE indexes, we

requested JSE index data from the Johannesburg Stock Exchange[32]. Our application identified our study, and the data was provided for free. Investors will not need to make a comparison with indexes. However, if investors want to compare their own portfolios with index data, they may acquire it at a cost. Kagiso[33] and ABSA[34] fund data were available on the Kagiso website and Yahoo finance web services.

MPT attempts to optimise risk-return ratios by changing the weights of the constituents. The weights are a percentage of each portfolio candidate, and the total weight of all constituents is 100% of the capital invested. In order to compare MPT models to the current industry benchmarks, the same closing price data for the 136 assets was collected. The asset collection process provided a pool of 187 assets and screened down to 136. Price data of up to five years was available for these assets. The data were modelled repeatedly to rebalance portfolios as established in the literature (see: Allen et al., 2016; Contreras et al., 2016). We chose to rebalance 4 times a year (see: Grinblatt et al., 1995). Hence, we ended up with nineteen iterations of results.

Data collection under Islamic Utility depends on applying the Shariah rules of investing. The literature review outlines the relevant screening considerations. To recapitulate, the literature advises that the circumstances for different countries would dictate different screening criteria (Ashraf & Khawaja, 2016). Investors can apply analogous reasoning (*qiyas*) when screening beyond the current standard. *Qiyas* may be a new concept to the reader. To explain, Islam prohibits investing in companies that have interest-based debt or interest-based earning[35]. However, through *Qiyas*, Islamic Jurists ruled that those companies would pass the screening if the debt/equity ratio were below 33.33%. A further example of *qiyas* is where historical teaching advises against exchanging gifts in countries where interest is common[36]. This study considered these cases. For example, gift exchange between business representatives could be

32 https://www.jse.co.za/data/historical-data

33 https://www.kagisoam.com/sharia-investor/our-funds/islamic-equity-fund

34 https://finance.yahoo.com/quote/NFSH40.JO/history/

35 Islam forbids interest of any kind. This is discussed in Section 2.5

36 For a full discussion on Qiyas, refer to section 2.4

construed as a bribe. Hence, it is prohibited in Islam. However, business ethics promotes company gift registers as part of business governance. Under these circumstances, gift exchange may be acceptable. In this way, each company was analysed for their Islamic Utility using company profiles, audited financial reports and news (SENS data).

## 5.3 Data collection

The SASI is screened with the Yasaar methodology and reviewed quarterly (JSE Marketing, 2014). Many South African funds are derived from the SASI, like the Kagiso fund and the ABSA ETF. Therefore, the SASI and the available SASI-derived funds were used for comparison against the MPT analysis. In Chapter Six and Seven, we compared our simulations with these funds and indexes.

The SASI does not include JSE AltX data. Hence, we collected AltX data for our analysis and to test our definition of Islamic Utility. Daily returns data for the SASI and the AltX were obtained from the JSE (JSE Marketing, 2021b). Other stockbroker companies and financial websites also offer some data for free (for example, see: Yahoo, 2021)[37]. The data sets were compared and found to be the same. Gold and Rhodium data was obtained from an investment brokerage account. The AltX was introduced in 2003, and the SASI was introduced in 2007. Therefore, five years of data were available for this research. Five years' worth of data was analysed starting on 1 January 2015 and ending on 31 December 2019.

Lastly, Islamic Utility requires investors to consider the business activity. The JSE Stock Exchange News Service (SENS) is a verified database of reports. We obtained the data from the SENS Share data online (2020) repository. The repository has SASI, and AltX reports. The reports include acquisitions, cautionary notes and financial changes that may affect Islamic Utility. Interpreting the news is subjective. The data is provided quarterly. Our MPT analysis was conducted to match the SENS reports, where our decisions trailed the news by one period.

## 5.4 Cleaning and classifying the data

Before the screening, the data needed some clean-up. The SASI was the first data set reviewed. Over the period, some company names changed while their share codes remained the same.

37 In practice, investors do not need fund and index data. We used it to prove our research questions.

Some of these were attributed to data capture errors, while others were updated to reflect the company's new name. Similarly, some companies' share codes were changed. The changes are attributed to changes in the company's structures. In many cases, the SENS data clarified the changes. The SENS reports provided the required information for screening advice that could be aligned within the three screening stages (see: Figure 5: Overview of the Conceptual Framework - Establishing Islamic Utility, page 101).

Once the data was cleaned, each company's business activity was reviewed to assess its Islamic Utility. The data were classified using an industry list derived from Stats SA (Statistics South Africa, 2001) and PWC (PWC South Africa, 2010) since these two lists appeared to be investor standards. We found the SASI included companies that engage in the Financial Services industry and retail and consumer industry that offer islamically prohibited goods and services. These were reviewed, and it was found that they were within acceptable limits as per the Yasaar requirements and our findings in the literature. Hence, we accepted the companies.

In addition to the above, some companies trade explosives for mining purposes. Explosives could be used as weapons of mass destruction. At first glance, this appears to be contrary to the literature. However, an investigation of these companies revealed that either the percentage makeup met Yasaar criteria, or their business activity was in line with the country's legislature[38].

The finding above guided thinking around the third (subjective) stage for establishing Islamic Utility. Clearly, as argued in the literature, circumstances in different countries would affect screening. In South Africa's case, investors may invest in companies that supply explosives for mining. These companies are regulated by legislation. However, as argued in the literature review, they cannot control how their products are used after they are sold. Therefore, in practice, investors may invest in responsible companies and follow their country's legislation without the risk of violating Shariah Law. Based on this argument, this thinking was applied to all the data (SASI and AltX).

38 See the South Africa's Anti-Terrorism bill, (Republic of South Africa, 2015a) and Organized Crime Legislation, (Republic of South Africa, 2015b).

Since Yasaar does not screen the AltX, the same stage 1 and 2 screening review for the SASI was applied to the AltX data. Additionally, each company's business activity was classified according to the Industry List before being individually screened. As with the SASI, there are many companies whose business activity may not comply with Shariah law at first glance. Some cases are clear where the companies are involved in finance and insurance, while others offer various goods and services requiring in-depth investigation. Finance and insurance companies were excluded. As for the rest of the companies, the primary source of information used to screen them was the audited annual reports and the available SENS data. This meant that while the MPT-based portfolio was balanced quarterly, the companies' business activity could only be verified annually. It implies that investors could unknowingly be invested in companies that fail any three screening stages during a financial year. It would be irrational to consider their income forbidden if they subjectively applied themselves before the year's activity.

In some cases, the investigation into the business activity did not clarify the percentages of permissible earnings. These were excluded from the study if it appeared that they did not have Islamic Utility. For example, the asset and wealth management company Anchor Group Ltd appeared to work primarily in finance and was eliminated. Similarly, other companies' data established scenarios that could not be answered by stages one and two. Hence, stage three screening was conducted to answer said questions. The following paragraphs highlight the findings.

Several scenarios became evident. The first scenario was related to real estate companies listed on the AltX board. These companies owned shopping centres whose tenants may sell prohibited goods like alcohol. In many cases, tenant details and contribution percentages were not published in annual reports. However, the annual reports showed that these companies have large property portfolios with a diverse tenant base, implying that the percentage of tenants conducting prohibited business could be small. Hence, they were included in this study.

The second scenario involved companies that are subsidiaries of other companies. As discussed in Chapter Four, investors may choose to consider the company as an individual or as part of a holding company where the business activity of the holding company is considered. We considered the holding company in stage three screening since holding companies often fund

subsidiaries. An example presented itself in a scenario that further describes the thinking behind stage three screening. Imbalie Beauty LTD's business activity includes several product ranges, including a manicure service (Dream Nails). The annual reports showed that Dream Nails accounted for most of the earnings. Nail painting is prohibited in Islam. Hence, under stage 3 screening, Imbalie was excluded. This type of thinking was applied to all the data (companies).

The third type of scenario also relates to a subsidiary's holding company. Their holding companies were listed in the SASI, AltX, or the All-Share boards. If their holding companies were not in the SASI, their annual reports and SENS data were reviewed. We found several cases where they failed the screening. A review of the examples highlighted two issues in Stage 3 screening. The first was in considering how the business activity of subsidiaries impacts holding companies. Even though they may not be a majority asset as a percentage, they could provide most of the earnings. Dream Nails is again an example where they provided most of the income. The second issue is that if investors choose to analyse Islamic Utility at a holding company's level, permissible subsidiaries may be excluded along with the holding company. Hence, investors must consider how they treat companies subjectively as it may impact their portfolio candidates. We rationalised the more conservative approach of considering the entire organisation since the relationships between the companies affect each other.

The fourth scenario that presented itself was companies that collected funds over several years. Applying stage two screening, they would be excluded when the cash asset exceeded 33.3% of total assets. Under current stage one and two screening, the data showed that the companies had Islamic Utility in one year and then lost it the following year due to their cash holdings. However, under stage three, the reasons for accumulating the cash were investigated using the annual reports and the SENS data. We found that some companies collected funds to acquire new assets or companies, buy back shares, or manage liquidity to stabilise the company. In these cases, the companies were considered to have Islamic Utility provided that the business activity remained permissible. We included these companies in our data set.

A fifth scenario considered companies' social contribution. Investors might consider supporting these companies in such cases since it means supporting jobs or other social responsibilities. In terms of this study, the view taken was that if the business activity was permissible, their

social contributions acceptable, and they incurred less than 50% loans[39], the company was to be included even if they failed the Yasaar test. When analysing the data, it became apparent that the scenarios might change within a year, resulting in companies losing Islamic Utility for a short while during the financial year. However, business activity had returned to acceptable levels by the time the annual reports were viewed. Hence, Ho's consideration is essential when considering Islamic Utility.

Other observations of the data showed that companies on the AltX were bought during the analysis period. When screening the data, these historical occurrences were considered as well. Since this study was conducted retrospectively, care was taken when analysing any period of data not to treat the data as retrospective. It means that the company's Islamic Utility status was considered current until the annual reports advised otherwise.

Some companies were also liquidated during the period. If these liquidated companies met the screening criteria before the period, they were included in the analysis. We accepted that the funds were lost when the liquidation news was released. Additionally, some companies did not have audited or reliable annual reports. Hence, they were excluded. Lastly, portfolios were rebalanced quarterly, while audited financial reports were only available annually and a few months late. Where there was no SENS data available during the financial year, benefit was given to companies to remain in the portfolio.

Interrogating these scenarios falls within Stage 3 (subjective) screening and is summarised in the table below.

39 Employing 20% religious considerations where environmental circumstances permit (Ho, 2015).

**Table 3: Summary of stage three screening scenarios**

| *Scenario* | *Description* | *Subjective response* |
|---|---|---|
| *1* | Companies with a small percentage of prohibited business activity. Regardless of the company being a whole or a subsidiary. | Several companies hold a small percentage of prohibitive assets in their portfolio. This case appeared the same as with other companies included in the SASI. A more in-depth investigation into the percentages was considered and the period for which these were held. Ho's (2015) consideration was adopted. |
| *2* | Subsidiaries whose prohibitive business activity constituted most of the earnings of the group. | Subject to the screening in scenario 1, subsidiary companies whose asset value was low were included. However, they were excluded if their prohibitive business activity contributed the most earnings. |
| *3* | Consider Holding Companies business activity. | In some cases, the subsidiary itself had Islamic Utility. However, the subsidiary was excluded when the holding company failed the screening. |
| *4* | Building cash reserves | The Yasaar screening process eliminates companies that are building cash reserves. However, employing the Ho (2015) consideration, the purpose of building cash reserves was considered. (Financial companies were already excluded before considering cash reserves.) |
| *5* | Religious consideration | Religious consideration included softer issues like Islamic social acceptance and contribution to society, which were in line with Ho (2015). |
| *Other observations* | Annual financial reports as opposed to quarterly rebalancing | Only audited annual financial reports were considered. In many cases, the only reliable information available was the annual financial statements. Therefore, the benefit was given to the company during the rebalance exercises. |

The AltX comprised 60 assets[40] from 1 January 2015 to 31 December 2019. Of these, 12 were eliminated by Shariah Screening (Stage 1). Twenty-two assets were excluded by Shariah Financial Screening (Stage 2), where their debt/total asset ratio failed the Yasaar test, and three companies did not have reliable annual financial reports. The remaining 26 were submitted to subjective screening. Two companies belonged to holding companies that were already

40 This is a count of the unique share codes. Some shares got new share codes during the period.

excluded. Two companies held high cash reserves from time to time, and there were no reasons for accruing the cash. Therefore, they were eliminated. After eliminating assets that failed the subjective screening (stage three), 22 AltX assets remained. These were added to the SASI data for MPT analysis. The last three assets included in the analysis were precious metals and cryptocurrencies. As per Agha et al. (2015), precious metals are used in account form instead of stored physically. There are gold and rhodium exchange traded funds listed on the JSE that track the metals' prices. Bitcoin was added via a cryptocurrency trading account. Based on the discussion above, 136 SASI, AltX and the gold and rhodium exchange traded funds, and Bitcoin made up the data set used in the MTP analysis.

In terms of the discussion to this point, we determined what is permissible in each asset class and discussed how the assets would be screened according to our three-stage method. As such, hypotheses H1 and H2 are answered. The third and fourth hypotheses use our derived dataset. Thus, the data has to be prepared for analysis.

## 5.5 Data preparation for analysis

After screening the companies and establishing a data set with Islamic Utility, the data for the companies was collected in a convenient excel format. The data comprised the historical (daily) date and the corresponding end-of-day closing price. This is the highest frequency data available; from this, investors could extract different periods (for example, weekly or monthly) of data as per their discretion and subjectivity. All assets were collated into a single spreadsheet. If any data point was missing, averages were imputed using the day before and the day after. If there were a few days of missing data, each missing data point was calculated incrementally (or decrementally) from the day before. Subjectively, it was excluded if any data was missing more than 5 data points.

The calculation used was:

$$cp_{t+1} = cp_t + \frac{cp_n - cp_1}{n-1}, for\ all\ missing\ data, m; \textit{where:}$$

$t = 1.m$

$n = (m + 2)$

The data was captured in the form as represented in Table 4, where it was captured in ascending chronological order and alphabetically by their share code.

**Table 4: Data for MPT analysis**

| ***Date*** | **Asset 1** | **Asset 2** | **Asset 3** | **…** | **Asset n** |
|---|---|---|---|---|---|
| *2015/01/01* | 51 | 720 | 883 | .. | 74 |
| *2015/01/02* | 45 | 740 | 879 | .. | 70 |
| *:* | : | : | : | : | : |
| *2019/12/31* | 47 | 752 | 877 | .. | 68 |

*The blue section of the table contains an example of the tabulated data.*

All the data was converted to South African cents (currency), and returns normalized, with the initial investment of 100 cents being the total portfolio initial investment. Since MPT relies on complete historical data during each analysis period, only assets where all the data was available for that period could be used. Further, since long-only constrained MPT analysis uses positive returns data, the data was screened for assets with positive returns (*p end date – p start date > 0*) to manage the size of the data set.

Table 5 presents a comparison of the current benchmark funds that were used in the analysis. All data reflects statistics for the five-year analysis period, even though some funds may have started before.

The table is recreated from the discussion in section 3.7. It presents the summary statistics and ratios for each fund and index. The results of the simulations will be compared with these funds and indexes in Chapters Six and Seven.

**Table 5: 5-year summary statistics of analysed funds and indexes**

| | SASI | AltX | Kagiso Islamic Equity | ABSA Shariah Top 40 |
|---|---|---|---|---|
| ***Value on 31 December 2019*** | ZAR 1,23 | ZAR 0,71 | ZAR 1,27 | ZAR 0,97 |
| ***average Daily Returns*** | 0,00% | -0,04% | 0,01% | -0,02% |
| ***Std Dev*** | 1,14% | 1,22% | 0,64% | 2,16% |
| ***Drawdown (σ)*** | 0,69% | 0,95% | 0,38% | 1,45% |
| ***Sharpe Ratio*** | 0,24% | -3,42% | 0,87% | -0,75% |
| ***Sortino Ratio*** | 0,39% | -4,41% | 1,47% | -1,11% |
| ***Sterling Ratio*** | 5,83% | 6,76% | 9,16% | 0,65% |
| ***Treynor Ratio*** | 0,06% | 1,05% | 0,11% | -0,91% |
| ***Kurtosis*** | 1,2372 | 68,5308 | 2,06 | 141,33 |
| ***Skewness*** | -0,0844 | -4,1046 | -0,03 | -0,3 |

Table 5 shows mixed performance for funds derived from the same set of assets. Fund managers can find portfolios with lower risk or higher earnings than the market. The distributions are leptokurtic[41] and negatively skewed, meaning tight variance with more probability of earning above the average returns. Alt-X appears to be more volatile than the SASI or SASI-derived funds. Hence, its assets may not readily be included in the MPT portfolios. This is considered in the discussion.

[41] Excel calculates excess kurtosis. See the Appendix: Returns Distributions of the SASI and AltX indexes, and Kagiso and ABSA funds for the graph and explanation.

## 5.6 Deriving data and simulating MPT

The rest of this chapter discusses deriving the variables used in the Modern Portfolio Theory (MPT) Model. After that, we consider how to verify MPT modelling results using an established test for robustness.

We derived the variables using the primary data. We explain how we calculate the average earnings and their associated volatility using Microsoft Excel. Drawing from the literature, we show how earnings and volatility are interpreted differently for the various risk-reward ratios. The chapter shows our derived variables for each risk-reward ratio and concludes with proposed robustness tests and a discussion on our analysis technique. This sets the stage for Chapter Seven, where we discuss the findings of our simulations.

## 5.7 Deriving the variables

The (primary) price data was extracted daily. This data was used to derive average returns and earnings volatility for those returns. MPT optimises risk-return ratios to suggest an efficient portfolio. The risk-return ratios are made up of average returns and standard deviation (volatility). Therefore, for all four ratios, the variables are derived as some form of average returns and their associated volatility. The list of derived variables for the ratios are listed in table 6.

**Table 6: List of derived variables and in which ratios they are used.**

| | **Sharpe** | **Sortino** | **Sterling** | **Treynor** |
|---|---|---|---|---|
| *Returns (Numerator)* | | | | |
| *Expected returns* | X | X | | X |
| *Compound annualised rate of return* | | | X | |
| | | | | |
| *Risk (Denominator)* | | | | |
| *Standard deviation* | X | | | |
| *Drawdown standard deviation* | | X | X | |
| *Beta of the expected return* | | | | X |

Table 6 shows the variables that are used for calculating the four ratios. The numerator is derived as a form of returns for each ratio, while the denominator is derived as some form of

associated risk as dictated by the ratio[42]. For example, the table shows that the Sterling numerator is calculated differently from the other three ratios. The rest of this section discusses the derived variables and shows how they were calculated.

### 5.7.1 Expected returns

The first derived variable is expected returns. The natural log (*ln*) of the change between a period *(t)* and the period before *(t-1)* was taken to determine periodic returns. The natural log helps produce normally distributed data supporting the MPT assumption. Returns and utility are used interchangeably.

*Expected Returns (utility) are calculated as:* $ln(p_t/p_{t-1})$; *where:*

*t: is the date of the data point*

### 5.7.2 Compound annualised rate of return

The Sterling ratio differs from the other ratios in that it uses a compound annualised rate of return. Since we started using data from 02 January 2015, we did not have an entire year's worth of data for the first three iterations. Therefore, for the first three iterations, the frequency was multiplied by the number of quarters the period represented. The first was $^1/_4$, the second $^1/_2$ and the third $^3/_4$. Thereafter the standard $CARR$ was used:

$$CARR = (number\ of\ quarters) * 252\left(\left(\frac{end\ price}{start\ price}\right)^{1/252} - 1\right)$$; *where:*

*Number of quarters = 0.25; 0.5; 0.75; 1*

42 The details of each ratio composition are provided in section 3.5.

### 5.7.3 Standard Deviation, volatility or risk

Standard deviation expresses the average distance the data is away from the data's mean. It tells us with how much certainty we can use the asset's returns mean. Assets with smaller standard deviations may be used with more certainty than others since, historically, the returns are more stable. The equation for standard deviation is:

$$\sigma_x = \sqrt{\frac{\sum(x_i - \mu)^2}{n-1}};\ where:$$

$$\sigma_x: asset\ x, standard\ deviation$$

$$n: the\ number\ of\ data\ points\ (from\ 63\ to\ 252)$$

$$x_i: where\ i = 1\ to\ N, is\ the\ i^{th}\ value\ of\ the\ data$$

### 5.7.4 Drawdown standard deviation

Drawdown is defined as the maximum peak to trough drop over a period. In our case, we consistently use daily data. Therefore, drawdown standard deviation is calculated on drawdown data where the peak to trough is within a day. The data is filtered such that any upward movement is made zero. Drawdown standard deviation is calculated in the same way as standard deviation. However, the interpretation is slightly different, where we only know the stability of potential loss. It could be that the potential loss is certain, while the gains are relatively erratic.

Further, In this case, $n \leq number\ of\ data\ points$. Hence investors could use this to know how often there is a drawdown. If screening two very similar assets, *n* could help to choose better-performing assets.

### 5.7.5 Beta of the expected return

Beta is a calculation of systematic risk. Effectively, beta gives us a view of how much of the volatility of the asset can be described by the market's volatility. Generally, beta is measured over the entire analysis period (in our case, up to one year). However, if calculated that way, we would not be able to apply MPT since MPT optimises covariance of assets (as a matrix) to optimise portfolios. To create a matrix of covariances, we calculated monthly betas for each

asset and created a covariant matrix of betas to use in MPT. Hence to create our covariant matrix of betas; first, we calculated beta as:

$$\beta_{at} = \frac{cov(R_{at}, R_{mt})}{var(R_{mt})}, \textit{where:}$$

$$R: Returns$$

$$a: is\ any\ asset\ (a = 1 - n)$$

$$m: all\ the\ assets\ of\ the\ market$$

$$t: is\ the\ month\ in\ the\ period\ analised\ (t = 1\ to\ 12)$$

$$covar_{xy} = \frac{\sum(x_i - \mu)(y_i - \mu)}{n - 1}$$

$$var_x = \sigma_x^2 = \frac{\sum(x_i - \mu)^2}{n - 1}$$

Thereafter we took the (up to) 12 monthly sets of Betas and applied a matrix multiplication to create a matrix of covariances.

## 5.8 Simulations

When simulating portfolios, we rebalanced the portfolios every three months. We repeated the process over the five-year period starting 02 January 2015 (the first trading day in our analysis period). We wanted to use 252 trading days (one year's worth of trading data points) for each simulation. However, the first three iterations had less data since our data set started at the beginning of 2015. Therefore, we used less data to predict the portfolios. In some cases, there were less than 252 trading days in the calendar year. To compensate, we used data from the previous December to make up the 252 data points.

Table 7 shows the periods used and the number of data points per period. Once we had 252 data points, 252 points were used for the remainder of the simulations.

**Table 7: Number of data points per period.**

| *Iteration* | **Period length** | **Analysis Period** | **Number of data points** |
|---|---|---|---|
| *1* | Three months | January to March 2015 | 63 |
| *2* | Six months | January to June 2015 | 123 |
| *3* | Nine months | January to September 2015 | 187 |
| *4* | One year | January to December 2015 | 252 |
| *We used 252 of the latest data points thereafter* | | | |

For each simulation, all the derived variables were calculated with the number of data points tabulated above. The following section explains how all the variables were derived in Microsoft Excel.

## 5.9 Excel functions used in the analysis

The analysis was conducted in Microsoft Excel Professional Plus 2016. The functions used are:

LN: natural logarithm.

STDDEV: Excel assumes that the data is a sample of the population.

VAR: calculates the variance of a sample

COVAR: calculates the variance of a sample

MMULT: calculates the matrix products

### 5.9.1 Robustness

The modified CAPM from section 3.9 was also calculated in Excel using various coefficients and betas calculated for the Treynor Ratio. The calculations are straightforward, and since we benchmarked errors ($\varepsilon_{it}$) when comparing results with our MPT, we made $\varepsilon_{it}$ the subject of the equation. The equation becomes:

$$\varepsilon_{it} = -\alpha_i - \beta_{i0}(Rm_t - Rf_t) - \beta_i' Z_{t-1}(Rm_t - Rf_t) + R_{it} - Rf_t$$

## 5.10 Analysis

Preliminary tests include comparing the various MPT models (using the different ratios) and the current South African products. The difference of two means t-Test will be used to evaluate the models' expected returns and volatility (DeFusco, McLeavey, Anson, Pinto, & Runkle, 2015). From a practical point of view, the models are built using an older period of data that is applied to data in a newer period, thus providing real-world results. Since we conducted the study on historical data, we can test our results with the following period's data, answering the performance evaluation questions proposed.

To summarise section 3.5, each ratio's volatility (risk) interpretation differs. The Sharpe Ratio gives the total (upside and downside) volatility, Sortino uses drawdown (downside only) volatility, Sterling uses the Largest Average Drawdown volatility, and Treynor uses the Beta of the expected return. Each ratio predicted a different weighted portfolio. A straight comparison of the model's portfolios would be unfounded since the volatility interpretation for each ratio is different. Therefore, all the ratios were calculated for all the models to analyse the risk and results. Additionally, the distributions for the next rebalance period were analysed as well.

Thereafter, as proffered by hypothesis four, an analysis of different market proxy rates, efficient frontier curves, tangent slopes, and loss probability was undertaken. MPT's efficient frontiers proposed the most efficient portfolio for a given set of assets. Efficient frontiers are created by considering all the weights ($\omega_i$ *= 0 to 1 to each asset i*) that can be shared between the assets. The efficient frontiers form curved lines where the total returns could be positive or negative depending on the weighting of each asset. Efficient frontiers present portfolios with Lower and higher risk than any individual assets. The next step in MPT is to choose an optimal portfolio. Graphically this is achieved by drawing a horizontal line at a specified hurdle rate. Choosing any portfolio below the line implies choosing a portfolio that earns less than the hurdle rate.

Similarly, choosing any portfolio above the line implies higher than hurdle rate returns. MPT implies that the optimal portfolio is one where the line is lifted from the horizontal until it makes a tangent with the efficient frontier curve. It will not be possible to choose a portfolio above the curve. Hence there can be no portfolio above that tangent. Therefore, the intersection

is the optimal portfolio. As you lift the line, this observation implies that the point where the line intersects with the curve gives the expected returns and the associated risk as a risk-reward ratio. The optimal portfolio is where the line intersects the curve as a tangent and gives the highest value ratio.

Typical efficient frontiers are depicted in figure 6.

**Figure 6: MPT efficient frontiers example**

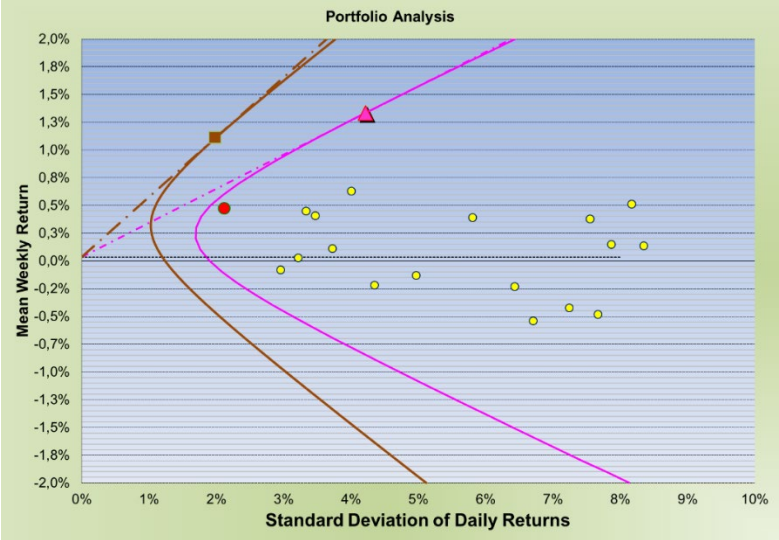



Figure 6[43] plots average periodic (weekly) returns on the y-axis and risk (volatility) on the x-axis. The yellow dots represent the different assets with weekly returns on the y-axis and their associated volatility on the x-axis. The red dot represents a South African Shariah investment product. The pink and brown curves represent efficient frontiers with the Sharpe and Sortino Ratio, respectively. The pink triangle and brown square represent their associated optimal, efficient portfolios modelled with MPT. The straight lines are the associated tangents from some market hurdle rate.

Graphically it becomes evident that different ratios for the same set of assets provide different efficient frontiers and portfolios. The tangent lines' slopes show how returns' sensitivity varies

43 Figure 6 is only used for explanation purposes since it clearly demonstrates the discussion. It is not derived from the results in this paper. This graph was derived from real data and was the clearest graph that could be created. It works for explanation purposes.

for changes in risk. Since the risk (denominator of the ratio) is interpreted differently, a direct comparison may not make sense. However, it is possible to calculate all four ratios for each portfolio. In other words, once the portfolio candidates are found under the different ratios, their other ratios for that portfolio can still be calculated to compare the portfolios.

The graph also shows a South African Shariah investment product (the red dot). As per the graph, the portfolio sits inside the efficient frontiers. Any portfolio not on the line implies that for the set of assets, either more returns (higher utility) could be earned for the same risk, or the risk itself could be lower. Hence, it appears that current products could be inefficient, providing an opportunity for academic discussion.

## 5.11 Conclusion

In this chapter, we explained how we collected and cleaned the data for any inaccuracies. Further, we classified the data into industries generally used by investors. Thereafter, we reviewed that data, excluding all data that did not have Islamic Utility. We conducted an in-depth analysis of each asset where five scenarios of business activity became apparent. These scenarios provide a basis for subjective screening (stage three). Finally, we checked for missing data and imputed the data if five or fewer data points were missing. If the data had six or more missing points, it was excluded from the final data set. After this analysis and cleaning, we had 136 assets for our MPT analysis. The next chapter develops the excel MPT model and uses the data to derive portfolios.

Thereafter, we discuss deriving the variables used in MPT. The derived variables are different forms of earnings and associated volatilities. These variables are used to derive the various risk-reward ratios. Microsoft Excel was used to calculate the ratios. The chapter presents the excel functions used and prepares the platform for running MPT optimisation simulations in Microsoft Excel. We discussed using the Capital Asset Pricing Model as a test for robustness and concluded with a high-level explanation of the MPT models' efficient frontier and optimal portfolio choices.

# Chapter 6: Analysis and discussion of empirical results

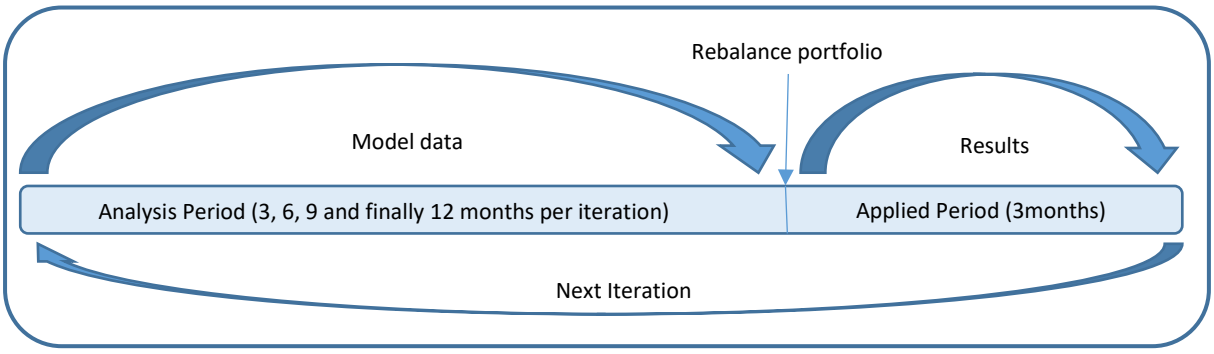
## 6.1 Introduction

The purpose of this chapter is to present a quantitative analysis of the screened dataset. As proposed, AltX, Gold and Rhodium data were included with the SASI in the analysis set. The chapter starts with contextualizing the data and analysis period. Thereafter, we define the MPT model in excel and follow up with the testing approach. We follow with a comparison of the modelled returns against the established indexes and funds. The discussion accounts for *Zakat* CPI and reinvesting dividends. The chapter concludes with a detailed statistical analysis and discussion of the model's predictive performance and robustness.

## 6.2 Analysis periods

The data was available from 2 January 2015 to 31 December 2019. The study used one year's historical data to predict a portfolio. However, less data was used for the three-month, six-month, and nine-month periods until a full year's data was available. As per the literature, the analysis was repeated every three months, and the portfolios were rebalanced. The results were used to derive returns for the next three months. Each iteration was moved forward by three months, and the suggested portfolio candidates applied to the next three months to extract results. The three-month period's results going forward were taken as actual returns that the portfolio would have yielded. Graphically, the analysis and rebalance timeline is represented in figure 7.

**Figure 7: Depiction of how data was used to model portfolios**




Nineteen iterations were completed giving returns from 1 July 2015 to 31 December 2019. For the twelve-month periods (iteration 4 to 19), the latest 251 data points for that period were

used. The average number of investment trading days in a year from 2015 to 2019 was 251. Table 8 explains how the periods were established.

**Table 8: MPT analysis and results periods**

| *Iteration* | Period length | Analysis Period | Portfolio Purchase Period |
|---|---|---|---|
| *1* | 3 months | January to March 2015 | April to June 2015 |
| *2* | 6 months | January to June 2015 | July to September 2015 |
| *3* | 9 months | January to September 2015 | October to December 2015 |
| *4* | 12 months | January to December 2015 | January to March 2016 |
| *5* | 12 months | April 2015 to March 2016 | April to June 2016 |
| *6* | 12 months | July 2015 to June 2016 | July to September 2016 |
| *7* | 12 months | October 2015 to September 2016 | October to December 2016 |
| *8* | 12 months | January to December 2016 | January to March 2017 |
| *9* | 12 months | April 2016 to March 2017 | April to June 2017 |
| *10* | 12 months | July 2016 to June 2017 | July to September 2017 |
| *11* | 12 months | October 2016 to September 2017 | October to December 2017 |
| *12* | 12 months | January to December 2017 | January to March 2018 |
| *13* | 12 months | April 2017 to March 2018 | April to June 2018 |
| *14* | 12 months | July 2017 to June 2018 | July to September 2018 |
| *15* | 12 months | October 2017 to September 2018 | October to December 2018 |
| *16* | 12 months | January to December 2018 | January to March 2019 |
| *17* | 12 months | April 2018 to March 2019 | April to June 2019 |
| *18* | 12 months | July 2018 to June 2019 | July to September 2019 |
| *19* | 12 months | October 2018 to September 2019 | October to December 2019 |

For the rest of this study, referring to an analysis period means the three, six, nine and twelve months of data.

## 6.3 The MPT model in excel

MPT maximises a risk-return ratio for a set of input assets (data). In the case of the Sharpe Ratio, where the *Sharpe Ratio* = $\frac{(R_x - R_f)}{\sigma_x}$, the returns (numerator) is the daily returns minus the set hurdle rate. The hurdle rate was set at 7.5%. The rate was calculated as the average CPI for 2015 to 1029 (5%) plus the *Zakat* rate (2.5%). The volatility (denominator) is the standard

deviation of the returns for a period. Similarly, the numerators and denominators were calculated for each ratio tested in this analysis.

The optimisation problem was set out as per the excel sheet below. Figure 8 represents the optimisation model, and column H presents the matrix multiplication formulas used in excel to calculate each variable. The last calculation gives the optimised ratio results.

**Figure 8: Depiction of the excel MPT model**

| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| 1 | **Code** | **Weight** | | | | | | |
| 2 | **ACG** | 10,00% | | | Portfolio Return | 0,03% | | MMULT(TRANSPOSE(Weights); TRANSPOSE(Mean Returns)) |
| 3 | **AEL** | 10,00% | | | Portfolio StdDev | 0,92% | | (MMULT(MMULT(TRANSPOSE(Weights); Covariance); Weights))^0,5 |
| 4 | **AFT** | 10,00% | | | Portfolio DD StdDev | 0,52% | | (MMULT(MMULT(TRANSPOSE(Weights); CovarianceDD); Weights))^0,5 |
| 5 | **AGL** | 10,00% | | | Portfolio Beta | 15,72% | | (MMULT(MMULT(TRANSPOSE(Weights); Betas); Weights))^0,5 |
| 6 | **AMS** | 10,00% | | | Sharpe Ratio | 0,02 | | (Portfolio Return-(Return hurdle Rate))/Portfolio StdDev |
| 7 | **ANG** | 10,00% | | | | | | |
| 8 | **ARI** | 10,00% | | | SumOfWeights | 100% | | |
| 9 | **BIL** | 10,00% | | | | | | |
| 10 | **BTC** | 10,00% | | | | | | |
| 11 | **CLR** | 10,00% | | | | | | |

Portfolio returns are calculated as the weighted excess returns $\omega_i(R_x - R_f)$ for each asset. The assets and their weights form vectors that are multiplied together to give a scalar product. The result becomes the numerator of the Sharpe Ratio. Next, the weights and covariance of returns of the assets are multiplied to derive a scalar Portfolio standard deviation (the denominator). SumOfWeights is used to ensure that the weights of the assets add up to 100%. Similar calculations derived the other ratios.

The excel optimisation model uses Generalized Reduced Gradient Nonlinear optimisation. The optimisation objective is set to maximise the risk-returns ratio by changing the weights. The optimisation model weights are constrained to $\geq 0$ (zero) to eliminate short selling (negative weights). Each asset was given equal weights as a starting point for the model. The constraint precision was set to 0,001, and the number of iterations set to 1000. The parameters were kept the same for all four ratios and all 19 iterations. All the iterations converged, giving optimal portfolio suggestions.

## 6.4 Comparison of returns

Using historical returns in simulations does not guarantee future returns. However, they offer a manner of understanding the behaviour of assets and portfolios and assist investors in decision-making (screening). The study simulated how investors could determine optimised portfolios based on the modelled risk-return ratios discussed in sections 3.5 and 5.7. Thereafter, the investors can subjectively choose and rebalance their portfolios as they see fit. For example, investors could have selected results of a single ratio over the five years and continuously rebalanced their portfolios based on that ratio. Alternatively, the expected returns and risk modelled for each ratio could have been considered for each iteration, and the portfolio for the next investment period selected the best-performing ratio for the next iteration. For the results, we used the actual returns of the Sterling Ratio (instead of compounded annualised rated returns) in order to be consistent with the other ratios.

Table 9 presents the summary statistics for the Shariah indexes, Shariah funds and the MPT analysis we conducted in column 1. The last two rows tabulate the results of our subjective investing portfolio and the best possible portfolio based on our iterations. The Best Returns portfolio assumes that an investor was always able to select the best-performing portfolio after each iteration. The difference between our subjective and best portfolio shows that there could be room for improving analysis. Section 5.10 discusses our detailed findings on improving screening in this regard.

Since this study aimed to find alternatives to the popular Sharpe Ratio investing, we subjectively chose portfolios with lower drawdown volatility and higher returns. This did not make Sortino the only choice. The literature indicates that the models are predictive only. Hence, we looked at the modelled risk-reward results and made choices. In this way, we chose between the four ratios models at each iteration. Section 3.5 and 5.7 discusses the ratios in detail, while this section discusses the results. Together, the findings further answer hypothesis 4[44]. Hypothesis 4 proposes that Modern Portfolio Theory applied with the various ratios

44 *H4: Modern Portfolio Theory applied with the various ratios can outperform current South African Shariah-compliant funds and indexes.*

outperform current South African Shariah-compliant funds and indexes. Where optimisation means either higher returns for some expected risk or lower risk for some returns. The results tabulated in Table 9 suggest that hypothesis 4 is supported. The Final Returns column (column 2 of the table) shows the actual growth of the indexes and portfolios from 1 July 2015 to 31 December 2019. Column 3 shows the final returns after subtracting Zakat and CPI, and the following two columns show total volatility and drawdown volatility. The last two columns show the Sharpe and Sortino ratios for each portfolio. So, for example, the SASI has a Sharpe Ratio of -9.14, while the Sharpe Portfolio (calculated in MPT with the Sharpe Ratio) has a Sharpe ratio of 19.61.

**Table 9: Summarised comparison of results (red results are below the hurdle rate)**

| ***Portfolios*** | **Final Returns** | **Net Return after Zakat and CPI** | **Std Dev (Risk)** | **Std Dev DD (Drawdown risk)** | **Sharpe Ratio of the portfolio** | **Sortino Ratio of the portfolio** |
|---|---|---|---|---|---|---|
| *SASI* | 118,68% | -10,38% | 1,14% | 0,75% | -9,14 | -13,82 |
| *AltX* | 80,96% | -48,10% | 1,12% | 0,84% | -42,83 | -57,36 |
| *ABSA* | 93,59% | -35,47% | 2,63% | 1,84% | -13,48 | -19,24 |
| *Kagiso* | 128,94% | -0,12% | 0,65% | 0,42% | -0,19 | -0,28 |
| *Our MPT iterations:* | | | | | | |
| *Sharpe portfolio* | 146,40% | 17,33% | 0,88% | 0,59% | 19,61 | 29,49 |
| *Sortino portfolio* | 149,24% | 20,17% | 0,94% | 0,61% | 21,37 | 32,81 |
| *Sterling portfolio* | 159,26% | 30,20% | 1,01% | 0,65% | 29,86 | 46,55 |
| *Treynor portfolio* | 114,99% | -14,07% | 1,06% | 0,69% | -13,22 | -20,24 |
| *Subjective* | 133,60% | 4,53% | 0,91% | 0,60% | 4,99 | 7,52 |
| *Best Returns* | 201,66% | 72,60% | 0,74% | 0,47% | 97,82 | 153,14 |

The results show that MPT generally outperforms the current funds and indexes. Treynor is the exception where it performs below the SASI. The (Net Returns after Zakat and CPI)[45] column

45 The hurdle rate was set at 7.5% (5% CPI and 2,5% Zakat). Therefore, funds would have needed to grow approximately 29% over the investment period to break even.

shows that none of the current funds and indexes kept up with the cost of living, whereas MPT and subjective screening did. The following two columns, Risk and Drawdown Risk, show that our risk profiles are generally lower than the current alternatives, except for Kagiso. However, MPT generally had higher returns than Kagiso. The last two columns show the popular Sharpe Ratio and, based on our drawdown screening, and we present the Sortino Ratio's results. It can be seen that except for Kagiso as a benchmark and our Treynor Ratio results, the simulated portfolios outperformed the existing indexes and funds, hence supporting Hypothesis 4. Even though Kagiso may be a viable fund, it did not add value to the investor since its returns were less than the Hurdle rate. The Best returns row shows that investors could have earned 72,7% returns more for risk comparable to Kagiso. Hence, the following two sections analyses screening further.

## 6.5 Discussion of the risk-reward ratios

Thus far, answering hypotheses 1 and 2, we successfully argued that investors could benefit by including additional assets (AltX, Gold, Rhodium, and Bitcoin). Further, we have shown that Shariah-based investments can outperform current indexes and funds (hypothesis 3). Lastly, we used MPT modelling on historical data to optimise returns, proving that MPT modelling can provide better-performing portfolios (hypothesis 4). However, we have not analysed which ratio provides the best prediction and under what circumstances this is achieved. Hence, hypothesis 4 is not wholly answered. This section explores a deeper analysis of the results of the ratios, providing a more comprehensive answer to hypothesis 4.

The results (Table 9) show that choosing between modelled results (Subjective and Best Returns) can improve performance. Table 10 below shows how many times each ratio was chosen.

**Table 10: Summarised comparison of results**

| *Risk-reward Ratio* | **Subjective Returns** | **Best Returns** |
|---|---|---|
| *Sharpe* | 6 | 4 |
| *Sortino* | 10 | 1 |
| *Sterling* | 3 | 6 |
| *Treynor* | 0 | 8 |
| ***TOTAL iterations*** | **19** | **19** |

The Subjective and Best Returns columns of Table 10 count how many times each ratio was chosen for the respective Subjective and Best portfolios. For example, in the Subjective Portfolio, the investor would have chosen the Sharpe Ratio six times, Sortino ten times and Sterling three times in the 19 iterations. The table shows that we should have selected Sterling and Treynor portfolios more often. Since they were not the obvious choice, we need to investigate when they are appropriate. The literature review suggests that a review of the statistical distributions can infer portfolio suggestions. Therefore, our discussion turns to an in-depth analysis of the results and their statistical information to better understand the results of the ratios. For the Subjective Returns, we constantly chose ratios that gave lower drawdown volatility, and when the drawdown was very similar, we chose the higher returns. Best Returns simulates the total returns an investor would have been able to get if the investor always chose the best performing model at each iteration. The results show that for lower risk, higher returns were attainable.

Since the Sortino Ratio aims to minimise drawdown risk, it stands to reason that it was chosen most of the time. It is equally interesting that the Sterling Ratio did not always provide the lowest drawdown risk. Some stocks are traded more actively than others (for example, some are traded daily, others weekly), and risk profiles could differ over different periods. Further, our simulations were limited to 1000 iterations. If the number of iterations was changed, the convergence could be different. Further studies into these observations could shed light on the reasoning.

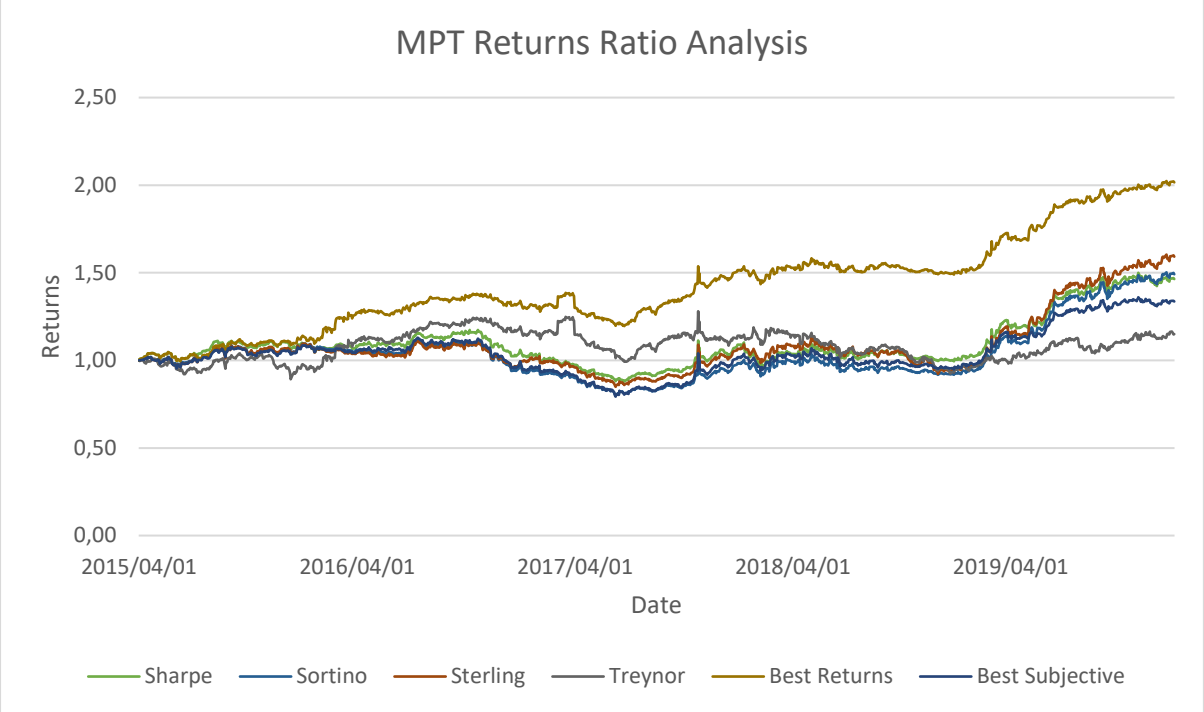
Similarly, the Best Returns column tabulates what the investor should have chosen. Best Returns portfolio used the Sterling and Treynor ratios more than the Sharpe and Sortino ratios. This scenario reveals that our objective for subjective screening is not the only solution and that investors may need other screening tools to identify best-performing portfolios. We discuss statistical inference as an additional screening tool that could assist investors in selecting the most predictive models in section 6.5.

The table above suggests that the Treynor Ratio yielded higher returns in eight of the 19 iterations. This was more than the second-highest ratio, with the Sterling Ratio at six times. Therefore, further analysis was conducted to understand why. In the subjective portfolio

selection, Treynor's Sharpe Ratios were consistently lower than the others, while Drawdown Risk was consistently higher. Hence it was never picked in the Subjective Portfolio.

During the analysis, some assets were delisted. In several cases, Treynor picked those assets. Hence, any investment made in them would not have been accessible for future rebalancing. The SENS data did not always alert investors to this possibility. While investors may still have value in those assets, they were excluded from future iterations, and the Final Returns exclude them. Delisting is a risk in equity investing, and all the models were affected. While the numeric results are not as crucial for this study, Treynor could have a high final return and associated Sharpe Ratio if the delisted assets could have remained included. The investigation further showed that sometimes Treynor could predict the highest returning portfolio. It could also predict the lowest, making it the most volatile.

**Figure 9: MPT results over the entire period**




Firstly, Treynor appears to predict better returns with more data. In 2015, where there was less data, it predicted the worst performing portfolios twice. In 2016 Treynor was the Best Results portfolio choice. Conversely, in 2019, where all the other ratios predicted high-performing portfolios, the Treynor predicted lower-performing portfolios.

Upon inspection of weightings over the periods, Treynor often chooses weights very differently from the other three ratios. This contributes to Treynor's unique performance. For example, there are periods when Treynor predicted the worst-performing portfolio, and the other ratios also performed poorly. However, the portfolio Treynor predicted recovered entirely in the next period, while the other ratios did not. Table 11 shows the example data and returns over two periods discussed in the example. The table shows two periods in 2017: April-June (Period 1) and July-September (Period 2). The four ratios' weights for each of 3 assets is tabled along with the ratios returns. For example, in Period 1, the Sharpe Ratio suggested an investor invest 21.68% in Asset 1, 9.81% in Asset 2 and 7.52% in Asset 3. The return for that portfolio was -7.58%.

While the values are unimportant, the difference in portfolio weight choices and the results are. It appears that Treynor can predict a somewhat unique portfolio where a loss could quickly be recouped. To show the principle, the table presents the weightings of the three top assets selected by each ratio over the Period 1 where a significant loss occurred in all portfolios. The market recovered in Period 2. However, while the Treynor loss was the biggest in Period 1, it recovered the most in the next period. Longer-term studies could investigate if Treynor predictions are good for recovery scenarios.

**Table 11: Example the period where Treynor predicted the highest recovery**

| | **Apr - June 2017** | | | | **Jul - Sep 2017** | | | |
|---|---|---|---|---|---|---|---|---|
| | Asset 1 | Asset 2 | Asset 3 | **returns** | Asset 1 | Asset 2 | Asset 3 | **returns** |
| *Sharpe* | 21,68% | 9,81% | 7,51% | -7,58% | 14,01% | 10,84% | 10,80% | 5,35% |
| *Sortino* | 21,14% | 7,87% | 6,70% | -8,49% | 13,22% | 11,19% | 10,32% | 3,78% |
| *Sterling* | 22,93% | 8,69% | 7,08% | -8,55% | 14,45% | 10,99% | 10,89% | 3,95% |
| *Treynor* | 9,83% | 5,37% | 4,49% | -12,12% | 6,67% | 6,67% | 6,67% | 14,94% |

Treynor is different from the other three ratios in that it optimises Betas. Betas may give insight into why Treynor outperformed the other three ratios most (8 out of 19 iterations) of the time. Betas were calculated for all four ratios suggested portfolios. The data were grouped into Betas, where Treynor's should have been chosen, and when they should not have. Correlation and r-squared (coefficient of determination) statistics were calculated to test whether the two groups differed. Table 12 tabulates the results.

**Table 12: Summary statistics where Treynor predicted unique portfolios**

| | | Sharpe | Sortino | Sterling | Treynor |
|---|---|---|---|---|---|
| *Treynor as the best solution (8 iterations)* | Correlation | -0,44 | -0,49 | -0,53 | 1 |
| | r-squared | 0,20 | 0,24 | 0,28 | 1 |
| *Other ratios as the best solution (11 iterations)* | Correlation | 0,98 | 0,78 | 0,76 | 1 |
| | r-squared | 0,96 | 0,61 | 0,57 | 1 |

While the data sample may be small, the table presents a difference in correlation between when Treynor should be favoured as opposed to when it should not. When Treynor produced the best portfolio, there was a relatively strong negative correlation with the other three ratios. This is observed in the data where Treynor recovers from a preceding loss while the other ratios do not.

When Treynor was not the best solution, there was a strong positive correlation. Similarly, the r-squared statistic shows that when Treynor is the preferred model, there is a low association of the model's performance attributed to the benchmark SASI (where SASI represents the Beta). The case is different where the other models (the 11 iterations) predicted superior results. The correlation and r-squared statistics suggest that when the Treynor model predicts a relatively divergent portfolio from the other three, it could yield higher returns and vice versa when it correlates with the other three models. This could be used in building subjective portfolio screening.

When calculating Treynor, the first iteration used only three months' worth of data. Treynor was not the suggested portfolio for the period. However, the Treynor Ratio value was 516,98. This is ten times the magnitude of the other 18 Treynor values. It is based on little data; hence we considered it an outlier for further statistical analysis. However, despite its exclusion, the results were similar to the results in Table 11, adding credibility to the observation that negative correlation suggests Treynor is the best screening candidate at that juncture. In our study, Treynor was interpreted and derived with up to twelve monthly Betas in an analysis period. As the first interpretation in a study using Treynor in this way, it proved that it could predict increased returns. The twelve, monthly periods could be changed, and the results analysed in further study.

Further, while Sharpe and Treynor use total volatility, Sortino and Sterling use drawdown volatility. Research using Beta Drawdown volatility with Treynor ratio could be conducted. Where the model becomes:

$$Drawdown\ Treynor\ Ratio = \frac{(R_x - R_f)}{Drawdown\ \beta_x};\ where:$$

$R_x$ *: is the Expected Return*

$R_f$ *: is the risk-free rate (market proxy)*

$Drawdown\ \beta_x$ *: is the Drawdown Betas of the Expected Return*

Similarly, since Sterling was the next favoured model, a hybrid Sterling, Treynor ratio could provide further insight into portfolio optimisation. The model would be:

$$Hybrid\ Ratio = \frac{CARR}{|covariance\ (Drawdown\ \beta_x)|};\ where:$$

*CARR: compound annualised rate of return*

$covariance\ (Drawdown\ \beta_x)$*: the covariate matrix of Drawdown Betas*

Hypothesis 4 proposed to test if Modern Portfolio Theory applied with the various Ratios outperforms current South African Shariah-compliant funds and indexes. The discussion so far proves that they can. However, we have not looked at predictiveness or how the distributions assist with selecting portfolios. Section 6.5 explores predictiveness and distributions. Further, this study proposes that a time lagged modified CAPM can test for robustness, and a difference of two means test can evaluate the advantage gained. Subsection 6.6 discusses these subjects.

## 6.6 Predictiveness and distributions

Thus far, we have discussed the best performance using the four ratios. However, we did not look at their consistency in terms of their predictions. MPT suggests portfolios with predicted risks and returns into perpetuity. We rebalanced every three months. Hence, we do not know if the suggested portfolio would have stabilised over time to the prediction. Instead, we tested how similar the predictions and actuals were in our nineteen interactions. Using Excel's Paired

Sample of Means t-Test, we accepted the null hypothesis for all four ratios[46] indicating that the predictions and actuals could be significantly different. The finding suggests that the MPT perpetuity assumptions may not simply apply when portfolios are rebalanced over shorter periods.

Further, we conducted two sets of paired One-Tail z-Tests. The first set was between the SASI and the six MPT models[47], and the second was between the Kagiso Fund[48] and the six MPT models. The null hypothesis was that the MPT Models are the same as the SASI and Kagiso Fund (control samples). Since all the p-values were less than our alpha (0.05), we rejected all the null hypotheses that there is no significant difference in the means of each sample, meaning that our models outperformed the control samples. Another interesting observation was that the Best Returns comparisons gave a p-value of zero. It could be attributed to computational rounding in Excel. However, it indicated that the results are highly significant. The main difference between Best Returns and the other MPT models is that it includes more Sterling and Treynor iterations. It appears the inclusion of more Sterling and Treynor iterations in the best-performing model gave the most significant results, warranting further study of the Sterling and Treynor Ratio.

46 Where the p-values were less than our alpha (0.05)

47 The six MPT models include the four ratios, the Subjective and the Best Results tests.

48 Since the Kagiso fund is the best performing Shariah based fund.

In line with the literature, we calculated the kurtosis and skewness of the 19 iterations results. The comparison was between the ratios in question (six Sterling or eight Treynor) and any of the other three ratios as a group. The Sterling results aligned with the literature, favouring leptokurtic, negatively skewed distributions[49]. Table 13 presents our findings.

**Table 13: Sterling Ratio distribution summary of calculations**

| | **Average** | | **Standard Deviation** | |
|---|---|---|---|---|
| | Sterling | Other Ratios | Sterling | Other Ratios |
| *Kurtosis* | 0,0031 | -0,5857 | 0,0033 | 0,4805 |
| *Skewness* | -0,7040 | 0,0839 | 0,4371 | 0,3879 |

Table 13 shows the summary statistics for Sterling's kurtosis and skewness. The average and standard deviation of the six times Sterling was chosen as the best choice is compared to the thirteen times when the other ratios were chosen. Comparatively, the table shows that when Sterling distributions are close to normal (low average (0,0031) and standard deviation (0,0033)), Sterling is a worthy subjective choice for a portfolio. Similarly, Sterling would be a good screening candidate if the distribution is negatively skewed. Note that the skewness of the standard deviation was not suggestive for Sterling. The Treynor results differed from the literature in that the platykurtic distribution predicted portfolios with higher returns.

**Table 14: Treynor Ratio distribution summary of calculations**

| | **Average** | | **Standard Deviation** | |
|---|---|---|---|---|
| | Treynor | other | Treynor | other |
| *Kurtosis* | -0,8038 | 0,2261 | 0,6975 | 3,8901 |
| *Skewness* | -0,0431 | 0,1897 | 0,5023 | 0,8946 |

Table 14 presents the summary statistics showing negative kurtosis and skewness, meaning that the distribution will have fatter tails with more data on the positive side of the average. The standard deviations of the kurtosis and skewness were markedly lower when Treynor was

49 As per Table 10, in the best performing portfolio, Sterling would have been chosen 6 times.

the best choice. These results give pointers that investors can use when selecting portfolios (screening).

The platykurtic, negatively skewed distribution should also be investigated for other ratios. In both cases, the negative skewness predicts a higher probability of higher-than-average returns. However, current literature suggests only leptokurtic distributions are predictive, while we found evidence that platykurtic distributions could also propose portfolios. Further studies with bigger sample sizes could provide more precise suggestions. In practice, investors wanting to use this screening method would employ the principle of analysing the current data and applying it one period forward, as depicted in figure 5 (page 121).

## 6.7 Testing robustness

As per the literature, we used the Modified Capital Asset Pricing Model to test for robustness. The model is reproduced here with the error as the subject of the formula for ease of reading:

$$\varepsilon_{it} = -\alpha_i - \beta_{i0}(Rm_t - Rf_t) - \beta_i' Z_{t-1}(Rm_t - Rf_t) + R_{it} - Rf_t$$

$R_{it}$: *excess return on asset* $i$ *in the period* $t$ *(net of the risk-free rate)*

$\alpha_i$: *abnormal performance of asset* $i$

$(R_{it} - Rf_t)$: *excess returns of the portfolio over a benchmark at time* $t$

$Rm_t$: *excess returns on the benchmark asset*

$(Rm_t - Rf_t)$: *excess return of the benchmark at time* $t$

$\beta_{i0}$: *systematic risk for the asset* $i$ *for the current period*

$(\beta_i' Z_{t-1})$: $\beta_i'$ *is the vector of conditional Beta related to the time-lagged predetermined instrument* $Z_{t-1}$.

$\varepsilon_{it}$: *forecast error for asset* $i$ *at time* $t$.

The literature review on robustness proposed comparing errors in MPT and the Modified CAPM to test robustness. For the Modified CAPM, $\varepsilon_{it}$ was made the dependent variable of the equation. The model uses historical data for each of the variables. $\beta_i'$ is time-lagged. Hence, we had to exclude the first iteration. Therefore, we calculated 18 iterations using the Betas and

the predicted portfolios from the previous iteration. For consistency, the historic Betas used are the covariate, weighted Betas derived in the MPT models.

By making $\varepsilon_{it}$ the subject of the formula, we are effectively taking the current performance and subtracting all other calculated performance factors. The error is then the unexplained performance. We need to create a similar measure for MPT. Hence, we calculated the errors as the difference between actual and predicted returns. The errors could be negative, where the actual returns were lower than the predicted or time-lagged return estimations. To calculate the magnitude of errors, we took the absolute value of the error as a percentage of the actual return.

Table 15 presents the results of the MPT and CAPM magnitude of errors. MPT tended to give more consistent predictions where the average and standard deviation of the magnitude between the 18 iterations was lower than that of the Modified CAPM. Next, we tested for correlation between MPT and Modified CAPM. The last two rows show that MPT and modified CAPM degree of correlation and the r-squared determination is relatively low. Treynor is negatively correlated. This stands to reason as CAPM uses Betas, and Treynor minimises Beta. It can be concluded that while both methods (MPT and Modified CAPM) have some errors, the MPT models tend to be more accurate and hence, more robust than CAPM.

**Table 15: Example where Treynor predicted unique portfolios[50]**

| | Sharpe | Sortino | Sterling | Treynor |
|---|---|---|---|---|
| *Average Magnitude – MPT* | 18,46% | 20,35% | 22,27% | 17,18% |
| *Average Magnitude – Modified CAPM* | 29,85% | 28,32% | 29,73% | 40,73% |
| *Standard Deviation – MPT* | 11,11% | 13,26% | 13,15% | 14,53% |
| *Standard Deviation – Modified CAPM* | 16,42% | 15,48% | 19,29% | 21,96% |
| *Correlation between errors* | 0,35 | 0,27 | 0,01 | -0,31 |
| *r^2* | 0,12 | 0,07 | 0,00 | 0,10 |

While the data sets are small (18 iterations over five years), this is an interesting finding where Sharpe uses total volatility, Sortino and Sterling uses Drawdown volatility, and Treynor uses monthly aggregated covariate Betas. As established in the study, Treynor could yield better

50 Please see the appendix for the periodic and t-Test results.

results if it becomes more evident when to pick a Treynor portfolio. Different period aggregated Betas and a comparison of errors with the Modified CAPM could assist with that and should be studied. Lastly, we considered a Paired Two Sample for Means t-Test between MPT and CAPM errors while considering the analysis. However, since we raised in section 6.5 that we rebalanced MPT every three months, which affected the predictions into perpetuity, we excluded a t-Test analysis.

## 6.8 Conclusion

This chapter on data analysis established that the broader data screening included assets like AltX assets, Gold, Rhodium, and Bitcoin offered additional investment opportunities. The chapter followed with a description of how Excel was used to optimise the risk-return ratios and apply an MPT model. Further, we showed how we could force long-only optimisation in the Excel model.

We conducted 76 simulations and combined them as 19 iterations. Lower risk and or higher returns were set as the criteria for improvement. We chose a low drawdown screening methodology when choosing portfolios. The MPT model's results were significantly better than the indexes and established funds. However, we found that even in subjective screening, there were more efficient possibilities. We explored the results of the iterations further and discussed that the interpretation of betas allows more efficient portfolios, warranting further study. Lastly, we tested the efficiency of our models against established benchmarks. Not only did our study find that MPT could yield significant results, but that the results were more robust when compared to CAPM pricing models. Hypothesis 4 is now answered. Answering the four hypotheses answered the four research questions.

# Chapter 7: Summary, implications and conclusions

## 7.1 Conclusion

The purpose of this study was to evaluate the performance of Shariah Investments in South Africa. The study opened with a discussion of *Riba* in the context of investments. *Riba* is ordinarily defined as financial interest. However, Umar ibn Al Khattab (RA) advised that *Riba's* definition is incomplete. We began the study by reviewing the current environment to understand how Shariah investing differs from conventional investing. We used the Islamic Sciences of Quraan and Hadith interpretation to redefine *Riba* as any income contrary to Islamic belief. This was followed by posing the research problem as an Economic Utility problem in investments. We used the newly defined *Riba* to define Islamic Utility as utility earned by engaging in islamically permissible business activity. In line with this thinking, investors are expected to act responsibly by judging assets' permissibility in terms of Islamic social benefit and acceptable Islamic risk.

In order to fulfil the Islamic Utility requirements, the Islamic investment principles were reviewed and applied. We found that the industry's current two-stage screening process benefitted from an additional third subjective stage. In the first stage, investors needed to screen portfolio assets according to Islamic social rules. The second stage required compliance with specific financial rules. We found that investors could investigate and understand the reasons behind the asset’s current position beyond interest and the two-stage rules. We introduced stage three, where assets were screened against additional considerations regarding organisational structures, stakeholders, employee well-being and financial planning. The considerations included subjective screening based on permissible Business Activity in the country, the permissibility of funding sources and flexibility in interpreting debt. We suggested that the subjectivity be based on fact. Hence, we used audited financial statements and SENS data to evaluate assets.

As the discussions evolved, we differentiated between asset classes and highlighted different screening considerations for each. These discussions provided the basis for selecting the data for different types of assets. The screening discussions cemented the concept of the third subjective screening stage (figure 4) to amend the current two-stage framework (figure 1). This third stage allowed for a more comprehensive interpretation of *Riba* and Islamic Utility. The

results were tabulated as scenarios to consider in Table 3. The list of scenarios is based on our observations. As the other asset classes mature, there could be additional scenarios. However, at this point, hypotheses 1 and 2 were answered for this study.

In terms of fund performance, the literature suggested that even though there are additional screening criteria for Shariah-based funds, these funds may compete with conventional funds. We tested this finding using Modern Portfolio Theory (MPT) analysis with four derived risk-reward ratios. We confirmed that the returns of each simulated Shariah fund generally performed equivalently or better than the main index. The discussion at this point answered questions 1 to 3. The data was subjectively screened during each period to simulate rebalancing.

The final screened data set was subjected to MPT analysis using the Sharpe, Sortino, and reinterpreted Sterling and Treynor ratios. Sterling and Treynor Ratios are generally used at the end of a period to assess the performance and volatility of the reward earned. We reasoned that we should use these ratios to choose portfolios instead of only to evaluate performance at the end. We interpreted the ratios to use them over an investment period similarly to the Sharpe and Sortino ratios. This study was the first to interpret Sterling and Treynor in MPT as far as we could find. The study noted that investment analysis on historical data is not meant to provide guaranteed future returns. The analysis only provides predictive advice for investors. Hence, while the results themselves proved that investors could find higher-earning portfolios, the essential findings are that the newly interpreted ratios and subjective portfolio rebalancing can provide higher, less risky returns than the current funds. The results were tested for statistical significance and robustness, wherein the results were statistically significant. We considered testing the statistical significance of MPT against Capital Asset Pricing Model (CAPM) results. However, since historical performance is not guaranteed to future performance and we rebalanced often, we considered the finding unimportant and not worth further investigation.

Lastly, the study found that the third and fourth hypotheses were also answered. All the risk-return ratios provided either higher returns for less risk and could be used in portfolio rebalancing. An interesting outcome from the analysis was that the best-performing portfolio might not have been considered in the investor's subjective reasoning. To understand this

observation, we calculated all ratios for all rebalancing iterations and compared the results. This comparison negatively biased the Treynor Ratio. The Treynor Ratio calculated with betas predicted high return portfolios but at relatively high risk. Hence, the Treynor results were hardly used. However, if investors could predict the best-performing portfolio at each rebalance period, they would have included the Treynor portfolios. Since the Sharpe and Sortino Ratio biased Treynor negatively, further analysis was conducted to identify when Treynor may be the best candidate. Statistical analysis suggested ways to predict when to invest in a Treynor-based portfolio by observing the previous period's performance and the shapes of the statistical distributions.

Finally, our objective was to establish Islamic Utility as a mechanism for an average investor to evaluate Islamic permissibility where there was no guidance. We accomplished our goal using Islamic sciences of interpretation to redefine the space, and our additional objectives used Islamic Utility to find more efficient investment opportunities. Our results show that this was accomplished.

## 7.2 Contributions to knowledge

### 7.2.1 Theological contribution

This study contributes to the body of knowledge in several ways. First, *Riba* was analysed and redefined. Historically, the Islamic leaders considered the definition of *Riba* incomplete. Islamic banking did not develop at the same time as secular banking. It appears that the Quraan's definition was adopted hastily to meet the growing need for Islamic products, while the Prophet's (saw) advice that further explains *Riba* was not. This resulted in the simple view that *Riba* is defined as interest, and the financial industry developed around that view. However, we showed that when applying the Islamic sciences with historical text, several examples of Riba apply in the modern world. We used digital sources to draw several collections of historical text together. In this way, we could ensure that several sources supported our interpretations. This type of analysis is new in the research space. Using this technique, we redefined *Riba* comprehensively to exclude all forms of islamically impermissible income.

This alone is a contribution to knowledge with far-reaching influence. All business activity can be reviewed under this definition. While it may not change the world, people considering their

religion can draw from this in their conduct in general. For example, the Hadeeth listed spoke about protecting the wealth of orphans. If Riba was only about interest, trustees could use orphans' wealth in other problematic ways. Hence, we think that looking at *Riba* more broadly contributes to social well-being. As another example, the Quraan says that with *Riba*-based transactions, payers, receivers, and accountants are equally guilty. In our case, investors have a large amount of control over the three roles mentioned in the Quraan. Other categories in the finance industry, like credit, have less control. Further studies can investigate *Darurah* in scenarios where Muslims do not have control like investors do.

The new definition of *Riba* was used to define a new concept called Islamic Utility. While Utility is commonly used in economics, it has social beginnings where labour was traded for food and lodging. Hence, drawing Utility from a social or religious perspective and defining it in economics is causal. We unified the social and economic perspectives to define Islamic Utility as utility earned by engaging in islamically permissible business activity. This definition can also be applied in other research areas where social well-being or individuals' influence in the scenario dictates their response.

We found that South African investors are very conservative when screening. We tested the current model and introduced subjective discernment. Applying our subjective thinking, we re-evaluated the rules and rationalised what assets to include in a portfolio. Internationally, investors allow for a variance in the recommended asset test ratios, whereas South Africa does not. By implementing the allowance, we were able to take advantage of strategic business opportunities and reduce the amount of rebalancing required to keep our portfolios Shariah-compliant.

Lastly, we discussed the impact of our new definitions when screening different classes of assets. There are differences when considering the various asset classes. We explained how investors could apply our definitions to all the classes. Hence, we established Islamic Utility in all cases. However, we found little to no literature on many of the other asset classes and little to no literature on investing across classes under our Shariah context. We, therefore, introduced our thinking and offered that there are further research opportunities.

### 7.2.2 Empirical contribution

Once we defined how investors can decide on assets, we highlighted many ways to pick investment portfolios. We gave the pros and cons and indicated that we needed a standard way of comparing performance. Modern Portfolio Optimisation (MPT) fits the criteria since it holistically looks at behaviour and optimises portfolios. MPT's optimisation objective is maximising risk-reward ratios. We showed that MPT could be restricted to long-only portfolios to maintain Islamic Utility. The analysis used historical data and applied the suggested portfolio to the following historical period. This provided expected results as a test for the study's proposal. Further, when reporting our results, we accommodated Zakat. Hence our results show the actual performance that Shariah investors may expect. Current industry results do not reflect Zakat and expect investors to remove it. As such, their net returns would be further lowered.

We found that MPT need not be restricted to specific ratios and that other ratios may predict better portfolios. Hence, we reinterpreted ratios generally used at the end of an investment period to develop efficient portfolios when predicting portfolios. We calculated periodic returns for the Stirling Ratio and periodic Betas for the Treynor Ratio. The different ratios offered different portfolios and efficient frontiers, and the results show that the newly interpreted ratios predicted higher-performing portfolios. However, it was not obvious when to use them. Hence, we looked at the results and determined statistically when one solution may be a better choice than the others. We could identify that Treynor ratios predicted recovery portfolios better than the other ratios.

We concluded our empirical investigation by testing how robust our portfolio predictions were. The financial industry generally uses a CAPM modified to use Betas. Hence, we compared our results with CAPM. Both models predict future returns. However, the actual returns are not necessarily the same as the predictions. Hence in both models, there is an unknown. CAPM calls it the error term. We made the error terms for each model the subject of the formula and compared which model was more predictive. We found that our model had significantly lower errors. Hence our new models are more predictive, and between our four models, we can choose one over the rest.

## 7.3 Further research opportunity

### 7.3.1 Theological opportunity

We found many opportunities for further research in Islamic theology during the study. The literature shows that we have become complacent with incomplete definitions. A fundamental weakness of this approach is that we have not evaluated how theology may be applied in different countries' governmental environments. Studies of this phenomenon would bring out challenges with applying Islamic Utility across contrasting country laws. We looked broadly at countries with central advisory councils versus countries with independent organisation-level advisories. There is some literature comparing the two approaches. However, we did not delve into the South African context since this was beyond the scope of this paper. Instead, we adopted the current literature. South Africa has some central control where Islamic bonds were legislated. This hybrid environment could be a research opportunity. The South African Islamic bond industry is still in its infancy, and no data was available. Hence, we discussed it briefly but could not interrogate it at a deeper level. This will change in the future as organisations offer bond products. Their thinking behind the products could contribute to knowledge where each organisation's advisory may interpret Shariah differently.

Many Arabic terms like *Murabaha, Mudarabah, Musharaka, Ijarah* and *Wadiah* may also need to be redefined in South Africa's or other countries' contexts. These terms are used under a single definition in many different sections of the finance industry. Understanding these in different contexts can identify issues and reduce *Darurah*. For example, companies sometimes offer preferential shares, whereas Islam advises that this is not allowed. The preferential issue is generally used to attract high-profile investors. These investors help improve the portfolio fund ratings. Which in turn supports the portfolio's success. We mentioned that gift registers are a way of managing gifts in a secular country. Under that governance, could preferential share issues be acceptable? Understanding the Arabic terms in the context of these scenarios offers a research opportunity that will inform policy and product development.

We found that the literature was sparse when discussing asset classes other than equities. We noted that within each class, there are subtleties. In-depth studies in each class could uncover subtleties we did not find or discuss how to screen assets within these classes. Further, we focused on assets whose data can be used in MPT. Investors may want to invest in these other

assets whose data does not fit in MPT. We noted that we could consider the impermissible rental portions negligible when we looked at companies with large asset holdings. However, we considered how investors would exercise their purchases if they wanted to purchase a building with leases in place while abiding with Shariah. There are theological and empirical research opportunities in these alternative investment types.

### 7.3.1 Empirical opportunity

MPT is criticised for suggesting small portfolios. The Excel models can easily be modified to limit the sizes of the portfolios. Empirical research identifying a suggested minimum number of assets could be significant. Further, the data was calculated over specific sub-periods. Different sub-periods may yield different results. There are opportunities to consider different periods against each other, such as daily versus weekly versus biweekly. Alternatively, optimisation algorithms may be designed to dynamically iterate at different periods for each asset to find optimal solutions. Lastly, quantum computing is emerging and approaches optimisation differently. Restricted optimisation models like our Shariah case may be tested with Quantum algorithms.

Lastly, we tested different risk-reward ratios, and in some cases, this was the first study to use these ratios in MPT. Our findings showed that different ratios yielded the most predictive results at different times. Since our findings were significant, we proposed that the numerator and denominators could be further analysed to suggest new risk-reward ratios like a Treynor Ratio with drawdown Betas. Future research can consider alpha-based risk-reward ratios or seasonality in the subjective strategies.

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# Appendix

The guidelines collated into the lists below are drawn from my Master of Science dissertation[51].

## Guidelines for Tafsir of Quraan

Elias et al. (2005) expand that tafsir takes the following considerations when determining interpretations:

1. Philology of Arabic

   As has been discussed, Arabic is considered a divine and complex language. There are many ways in which words and phrases are used. Tafsir looks at the subtle differences in the expression used in the phrases.

2. Syntax

   Guarding against quoting single verses, this science helps create the context in which the verses of the Qur'aan offer guidance. The whole passage is taken into consideration. For example, in the second story of the Qur'aan, the first passage on riba/interest starts at verse 274 and ends at 281.

3. Etymology

   Etymology is the study of the source and derivation of a word or conjunction to understand the word in the context of the verse.

   A good example is the word cube. The Arabic word is Kabaah. Those familiar with Kabaah know it to be the black shrouded building in Makkah. It is also the word for a cube (like a Rubik's cube). Hence, depending on the conversation, the word would be understood appropriately. Another example is Taariq, which means leader, direction, guidance or to give way.

[51] Surtee, T. (2020). Compliance of South African legal and financial instruments with Shariah law. (MBA), University of the Witwatersrand, Johannesburg.

4. Derivatives of words

   Words could be derived from different sources, and hence their meanings could be different.

5. Semantics

   Semantics refers to understanding common phrases, figures of speech or metaphors, as derived in Arab culture.

6. Knowledge of rhetoric

   Applies to understanding the way that the Arabic language is used. As with any language, there is a cultural aspect to communicating in Arabic.

7. Understanding the pronunciation

   Even the pronunciations of words change their meanings. It is imperative to understand these subtle pronunciations when reading Arabic verses.

8. Understanding the fundamentals of faith

   Some analogies are only explained by knowing the faith and careful explanation of how this understanding of faith explains the analogy.

9. Principles of Islamic jurisprudence

   Understanding the principles used in Islamic law are important to enable the correct result when making interpretations.

10. Knowledge of the commandments

    Knowledge of the commandments refers to knowing which commandments have been annulled or changed. The knowledge includes knowing why something has happened and if it was replaced, which commandment replaced it.

11. Knowledge of Islamic jurisprudence

    This science involves using established Islamic law when making interpretations.

12. Knowledge of hadeeth

    Refers to the knowledge of hadeeth that explains specific verses of the Qur'aan.

13. Attaining the status of Wahabi

    Wahabi is a person who is deemed as guided by Allah (not like the revelation Prophets received). This person has to be accepted by scholars as a Wahabi and cannot claim this title.

## Guidelines for Tafsir of Hadeeth

Hasan (1994) has listed the rules used to interpret hadeeth. These rules are summarised as:

1. Knowledge of i'tibar ("consideration").

   I'tibar is related to the interpretation of hadeeth. There are hadeeth that are recorded only once, additionally where there is reliable mutaba'ah ("follow-up") or where there are several reliable shawahid ("witnesses").

   Hadeeth recorded once only are investigated where traditionalists search for other hadeeth to strengthen support for the hadeeth. Such research is termed i'tibar or consideration of hadeeth. If a supporting narration is not found for a particular hadeeth, it is declared as far'd mutlaq (singular) or gharib.

   For follow-up, when searching for the strength of a hadeeth, if the method of reporting a hadeeth was through an isnad (chain) of people, eg.:

   - Hammad b. Salamah, who sites his source as Ayyub.
   - Ayyub in turn sites Ibn Sirin.
   - Ibn Sirin sites Abu Hurairah.
   - Abu Hurairah, who heard from or was instructed by the Prophet.

   Then the research would be done to ascertain whether another trustworthy reporter has narrated it from Ayyub; if so, it will be called mutaba'ah tammah (full follow-up). Follow-up analysis is done where they work backwards from the closest narrator to the Prophet (saw), who, in this case, is Abu Hurairah.

   If the investigation of other narrators from Ayyub does not give results, a reporter other than Ayyub narrating from Ibn Sirin would be sought: if found, it will be called mutaba'ah qasirah (an incomplete follow-up).

   Mutaba'ah applies to the chain of narrators being similar and having some common root reporters, i.e. other reporters heard of the narration and reported it in a way that the name of the root reporter is stated. This is different from hadeeth that have the same

meaning, although it may be reported through a completely different chain of narrators. These hadeeth are called shawahid ("witnesses") hadeeth.

2. Afrad (singular narrations) are considered differently.
3. The type of character (of the person) required is that of an acceptable reporter.
4. The way a hadeeth is heard, and the different ways of acquiring hadeeth, e.g.:
    - We observed the Prophet.
    - The Prophet said.
    - We asked the Prophet who showed us.
5. How a hadeeth is written, and (Arabic) punctuation used. This expands on the intended meaning with emphasis placed on certain words or actions.
6. The way a hadeeth is reported (rule 4 applies to the first/root narrator), e.g.:
    - I heard from someone who observed the Prophet.
    - I saw someone who acted on what the Prophet said.
    - Someone showed us what the Prophet showed him or her.
7. The manners or character of traditionalists and students of hadeeth. This refers to the trustworthiness and social nature of the person (student).
8. Knowledge of a higher or lower chain of narrators (i.e. one with fewer or more reporters respectively).
9. Knowledge of difficult Arabic words.
10. Knowledge of abrogated (annulled or obsolete) hadeeth.
11. Knowledge of altered Arabic words in a text or chain of narrators.

12. Knowledge of contradictory hadeeth.

13. Knowledge of additions made to a chain of narrators (i.e. by inserting the name of an additional reporter).

14. Knowledge of hadeeth that are defined as mursal, i.e. hadeeth reported where the chain of narration is not stated in order to speed up the narration.

15. Knowledge of the Companions of the Prophet.

16. Knowledge of the Successors to the Companions.

17. Knowledge of elders reporting from younger reporters.

18. Knowledge of reporters similar in age reporting from each other.

19. Knowledge of brothers and sisters among reporters.

20. Knowledge of fathers reporting from their sons.

21. Knowledge of sons reporting from their fathers.

22. Knowledge of cases where, e.g. two reporters report from the same authority, one in his early life and the other in his old age; in such cases, the dates of death of the two reporters will be of significance.

23. Knowledge of such shariah authority from whom only one person reported.

24. Knowledge of such reporters who are known by several other names and titles.

25. Knowledge of unique names amongst the Companions in particular and the reporters in general.

26. Knowledge of names and by-names (kunyah).

27. Knowledge of by-names for reporters known by their names only.

28. Knowledge of nicknames (alqab).

29. Knowledge of mu'talif and mukhtalif (names written similarly but pronounced differently), e.g. Kuraiz and Kariz.

30. Knowledge of muttafiq and muftariq (similar names but different identities), e.g. "Hanafi": there are two reporters who are called by this name; one because of his tribe Banu Hanifah; the other because of his attribution to a particular Madhhab (school of thought in jurisprudence – discussed later).

31. Names covering both the aforementioned types.

32. Names that look similar but they differ because of the difference in their father's names, e.g. Yazid bin al-Aswad and al-Aswad bin Yazid.

33. Names attributed to other than their fathers, e.g. Isma'il bin Umayyah; in this case, Umayyah is the mother's name.

34. Knowledge of such titles which have a meaning different from what they seem to be, e.g. Abu Mas'ud al-Badri, not because he witnessed the battle of Badr but because he came to live there; Mu'awiyah b. 'Abdul Karim al- Dall ("the one going astray"), not because of his beliefs but because he lost his way while travelling to Makkah; and 'Abdullah b. Muhammad al-Da'if ("the weak"), not because of his reliability in hadeeth, but due to a weak physique.

35. Knowledge of ambiguous reporters by finding out their names.

36. Knowledge of the dates of birth and death of reporters.

37. Knowledge of trustworthy and weak reporters.

38. Knowledge of trustworthy reporters who became confused in their old age.

39. Knowledge of contemporaries in a certain period.

40. Knowledge of free slaves (mawali) amongst the reporters.

41. Knowledge of the homelands and hometowns of reporters.

## Comparison: CAPM and MPT Magnitude of errors by period

| *Period* | Sharpe | Sortino | Sterling | Treynor | | Sharpe | Sortino | Sterling | Treynor |
|---|---|---|---|---|---|---|---|---|---|
| *2* | 0,2188 | 0,2205 | 0,1937 | 0,2086 | | 0,2957 | 0,4649 | 0,5366 | 0,5541 |
| *3* | 0,2652 | 0,1642 | 0,1567 | 0,3996 | | 0,1262 | 0,1741 | 0,2248 | 0,1096 |
| *4* | 0,3535 | 0,3696 | 0,3956 | 0,0539 | | 0,139 | 0,0788 | 0,1104 | 0,2889 |
| *5* | 0,2419 | 0,2754 | 0,2581 | 0,2539 | | 0,1936 | 0,2178 | 0,2589 | 0,0482 |
| *6* | 0,2206 | 0,221 | 0,204 | 0,2397 | | 0,1418 | 0,1305 | 0,1414 | 0,0287 |
| *7* | 0,4591 | 0,39 | 0,3841 | 0,4009 | | 0,1316 | 0,1669 | 0,1729 | 0,0373 |
| *8* | 0,4383 | 0,3646 | 0,365 | 0,4019 | | 0,421 | 0,5081 | 0,4262 | 0,1897 |
| *9* | 0,5131 | 0,4868 | 0,4921 | 0,8127 | | 0,3396 | 0,3264 | 0,2679 | 0,1725 |
| *10* | 0,2256 | 0,2325 | 0,2113 | 0,1184 | | 0,302 | 0,3139 | 0,3268 | 0,3666 |
| *11* | 0,0486 | 0,04 | 0,0127 | 0,4942 | | 0,0391 | 0,062 | 0,0616 | 0,1045 |
| *12* | 0,4706 | 0,2828 | 0,2584 | 0,4346 | | 0,0504 | 0,0527 | 0,0652 | 0,1336 |
| *13* | 0,3608 | 0,4069 | 0,3895 | 0,7169 | | 0,2872 | 0,1881 | 0,1869 | 0,0968 |
| *14* | 0,3374 | 0,319 | 0,3013 | 0,4667 | | 0,2279 | 0,2945 | 0,2909 | 0,2894 |
| *15* | 0,4327 | 0,4008 | 0,5362 | 0,8231 | | 0,2215 | 0,2178 | 0,2303 | 0,1012 |
| *16* | 0,0236 | 0,0409 | 0,1001 | 0,4167 | | 0,1388 | 0,1346 | 0,3657 | 0,3521 |
| *17* | 0,0212 | 0,113 | 0,1721 | 0,2556 | | 0,1177 | 0,1197 | 0,1281 | 0,0029 |
| *18* | 0,1935 | 0,1415 | 0,0933 | 0,578 | | 0,0039 | 0,0553 | 0,0555 | 0,0672 |
| *19* | 0,5488 | 0,6273 | 0,8267 | 0,2562 | | 0,1453 | 0,1562 | 0,1582 | 0,1496 |
| | | | | | | | | | |
| *Average Magnitude* | 0,2985 | 0,2832 | 0,2973 | 0,4073 | | 0,1846 | 0,2035 | 0,2227 | 0,1718 |
| *Standard Deviation* | 0,1642 | 0,1548 | 0,1929 | 0,2196 | | 0,1111 | 0,1326 | 0,1315 | 0,1453 |
| *Correlation* | | | | | | 0,35 | 0,27 | 0,01 | -0,31 |
| *r^2* | | | | | | 0,12 | 0,07 | 0 | 0,1 |

## Comparison: T-test CAPM and MPT

**Sharpe Ratio**

t-Test: Paired Two Sample for Means

| | *Variable 1* | *Variable 2* |
|---|---|---|
| Mean | 0,298519 | 0,184569 |
| Variance | 0,026946 | 0,01235 |
| Observations | 18 | 18 |
| Pearson Correlation | 0,352118 | |
| Hypothesized Mean Difference | 0 | |
| Df | 17 | |
| t Stat | 2,972662 | |
| P(T<=t) one-tail | 0,004269 | |
| t Critical one-tail | 1,739607 | |
| P(T<=t) two-tail | 0,008538 | |
| t Critical two-tail | 2,109816 | |

**Sterling Ratio**

t-Test: Paired Two Sample for Means

| | *Variable 1* | *Variable 2* |
|---|---|---|
| Mean | 0,297277 | 0,222686 |
| Variance | 0,037196 | 0,017301 |
| Observations | 18 | 18 |
| Pearson Correlation | 0,013883 | |
| Hypothesized Mean Difference | 0 | |
| df | 17 | |
| t Stat | 1,364462 | |
| P(T<=t) one-tail | 0,095107 | |
| t Critical one-tail | 1,739607 | |
| P(T<=t) two-tail | 0,190213 | |
| t Critical two-tail | 2,109816 | |

**Sortino Ratio**

t-Test: Paired Two Sample for Means

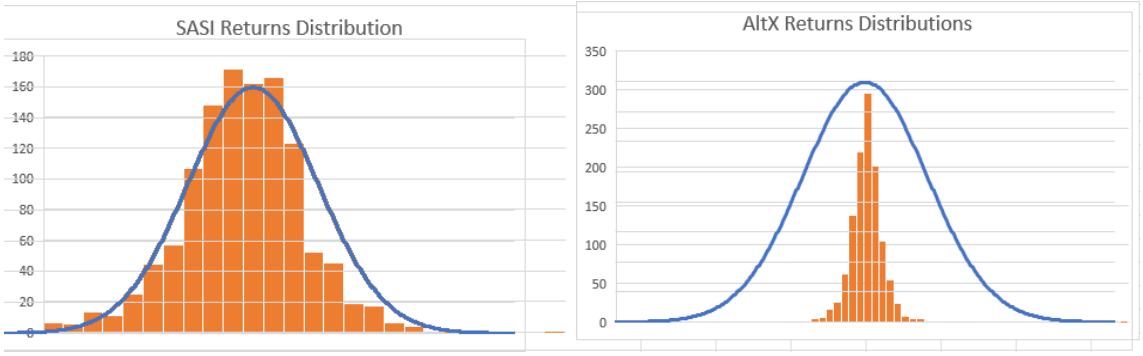
| | *Variable 1* | *Variable 2* |
|---|---|---|
| Mean | 0,283158 | 0,203461 |
| Variance | 0,023956 | 0,017596 |
| Observations | 18 | 18 |
| Pearson Correlation | 0,269928 | |
| Hypothesized Mean Difference | 0 | |
| Df | 17 | |
| t Stat | 1,937109 | |
| P(T<=t) one-tail | 0,034766 | |
| t Critical one-tail | 1,739607 | |
| P(T<=t) two-tail | 0,069531 | |
| t Critical two-tail | 2,109816 | |

**Treynor Ratio**

t-Test: Paired Two Sample for Means

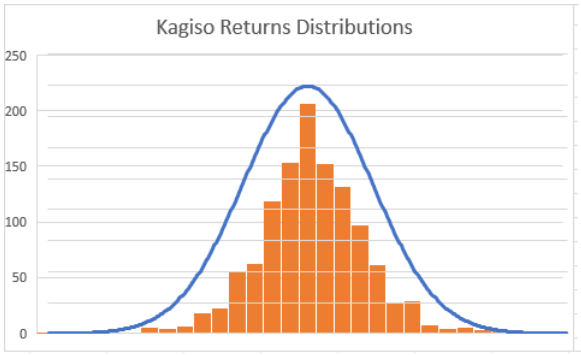
| | *Variable 1* | *Variable 2* |
|---|---|---|
| Mean | 0,407303 | 0,171845 |
| Variance | 0,04821 | 0,021099 |
| Observations | 18 | 18 |
| Pearson Correlation | -0,31141 | |
| Hypothesized Mean Difference | 0 | |
| df | 17 | |
| t Stat | 3,345293 | |
| P(T<=t) one-tail | 0,001918 | |
| t Critical one-tail | 1,739607 | |
| P(T<=t) two-tail | 0,003836 | |
| t Critical two-tail | 2,109816 | |

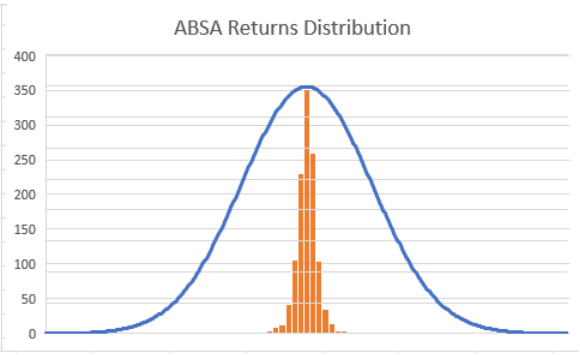
## Returns Distributions of the SASI and AltX indexes, and Kagiso and ABSA funds










The normal distribution (blue line) in the graphs is created from dummy variables to show a normal distribution bell curve. The data set was downloaded and adapted from https://exceluser.com/category/downloads/. Since these graphs compare the general distribution shapes, the bell curve shape is maintained. However, the scale may not be the same as for the returns data.

A typical leptokurtic distribution has the characteristics of being more concentrated around the mean, and somewhat more pointy. Hence, when compared to a normal distribution, it appears to stay within the bell curve and occasionally the highest peak transcends the peak of the normal distribution.