PERFORMANCE EVALUATION OF SMOOTH BONUS FUNDS

A Research Report submitted by
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I. Abbreviations and Acronyms

SBF	Smooth Bonus funds
TF	Traditional funds
SBF 1	Smooth Bonus fund: Old Mutual Flexi Retirement fund
SBF 2	Smooth Bonus fund: Old Mutual Flexi Private investor (Endowment and whole life)
SBF 3	Smooth Bonus fund: Old Mutual Guaranteed fund
SBF 4	Smooth Bonus fund: Fedsure Guaranteed fund (Liberty Smooth bonus)
TF 1	Traditional fund: Old Mutual Mining and Resources Fund R
TF 2	Traditional fund: Old Mutual Investors R
TF 3	Traditional fund: STANLIB Income R
TF 4	Traditional fund: STANLIB Equity R
Benchmark	South African Government bond (R156)

1. Introduction

An interesting class of asset funds known as Smooth Bonus Fund has been growing in the South African market since it was established in 1967. The Smooth Bonus Funds is a balanced fund generally invested in local equity, bonds, property, interest bearing, international equity, and other international Alternatives managed by Fund Managers. This is a saving vehicle for the purpose of saving for retirement and / or saving for a specific goal. It is offered by Insurance companies such as Old Mutual, Liberty Life, Metropolitan and Sanlam for low to middle income earners. This fund is regulated by Long Term Insurance Act, and various policies use this fund including endowment policies which are designed to have a minimum term of five years. Endowment policies would then pay out the lump sum benefit to the beneficiary at the earliest of death or maturity (Wilson, 2015). Smooth Bonus fund guarantees inflation beating returns with guarantee of capital investment plus bonuses/returns declared. Smooth Bonus Funds are savings vehicles that offer steady growth by smoothing out the ups and downs (volatility) often seen in other comparable traditional funds. Although a significant body of literature exists for asset funds in general, the has not being any investigation of Smooth Bonus fund in South Africa, however in Britain there is existing literature for similar funds known as With-Profit fund.

This research paper will investigate whether Smooth Bonus Funds are able to outperform traditional funds such as balanced fund, Unit trust, Equity funds and balanced retirement fund portfolios provided by Old Mutual, Liberty life, Sanlam and Metropolitan for a period of 15 years starting from 2003 to 2017. South African Government bonds will be used as a benchmark (risk free investment) over the same period.

Investors in equity have had their stock (or capital) reduce by up to a third of their original investment due to the decline in the equity market in the early 2000's in Britain. These experiences has made them more reluctant to continue in investing in stock market, are looking for a safe way of growing their investments with a protection of their initial capital and are looking for an alternative investment vehicle (Jensen, 2002).

Only a limited number of funds have been found to outperform different benchmarks, have market timing ability, or selectivity expertise. Despite the research, Smooth Bonus funds have attracted a growing percentage of financial wealth in recent years. Investors purchasing Smooth Bonus funds received diversification benefits and liquidity that may not be available to them individually. Smooth Bonus funds are also a convenient method of investing in equity, interest bearing, property and bonds (Dellva & Olson, 1998). "Moreover, investors expect, despite the academic evidence that their particular fund will earn a risk adjusted performance, net of expenses, that exceeds what they could achieve in the equity market" (Dellva & Olson, 1998).

Background of Smooth Bonus fund

Smooth Bonus funds are medium to long-term saving vehicle offered by traditional long term insurers. The money is pooled together with money from other investors and invested in the insurance company's Smooth Bonus fund. The fund is managed by a professional investment manager, who puts the fund's money into different types of investment, such as local equity, property, bonds, cash and international assets class. The cost of managing the portfolio, administration fees and distributions costs are deducted from the fund value

and the remainder is distributed to the investors. The name comes from how the fund operates in terms of removing market volatility by smoothing the bonuses declared to investors.

Smoothing

Smoothing is a way through which an insurer retain a portion of the returns in good years to be distributed in bad years. The reserved bonuses/returns are reinvested into the fund. The returns are distributed to the investors in the form of annual bonuses (Miltersen & Persson, 1998). The bonus system allows for stable bonuses to be declared throughout the lifetime of the investment. This allow for a steady annual bonus payment regardless of the market performance.

Background of Traditional fund

Traditional funds' assets such as hedge funds, balanced fund, Unit trust, Equity funds, and balanced retirement fund portfolios are popular in the world and the individual investors are able to purchase them directly from the market (Brennan, 1993).

The mutual fund was born in Europe in 1774 by Dutch merchant, Addriaan van Ketwich, when they pooled money from different investors to form a trust. This scheme was available to the public to purchase a share in a portfolio which were called units. Van Ketwich's fund survived until 1824 however this vehicle he created had an estimated 27 trillion US dollars is global assets in July 2013 in over two centuries (Sekhuar, 2017). Based on the investment strategy the fund can be equity or debt oriented exchange trade and specific to industry or sector.

The investor will own the number of shares or units in the portfolio and it is managed by the Investment manager who determine the investment target at the required return strategy in a portfolios. The funds are normally liquid, with no or minimal investment term and management fees are charged by the fund manager/investment house. The investor is exposed to high returns during the good economic cycle and also exposed to the risk during poor conditions. Traditional funds are volatile and subject to market conditions/risks. Capital investment and returns are not guaranteed (Arteaga, Ciccotello, & Grant, 1998). The investor will be credited with all the returns the portfolio has generated at the particular point in time less management fees while Smooth Bonus fund typically will declare bonus lower than the return generated and reserve the rest for future use. The units in the portfolio can fluctuate depending on the market conditions and this can affect the value of the initial capital.

Key differences between Smooth bonus fund and Traditional fund

- The initial capital investment in Smooth Bonus fund is protected and guaranteed while in Traditional fund it is exposed to risks.
- Smooth Bonus fund normally declares bonuses that are inflation beating however lower than the actual return during good market period while Traditional fund will credit the investor with actual returns generated.
- There is additional guarantee fee payable under Smooth Bonus fund for guaranteeing capital amount and minimum returns.
- Once the bonuses have been declared they are guaranteed and protected from future poor market conditions under Smooth bonus fund while Traditional fund returns can fluctuate with market risks.

- Smooth Bonus fund is an endowment with a minimum period of 5 years regulated under long term insurance act and if the contract is terminated before maturity there will be penalties charged. While liquidity of a Traditional fund is typically not restricted.

The greater the risk the higher the returns. Traditional funds have higher risk tolerance than Smooth Bonus funds and normally produces better risk adjusted return during good period however during bad period like recession the fund can deteriorate to zero (Liang, 1999).

1.1 Why study Smooth Bonus funds?

The Smooth Bonus fund has been in existence in South Africa for 50 years and was firstly launched by Old Mutual in 1967. The total fund value was over R150 billion between Old Mutual, Metropolitan & Momentum Investment and Sanlam as at 2016 Smooth Bonus Fund portfolio fact sheet, and this is equal to 2.8% of total investment and savings value of about R6.5trillion in South Africa based on 2014 data (27four Investment Managers (Pty) Ltd, 2014). The funds have grown over the period, in the 1990s & early 2000s more insurance companies such as Momentum, Metropolitan, Ashton Investment and Sanlam launched Smooth Bonus fund portfolios.

The South African market has been volatile in the past few years due to political unrest and financial turmoil due to the subprime contagion in the country (Madubeko, 2010). The investors may want to protect their investment from this financial instability and earn good return at the same time. There is a need to understand how Smooth Bonus funds work and their ability to produce positive inflation beating returns under these conditions. This research will improve the knowledge of ordinary South Africans since there is no previous academic study conducted on Smooth Bonus fund performance evaluation in South Africa since the inception of this class of funds.

1.2 Purpose of study

The Smooth Bonus funds have a different strategy from traditional funds by protecting the investor from the short term fluctuations of the market, capital invested is protected and guaranteed return that is inflation beating. The fund follows an active strategy and invests in a mix of local and international investments, such as equities, interest bearing assets and property which minimise the risk of the fund (Low risk fund). The objective of this research is to investigate whether the Smooth Bonus fund can outperform traditional funds over different time horizons.

1.3 Research question

How do smooth bonus funds perform against traditional funds?

1.4 Delimitations

There are no prior studies done in South Africa comparing smooth bonus with other funds, no existing literature. The paper uses literature from Britain where they have similar products.

1.5 Assumptions

The size of the portfolio has no impact on the risk and return, because they already have been factored in.

2. Literature

2.1 Risks and Diversification

2.1.1 Risks

There two basic types of risks that the investment portfolio is exposed to: systematic and unsystematic risk.

Systematic risk

This is the risk to the investment portfolio that has nothing do with the risk of the particular investment asset such as recession, fluctuation of currencies, political and wars. The companies have no control of systematic risk.

Unsystematic risk

Unsystematic risk has to do with risk that is within the company or industry and this include business risk, product risk, and operational. The company is able to control/manage this risk and they have direct impact to the stock market returns.

Mitigation of risks

“Systematic risk can be partially mitigated by asset allocation. Investing in different asset classes with low correlation can smooth portfolio volatility because asset classes react differently to macroeconomic factors. When some asset categories (i.e. domestic equities, international stocks, bonds, cash, etc.) are increasing others may be falling and vice versa” (Faulkenberry, 2012, para. 2). The investor is able to reduce unsystematic risks by investing in different companies, industries and different countries which diversify his portfolio (Indian Institute of Planning & Management, 2009).

2.1.2 Portfolio Diversification

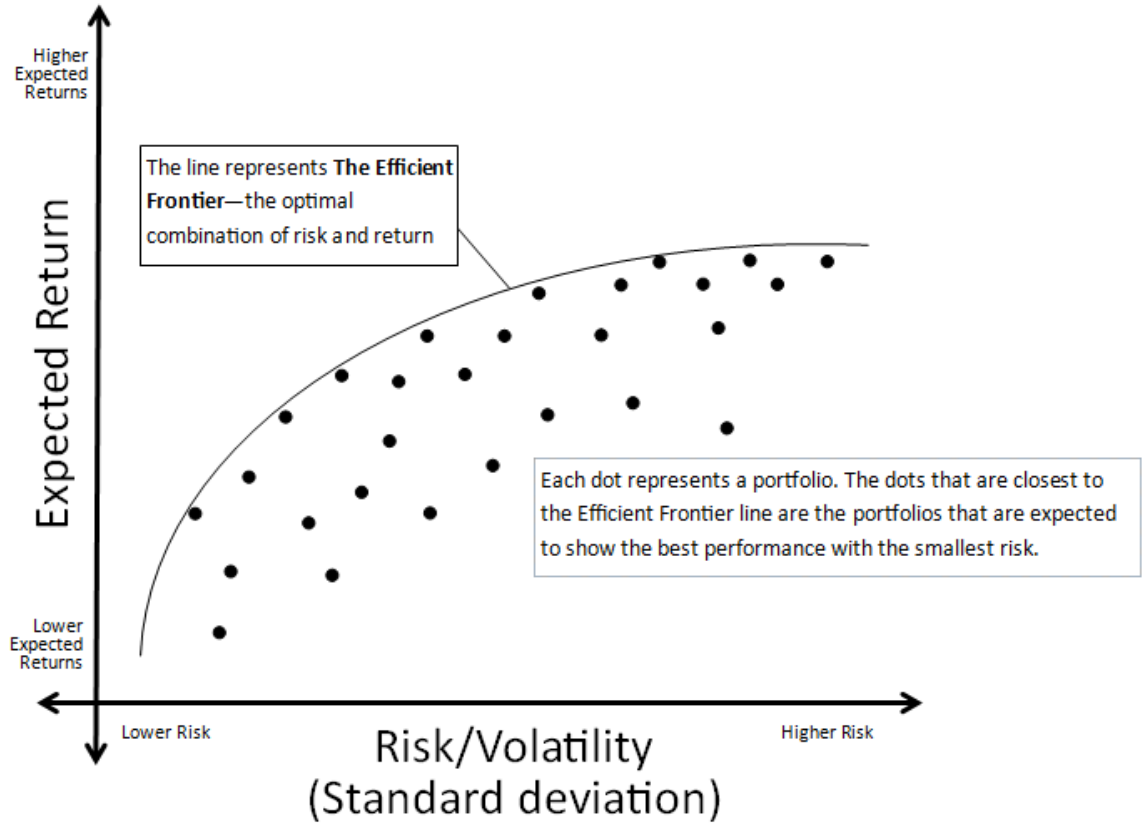
Diversification is a way of reducing the risks to minimal level and this is done by investing in assets with different risk profile or industry and the prices is not likely to move in the same direction / different point in time. Markowitz was one of the first to quantify risk and demonstrate how the concept of portfolio diversification can reduce the risk and improve the returns for investors. In simple terms, his approach was one of “not putting your eggs all in one basket” (Elton & Gruber, 1997).

The assets in any portfolio can be combined to produce an “efficient portfolio” that has the capacity to give you the highest possible level of return on investment for any level of portfolio risk (Lubatkin & Chatterjee, 1994). The portfolios that are below the efficient frontier curve are producing returns that are less efficient and the optimal combination of risk and return is at the efficient frontier.

The efficient frontier is a graph representing a set of portfolios that maximize expected return at each level of portfolio risk (Bode, Kane, & J, 2003). “The efficient frontier describes the collection of portfolios (i.e. asset mixes) that produces the highest expected return at various levels of risk (as measured by the standard

deviation of portfolio returns)" (Burger, 2012, p.10 - 11). This minimise the unsystematic risks with optimum returns.

Figure 1: Efficient Frontier Curve



Source of the Image: http://www.smart401k.com/Content/retail/resource-center/advanced-investing/modern-portfolio-theory-and-the-efficient-frontier

The portfolios that are closer to the Efficient Frontier curve are optimal and producing the best performance return with minimal risk as shown by the curve in efficient frontier graph above. "So what is an optimal portfolio? There are two parts to this: (1) For a given level of volatility, the portfolio which gives the highest expected return and (2) For a given expected return, the portfolio which has the lowest volatility. That is, for the same level of risk, the return of a portfolio on the Efficient Frontier is higher than the return of a portfolio which is away from the Efficient Frontier. Similarly, for the same level of expected return, the risk of a portfolio on the Efficient Frontier is lower than the risk of a portfolio which is away from the Efficient Frontier. Logically, the portfolios which lie to the right of the Efficient Frontier or below it are sub-optimal in nature represented by the dots in the graph above, as they have a higher risk or a lower return respectively for a given level of return or risk" (Hari, 2015, p.2).

"The nature of the Efficient Frontier line shows that optimal portfolios have a higher degree of diversification compared to the sub optimal ones. As the line is a curved one, it starts with the lowest risk - return combination and moves higher to a greater risk - return combination. An investor can choose a suitable portfolio anywhere on the Efficient Frontier depending on his individual preferences and investment timeframe" (Hari, 2015, p.2).

2.2 Is Smooth Bonus fund the answer?

Financial portfolio theory describes how investors can construct portfolios to maximize return according to a given level of market risk, emphasizing that risk is an inherent part of greater reward (Markowits, 1952). In an equity portfolio, the lower the total correlation of equity with the total return, the more desirable the particular equity is to the portfolio. For example, equity drawn from different industries, different countries, and different-sized companies are affected by environmental and economic changes in specific ways (Niemira & Klein, 1994). Market changes are unpredictable thus diversifying the portfolio will increase the possibility of a positive returns from the given portfolio. The efficient (or optimal) portfolio is then considered as the portfolio that has the least risk for a given return or the highest return for a given level of risk (Bolton, Tarasi, & Walker, 2011).

The fund managers considered at some length the concept of stabilising bonus. While one view expressed was that the public should be educated to expect substantial changes in bonus rates, the general view of the fund managers was that the conventional Smooth Bonus fund business should smooth out the fluctuations in investment return (Froggatt, Hodge, Kennedy, & King, 1976). Indeed, this is the greatest strength of the business as compared with other forms of savings. The investor is enabled to share in the benefits of enhanced returns on their capital and at the same time to be largely protected from sharp fall and volatility in the market especially within the short-term. A conventional Smooth Bonus fund reduces the exposure to fluctuations in the market which many policyholders value highly, some no doubt more highly, than the insurance against their own death. Furthermore, with-profits system has grown up over a long period and there is an expectation by policyholders that bonus rates will only fall in exceptional circumstances. An abrupt fall in bonus rates would do great harm to the confidence placed in insurance company as a savings medium. The expectation that reversionary bonus rates will be maintained, if not increased, has been strengthened by the introduction of terminal bonuses (Froggatt, Hodge, Kennedy, & King, 1976).

Life insurance policies with a minimum guaranteed returns and a surplus participation mechanism, i.e. so called Smooth Bonus fund policies, have a significant market share in many countries, including the United States, Japan, Great Britain, and Germany (Berry-Stolzle, Klaver, & Qui, 2011). The guarantees and the resulting obligations for the insurance companies inherent in these policies vary. Some policies include point-to-point guarantees for the surplus participation, where the insurer declare bonuses to the policyholder's account every year, but the accumulated surplus participation is only guaranteed at maturity of the contract (which would be based on the sum of regular and terminal bonuses declared) (Briys & Varenne, 1997). This mechanism is also referred to as conditional bonus (Grosen & Jorgensen, 2002). For an insurer offering point-to-point guarantees, it is, hence, tolerable if its investment portfolio is not able to cover the complete policyholder's account in a given year, as long as all obligations are met in the end. Other policies include a year-by-year guarantee that locks in any return credited to the policyholder's account on a yearly basis. Each year, the guaranteed interest rate has to be applied to the total policyholder's account balance. Offering a year on year guarantee restricts the active asset management strategies of the Smooth Bonus portfolio manager since the returns have to meet their objectives in every year. Thus the option for the negative returns (or lower than expected returns) to be offset by higher than expected returns over the term of the investment is limited. (Berry-Stolzle, Klaver, & Qui, 2011).

The Smooth Bonus funds have been offered by many of the major insurance companies in the United Kingdom for over a century.

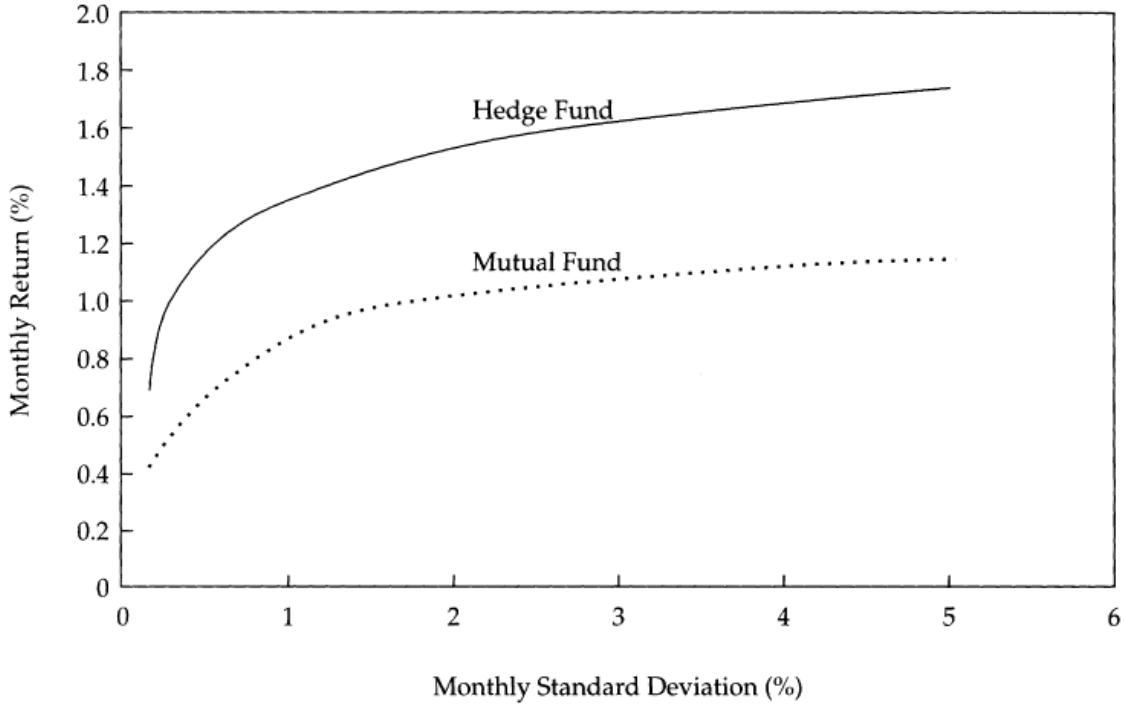
The investor in a Smooth Bonus fund benefits from the profits made by the Smooth Bonus fund through guaranteed annual bonuses and a terminal bonus. The insurance companies normally charges administration fees and penalties for early termination of the policy before the end of contractual term (Jensen, 2002).

2.3 Performance

2.3.1 Hedge Funds versus Mutual Fund

To compare hedge funds with mutual funds monthly return data was obtained from Morningstar OnDisc database and hedge fund data from websites for the period January 1992 to December 1996 (Liang, 1999).

Figure 2: Hedge Funds versus Mutual Fund Efficient Frontier



Source of the Image: https://www.jstor.org/stable/4480184

Efficient Frontiers

From the efficient frontier (figure 2 above) the investor was better of holding diversified hedge funds portfolio because the efficient frontier of the hedge funds overwhelmed the efficient frontier for the mutual funds for all feasible standard deviations. Moreover given that the hedge fund return was net of all the fees while mutual fund is gross return (before deducting all fees), therefore the dominance of hedge funds over mutual funds may be understated (Liang, 1999).

Sharpe's Measure

The Sharpe ratio standardises the relationship between standard deviation and return and therefore can be used to compare different asset classes (Kidd, 2001). Any benchmark will work with these measures which

eliminate the problem of specification of a benchmark model (Gökgöz, 2010). These performance measures do not take transaction cost, fees and broker commission into account. According to Ippolito (1989) and Elton, Gruber, Das, & Hlavka (1993) it is important to include the transaction costs when measuring portfolio performance. Murthi, Choi, & Desai (1997) argue that any performance index should include transaction costs from an investor's point of view.

The results from the longer period are very similar to the results of the shorter period and the S&P 500 was used as a benchmark. The average Sharpe ratio for hedge funds is 0.44, much higher than the ratio of 0.26 for mutual funds (Liang, 1999).

2.3.2 Evaluate performance of social responsible investment funds and environmentally friendly funds

Prior studies evaluated the performance of social responsible investment funds (SRI) and environmentally friendly funds (EF) using dynamic mean-variance model which consider return and risks at the same time (Ito, Managi, & Matsuda, 2003). Bauer, Koedijk, & Otten (2005) showed that in the early 1990s, USA SRI funds under performed and UK SRI funds outperformed conventional funds by applying a multi-factor model while Kempf & Osthoff (2007) reported positive and significant risk-adjusted returns during 1992-2004 for a USA portfolio based on a sample of SRI funds.

Ito, Managi, & Matsuda (2003) results showed that SRI and EF funds performed better than conventional funds. Specifically, 6 out of 80 Europe SRI funds and 7 out of 29 USA SRI funds were statistically better during the period from 2000 to 2009. From 2006 to 2009, two Europe SRI funds and four USA SRI funds were better in the stock market index. For the EF fund category, 1 out of 27 SRI funds was better in both the 2000-2009 and 2006-2009 periods. In Japan, there were no statistically significant SRI or EF funds.

Ito, Managi, & Matsuda (2003) also used two-sample Kolmogorov-Smirnov test (KS test) to test two independent samples drawn from the same population. This is a test of the null hypothesis, which shows p values in tests for the average improvement scores between SRI funds, EF funds and conventional funds. Both in the long and short term the results showed that SRI and EF funds in the Europe were significantly different from conventional funds. SRI out performed conventional funds, and EF fund performances were similar to all fund performances on average.

2.3.3 Evaluation of Smooth Bonus funds

While study by Canniffe (2001) shows good performance for Smooth Bonus funds. She was looking at the differences in returns at maturity of Smoot Bonus funds and unit-linked pension funds over different time spans. From the results, it is evidence that Smooth Bonus funds performed better for 15 years and 25 years while unit-linked funds toped in the 10 years investment. In the Smooth Bonus pensions market, Standard Life displaced Caledonian Life (formerly Guardian Life) as the top performer over 10 and 15 years, while Caledonian Life retained its top placing over 20 years. Standard Life produced net annual returns of 14.24% over 10 years and 15.14% over 15 years, while over 20 years, Caledonian Life produced a net annual return of 15.95%. The worst performers in the Smooth Bonus category were Royal Liver over 10 years with a net annual return of 11.02 %%, and Hibernian Life over 15 and 20 years, according to the survey. Over 15 years,

Hibernian produced a net annual return of 12.88 % compared with the top return of 15.14 %. Over 20 years, Hibernian's annual return of 13.96 % compared with the top return of 15.95 %. Comparing the performance of unit-linked and Smooth Bonus funds shows that unit-linked funds performed better over 10 years while Smooth Bonus funds were better performers over 15 and 20 years (Canniffe, 2001).

According to Eastwood, Ledlie, Macdonald, & Pike (1994) using the model office program "MO", written by Angus Macdonald, they were able to demonstrate that Smooth Bonus still offers value for money in the face of competition from unit linked funds with a pay-outs closer to the asset shares. The strong growth in asset shares over the mid-1970s to mid-1980s appears to have been reflected in maturity pay-outs for 25-year policies, but less so for 10 year policies. Model Office program suggests that 10-year maturity pay-outs have been closer to asset shares more recently. However, it seems likely that some pay-outs have significantly exceeded raw asset shares in the early 1990s.

The previous studies did not use the risk adjusted returns to insure that the potential return expected from an investment justifies the risks involved.

2.3.4 South Africa

A person who invested in Traditional fund (typical balanced fund) retiring at the end of 2008 would have seen their investment value falling drastically by around 11.6% over 2008, while Smooth Bonus fund paid bonuses of 14.3% in the same period (Old Mutual South Africa, 2016). This means that, in the year leading up to retirement, his savings were not only preserved, but grew significantly and avoided the losses he would have incurred in a typical balanced fund, giving him more money to invest so he could receive a higher monthly pension throughout his retirement. The reason why Smoothed Bonus Funds were able to deliver such consistent returns compared to a typical balanced fund over this period has to do with the way they are designed. A Smoothed Bonus Fund puts aside a portion of the returns it makes in the years when growth is good. This is then used to support the fund's returns and growth in times when the markets are not doing as well (Old Mutual South Africa, 2016).

3 Methodology

The study will use Sharpe ratio model, which was originally devised in the 1966 by Nobel laureate William F. Sharpe, essentially tells you if the potential return expected from an investment justifies the risks involved. The Sharpe ratio also standardises the relationship between standard deviation and return and therefore can be used to compare different asset classes (Kidd, 2001).

Statistical probability (T-test) will be used to test the hypothesis that Smooth Bonus funds outperform traditional funds for a selected period. The test analyse if the two sets of portfolio mean/average risk adjusted return (Smooth Bonus fund and traditional fund) are significantly different from one another.

3.1 Research question

How do smooth bonus funds perform against traditional funds?

3.2 Population, study sample and data source

The population is all the funds that are provided by Long Term Insurance companies in South Africa. A sample of four Smooth Bonus funds will be selected from Old Mutual and Liberty life and the data is selected based on the availability of data and the funds that have been in existence for the full period under investigation. This are the only funds that data is publicly available for the period 2003 to 2017 prior 2003 the companies did not publish the data publicly consistently. Four traditional funds will also be selected from the same providers, this will make a good comparison looking at the funds provided by the same provide or Asset management house (Old Mutual and Liberty life) and managed by the same team. We will use annual return data from the year 2003 to 2017. The returns are net after fees, expenses and broker/Advice fee. For the risk free asset class, the South African Government bond (R156) performance will be used and downloaded from website. R156 is a long term investment with inflation linked return and has similar characteristics as Smooth Bonus fund. All this data is available in the respective companies' websites; it is freely available for download.

3.3 Data management

The data will be managed and sorted on the Excel spread sheet

3.4 Data Analysis

Firstly, each asset fund historic performance will be captured on a frequency table using Excel spreadsheet. The historic returns will be used for the purpose of this research and we use the following formula to calculate return over a given period of time. The return (R) of a portfolio at time t can be defined as price/total value Pt of the portfolio divided by the price/total value at an earlier time (Pt-1). South African Government Bond (risk free) will be used as a Benchmark for the same period with an annual interval.

$$R = \frac{P_t}{P_{t-1}} - 1 \qquad 1$$

Secondly, calculate the excess return of each asset fund by taking asset class return minus South African government bond (risk free) return for each year.

Excess return (R_i) = asset fund return (R) – Government bond return (r_f)

Calculate the mean of each portfolio using excess return(R) and also calculate mean of South African government bond (risk free) for 5, 10 and 15 year interval.

$$\bar{R} = \frac{\sum_{i=1}^{n} R_i}{n} \qquad 2$$

$$\bar{r_f} = \frac{\sum_{i=1}^{n} r_f}{n} \qquad 3$$

$\bar{R}$ = mean of the set of R_i values
$\overline{r_f}$ = mean of the set of r_f values
n = the number of data points

R_i = each of the values of the data (excess return of asset fund)

r_f = each of the values of the data (return of Government Bond)

Financial risk can be defined as deviation away from expected historical returns during a particular time period (McClure, 2010). However, Markowitz' portfolio selection theory maintains that the essential aspect pertaining to the risk of an asset is not the risk of each asset in isolation, but the contribution of each asset to the risk of the aggregate portfolio (Royal Swedish Academy of Sciences, 1990).

$$S_R = \sqrt{\frac{\sum_{i=1}^{n}(R_i - \bar{R})^2}{n}} \qquad 4$$

S_R= standard deviation of returns

Expanding the time series gives rise to another consideration when evaluating portfolio standard deviations and Sharpe ratio. An investor must consider the length of the time period used in the measurement; longer time periods tend to result in lower volatility measures (Kidd, 2001). Annualised standard deviation of returns tends to be higher for shorter periods: Daily returns have higher standard deviations than weekly returns, which have higher standard deviations than monthly returns (Kidd, 2001).

$$Sharpe\ Ratio = \frac{\bar{R} - \overline{r_f}}{S_R} \qquad 5$$

Sharpe Ratio (SR) = Risk adjusted return

Calculate Sharpe ratio (risk adjusted performance) for each asset class annually using formula 5 for the period under evaluation. Group all the Smooth Bonus funds Sharpe ratio together and Traditional funds Sharpe ratio to form two new portfolios. The Sharpe ratio measures what portion of an asset fund performance is associated with risk taking.

3.5 Hypothesis

3.5.1 Smooth Bonus Fund

Previous research shows that over the longer-term, the returns of Smooth Bonus funds are very competitive relative to those delivered by traditional funds. In addition, the traditional funds do not provide the stability of returns offered by smoothed bonus funds. The Smooth Bonus fund, through the smoothing process, also significantly reduces exposure to short-term investment market volatility. "This is very important for

policyholders who cannot delay taking the policy benefits and cannot afford to be directly exposed to the market right up to the maturity date of their policies" (Venter, 2006, Smoothing versus marked-linked investments, para. 2).

Other study shows good performance for Smooth Bonus funds. They looked at the differences in returns at maturity of Smooth Bonus fund and traditional funds over different time spans. From the results, it was evident that Smooth Bonus fund performed better over 15 years and 25 years while traditional funds toped in the 10years investment (Canniffe, 2001).

Based on the above prior research, the researcher expect Smooth bonus fund to outperform traditional fund.

Hypothesis procedure

The two new portfolios formulated above will be used to test the hypothesis.

Step 1**. State the null hypothesis and the alternate hypothesis.**

The null hypothesis states that Smooth Bonus fund does not outperform traditional fund, and Smooth Bonus funds Sharpe ratio mean is less or equal traditional funds Sharpe ratio mean. The alternative hypothesis states that Smooth Bonus fund outperform traditional fund, and Smooth Bonus funds Sharpe ratio mean is greater than traditional funds Sharpe ratio mean.

H_o: $\overline{SR}_{Smooth\ Bonus\ fund} \leq \overline{SR}_{Traditional\ Fund}$

H_1: $\overline{SR}_{Smooth\ Bonus\ fund} > \overline{SR}_{Traditional\ Fund}$

Step 2.**Select the level of significance.**

Significant level of 5% or α = 0.05

Step3. **Identify the statistical test to use**.

The population standard deviation is unknown. The test analyse if the two sets of portfolio mean/average (Smooth Bonus fund and traditional fund) are significantly different from one another. This is an Independent Sample T-test with two independent samples drawn from the same population.

$$\overline{SR} = \frac{\sum_{i=1}^{n} SR}{n} \quad (6)$$

$$S_{SR} = \sqrt{\frac{\sum_{i=1}^{n}(SR-\overline{SR})^2}{n}} \quad (7)$$

$$t = \frac{\overline{SR}_{Smooth\ Bonus\ fund} - \overline{SR}_{traditional\ fund}}{\sqrt{\frac{S_{SR1}^2}{n_1} + \frac{S_{SR2}^2}{n_2}}} \quad (8)$$

SR = each of the values of the data

$\overline{SR}_{Smooth\ Bonus\ fund}$ = mean of Smooth Bonus funds Sharpe ratio (SR) using formula 6

$\overline{SR}_{traditional\ fund}$ = mean of traditional funds Sharpe ratio (SR) using formula 6

n = the number of data points

S_{SR1} = standard deviation of Smooth Bonus funds Sharpe ratio using formula 7

S_{SR2} = standard deviation of traditional funds Sharpe ratio using formula 7

Step 4. **State the decision rules.**

Since the alternate hypothesis states $\overline{SR}_{Smooth\ Bonus\ fund} > \overline{SR}_{Traditional\ Fund}$, this is a one tailed test to the right. For a = 0.05, Calculate the probability of observing the test statistic under the null hypothesis. This value is obtained by comparing *t* to a *t*-distribution with (n − 1) degrees of freedom. This can be done by looking up the value in a statistical table. If the computed value is within the rejection region, we reject the null hypothesis; otherwise, we do not reject the null hypothesis.

Step 5. Interpret the decision.

Based on the decision in Step 4. State a conclusion in the context of the original problem.

T-test Diagnostic

Independent variable

The independent variable should consist of two categories, these are Smooth Bonus fund and traditional fund, and the performance of each is not dependent on the strategy or performance of the other. The two portfolios are managed by different fund managers with two different strategies. This ensures minimal risk of collecting a biased sample that would yield inaccurate results.

Normal distribution

The first step is to make sure that the data captured is accurate and free of error. “Independent-samples T test is to test the assumption of normality, where the Null Hypothesis is that there is no significant departure from normality, as such; retaining the null hypothesis indicates that the assumption of normality has been met for the given sample. The Alternative Hypothesis is that there is a significant departure from normality, as such; rejecting the null hypothesis in favour of the alternative indicates that the assumption of normality has not been met for the given sample. To test the assumption of normality, we can use the Shapiro-Wilks test. From this test, the Sig. (p) value is compared to the a priori alpha level (level of significance for the statistic) – and a determination is made as to reject (p < á) or retain (p > á) the null hypothesis”. Also inspect the data visually using histogram graph and it must have an approximately symmetric and bell shaped. Visually all the histogram graphs in appendix A show a normal distribution (bell shape).

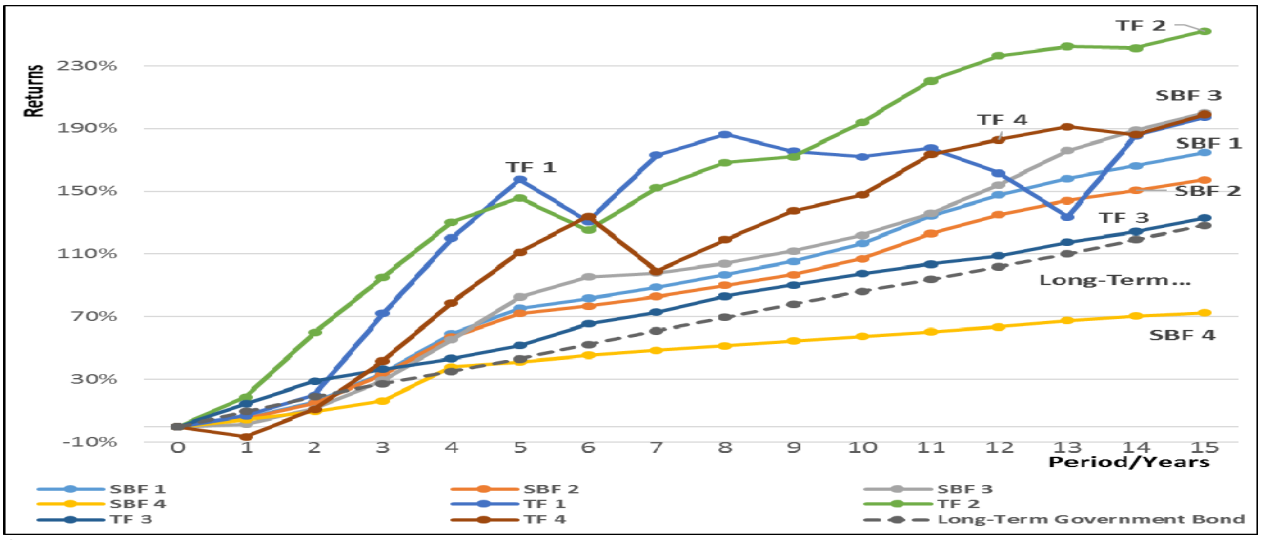
3.6 Validity and reliability

The sample data is freely available on the company’s websites as published by management and will be downloaded from that source to ensure data integrity. A test is seen as being reliable when it can be used by a number of different researchers under stable conditions, with consistent results and the results not varying.

Furthermore, reliability is seen as the degree to which a test is free from measurement errors, since the more measurement errors occur the less reliable the test (Fraenkel & Wallen, 2003; McMillan & Schumacher, 2006; Moss, 1994; Neuman, 2003). The sample selection and analysis processes has adhere to statistical principles which made the study reliable.

4 Presentation of Results

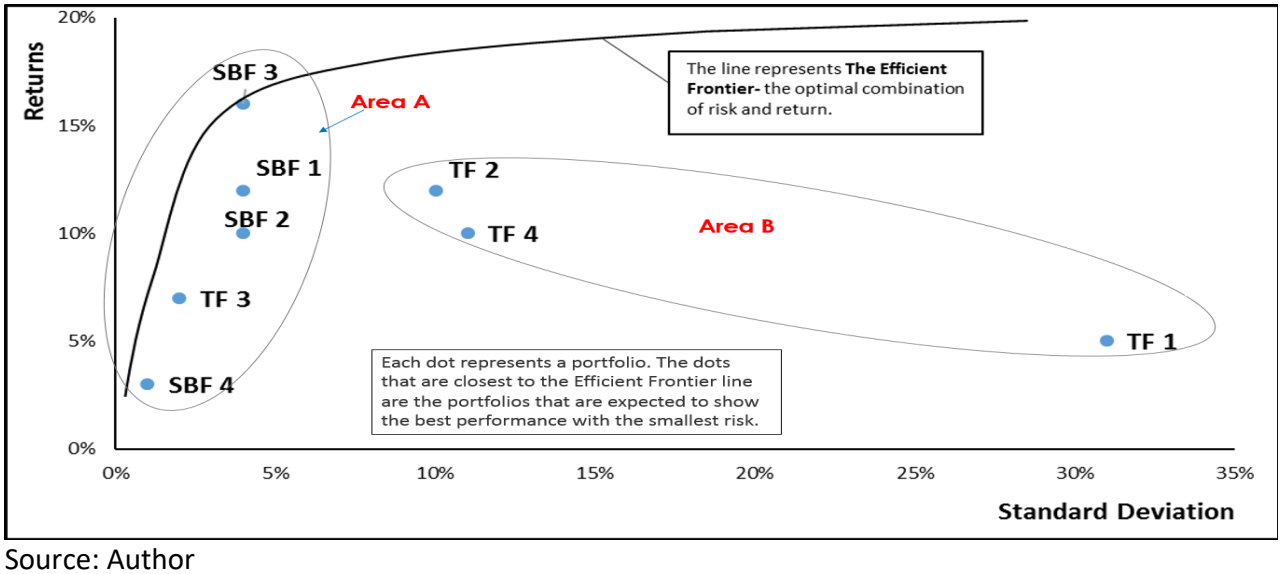
Figure 3: Cumulative Returns of Smooth Bonus funds, Traditional funds and Benchmark



Source: Author

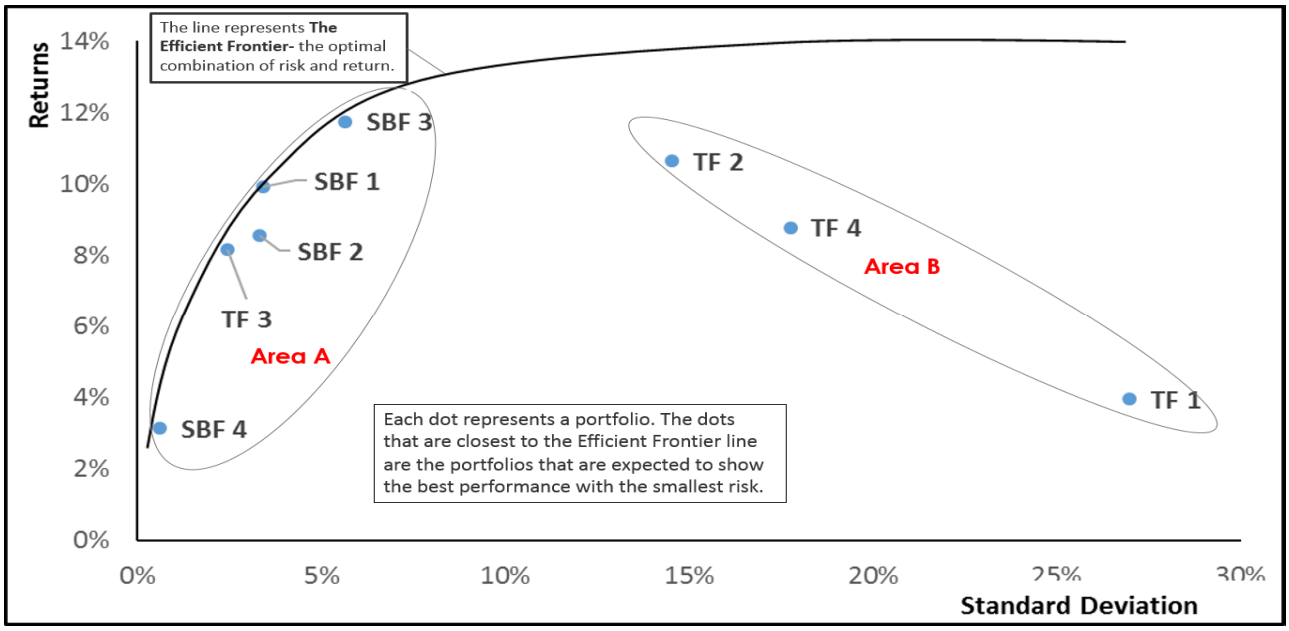
The cumulative graph shows that TF 1, TF 2 and TF 4 are more volatile over the period relative to other portfolios and producing the best performance. All the portfolios are beating the benchmark indicated by broken straight-line in the graph above except for SBF 4 being the worst performing. Portfolio TF 1 was the best performing for 5 years while TF 2 tops in 10 and 15 year period.

Figure 4: Efficient Frontier curve for 5 year horizon



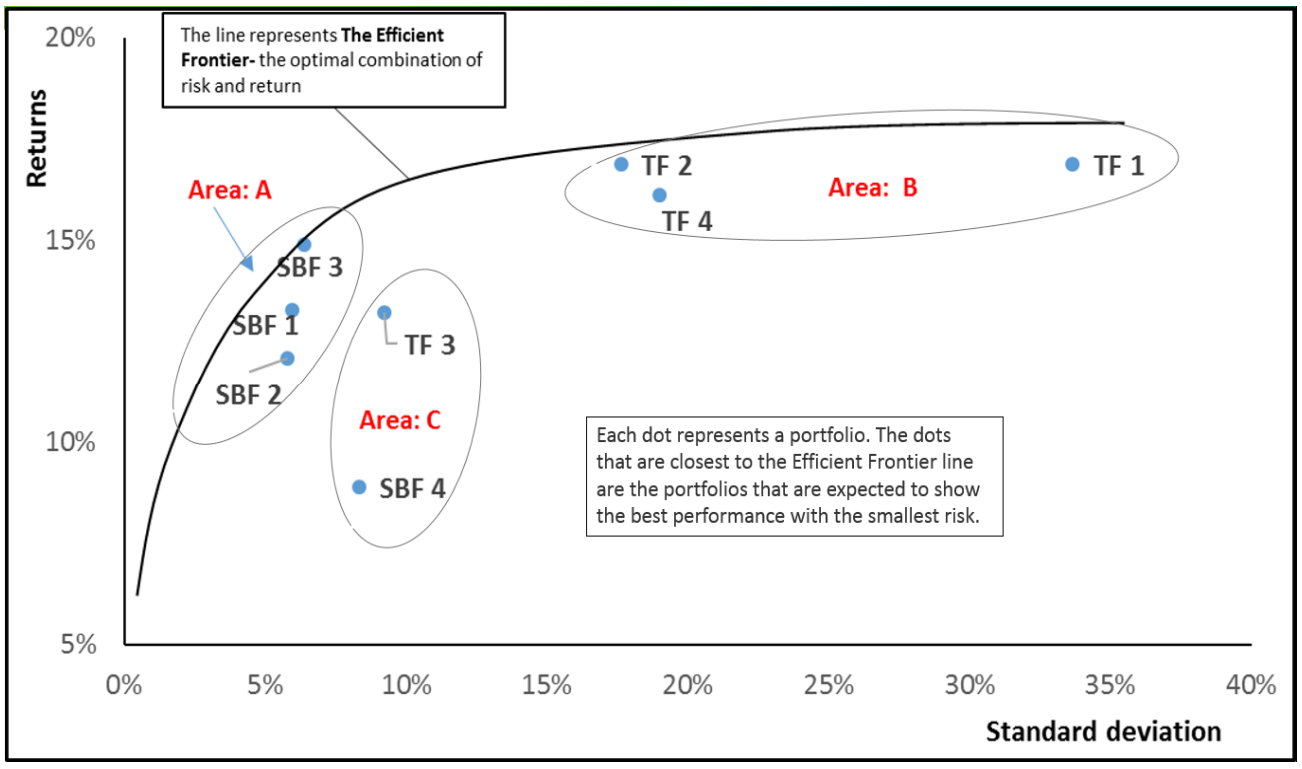
Source: Author

Figure 5: Efficient Frontier curve for 10 year horizon



Source: Author

Figure 6: Efficient Frontier curve for 15 year horizon



Source: Author

Efficient frontier analysis

The curve represents The Efficient Frontier which is the optimal combination of risk and return for any portfolio. Each dot on the graphs represents a portfolio. The dots that are closest to the Efficient Frontier line are the portfolios that are expected to show the best performance with the smallest risk (Hari, 2015).

As shown in figure 3 and 4 above, the portfolios that are in area A are closer to the efficient frontier curve and they produced the best performance relative to the portfolios in area B. All the Smooth Bonus fund portfolios are situated in area A and produced the highest returns with smallest risks. Portfolio TF 1, TF 2 and TF 4 have risks that exceed the returns for time span. These results are inconsistency with cumulative returns analysis from figure 2 which shows the portfolios in area B have the highest cumulative returns for all time span, however are highly volatile.

In figure 5 the was a shift of portfolios in area B which have moved closer to the efficient frontier for 15 year horizon and they still have higher risks than the portfolios in area A while portfolio SBF 4 and TF 3 in area C have move out of the efficient frontier area A. This means over a period longer than 10 years portfolios in area C becomes less efficient and unattractive while the area B portfolios becomes more attractive to the investor.

Table1*: Descriptive Statistics for Smooth Bonus funds and Traditional funds.*

Variables	Mean	Standard Deviation	Max	Min
5 Year Horizon				
Smooth Bonus funds	10.08%	3.25%	14.88%	6.88%
Traditional funds	8.51%	13.47%	28.24%	-7.30%
10 Year Horizon				
Smooth Bonus funds	8.34%	3.26%	14.95%	3.93%
Traditional funds	7.88%	15.44%	29.67%	-19.65%
15 Year Horizon				
Smooth Bonus funds	12.29%	6.61%	24.38%	-1.50%
Traditional funds	15.77%	19.87%	64.43%	-22.09%

5 year horizon

The Smooth Bonus funds has an average return of 10.08%, ranging between 6.88% - 14.88% with standard deviation of 3.25%, while Traditional funds has mean return of 8.51% with a range of -7.30% - 28.24% and standard deviation of 13.47%.

10 year horizon

The Smooth Bonus funds has an average return of 8.34%, ranging between 3.93% - 14.95% with standard deviation of 3.26%, while Traditional funds has mean return of 7.88% with a range of -19.65% - 29.67% and standard deviation of 15.44%.

15 year horizon

The Smooth Bonus funds has an average return of 12.29%, ranging between -1.50% - 24.38% with standard deviation of 3.25%, while Traditional funds has mean return of 15.77% with a range of -22.09 - 64.43% and standard deviation of 19.87%.

Both smooth bonus fund and traditional fund average return is fluctuating higher in 5 years, drops in year 10 then increases in 15 year term. The standard deviation increases the longer the time horizon and the range becomes wider for both Smooth Bonus funds and Traditional funds.

4.1 Independent T-Test Sample results

The study tests the hypothesis that Smooth Bonus funds outperform Traditional funds for 5, 10 and 15 year time horizon and an independent sample t-test was conducted. The following table 2 shows the minimum and maximum values, means and standard deviations of the variables in the study.

Table2*: Descriptive Statistics for Sharpe Ratio Smooth Bonus funds and Traditional funds.*

Variables	Mean	Standard Deviation	Max	Min
5 YEARS				
Smooth Bonus funds	-1.627	5.119	2.344	-14.746
Traditional funds	-0.270	1.054	1.535	-2.434
10 YEARS				
Smooth Bonus funds	-0.321	2.007	1.718	-11.884
Traditional funds	-0.041	0.725	1.416	-1.618
15 YEARS				
Smooth Bonus funds	0.267	1.101	3.009	-1.523
Traditional funds	0.195	0.755	1.575	-1.868

The table 3 below shows the summary of Independent Sample T-Test results. The hypothesis are:

H_o: $\overline{SR}_{Smooth\ Bonus\ fund} \leq \overline{SR}_{Traditional\ Fund}$

H_1: $\overline{SR}_{Smooth\ Bonus\ fund} > \overline{SR}_{Traditional\ Fund}$

Table3*: Summary of Independent Sample T-Test Results.*

Variable	Degree of freedom	T-Value	Sig (p) One Tailed
5 Year Horizon	21	-1.161	0.129
10 Year Horizon	49	-0.832	0.205
15 Year Horizon	104	0.415	0.340

$Significant\ \alpha = 0.05$

5 year horizon

Average Sharpe ratio of Smooth Bonus funds ranges from -14.746 to 2.344 and from -2.434 to 1.535 on Traditional funds. These results indicate that Smooth Bonus funds risk adjusted returns (Mean= -1.627, Standard Deviation = 5.119) is performing lower than Traditional funds risk adjusted return (Mean= -0.270, Standard Deviation = 1.054).

An independent sample t-test found to be no statistically significant as the p-value is greater than 0.05 (p>0.05), t(21) = -1.161, p=0.129 (One tailed).
Accept the null hypothesis that Traditional funds outperform Smooth Bonus funds over a 5 year time horizon.

10 year horizon

Average Sharpe ratio of Smooth Bonus funds ranges from -11.884 to 1.718 and from -1.618 to 1.416 on Traditional funds. These results indicate that Smooth Bonus funds risk adjusted returns (Mean= -0.321, Standard Deviation = 2.007) is performing lower than Traditional funds risk adjusted returns (Mean= -0.041, Standard Deviation = 0.725).
An independent sample t-test found to be no significant as the p-value is greater than 0.05 (p>0.05), t(49) = -0.83, p=0.205 (One tailed).
Accept the null hypothesis that Traditional funds outperform Smooth Bonus funds over a 10 year time horizon.

15 year horizon

Average Sharpe ratio of Smooth Bonus funds ranges from -1.523 to 3.009 and from -1.868 to 1.575 on Traditional funds. These results indicate that Traditional funds risk adjusted returns (Mean= 0.195, Standard Deviation = 0.755) is performing lower than Smooth Bonus funds risk adjusted returns (Mean= 0.267, Standard Deviation = 1.101).
An independent sample t-test found to be no significant as the p-value is greater than 0.05 (p>0.05), t(104) = 0.41, p=0.340 (One tailed).
Accept the null hypothesis that Traditional funds outperform Smooth Bonus funds over a 15 year time horizon.

Smooth bonus funds average risk adjusted return is lower than tradition fund for 5 and 10 year term while its standard deviation (risk) was higher and for 15 year term smooth bonus fund had a better average risk adjusted return with a lowest risk. However unadjusted risk return showed that traditional fund had the highest risk with lower average return compared to smooth bonus fund for 5 and 10 year term while smooth bonus fund had higher average return with lower risks. For 15 year term traditional had the highest risk and average return (see Table 1 above). The results shows that funds with a high risks tend to generate higher average risk adjusted returns than those with lower risks for period up to 10 year term. The importance of adjusting the risks of the returns will yield different results. The notion that high risk tend to generate higher returns is inconsistent with the results.
The result shows that Traditional funds performed better than Smooth Bonus funds in all different time horizon as the null hypothesis is accepted. In addition the results were inconsistent with the previous studies done by Canniffe (2001) and Eastwood, Ledlie, Macdonald, & Pike (1994), that Traditional funds were better performer for 10 year term while Smooth Bonus funds performed better for 15 years. The prior studies evaluated performance based on the unadjusted risk return and risk adjusted returns measure an investment's return, relative to the amount of risk the investment has been exposed to. This paper has done robust test using Sharpe ratio and independent t-test sample.
The implication of this finding is that fees, expenses and broker commision are were ignored for this study and the results maybe different depending on the all fees charged and fee structure. The study evaluated performance by grouping Smooth Bonus fund and Traditional fund to form two portfolios while the individual

Smooth Bonus fund generated better risk adjusted return. This could lead to investor selecting poor performing funds.

5 Conclusions

The purpose of this study was to investigate whether the Smooth Bonus fund outperform traditional funds over a different time horizon. Sharpe ratio was used to calculate risk adjusted returns and then used statistical Independent sample T-test to test the hypothesis for 5 year, 10 year and 15 year time horizon. The test analysed if the two sets of portfolio mean/average risk adjusted return (Smooth Bonus fund and traditional fund) are significantly different from one another.

The major conclusion to this study was that Traditional funds performed better than Smooth Bonus funds in all different time horizon.

However in this study we did not include the Broker/Adviser's fees and the distribution fees which in my opinion have a great impact on the total net return on an investment. The availability of the data for 10 year period and longer was only available for four Smooth Bonus funds because most of the funds were only established early 2000s and / data were not made available to the public.

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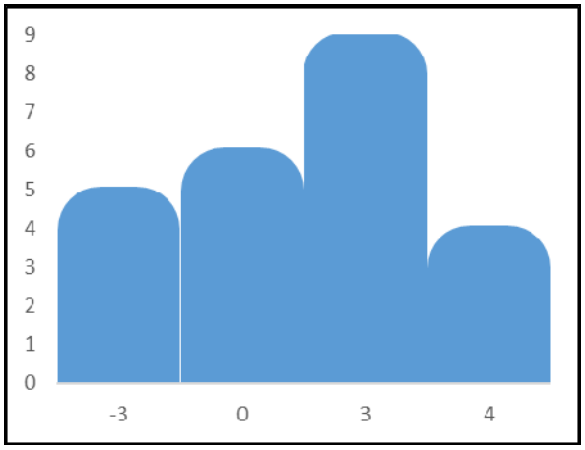
7 Appendix

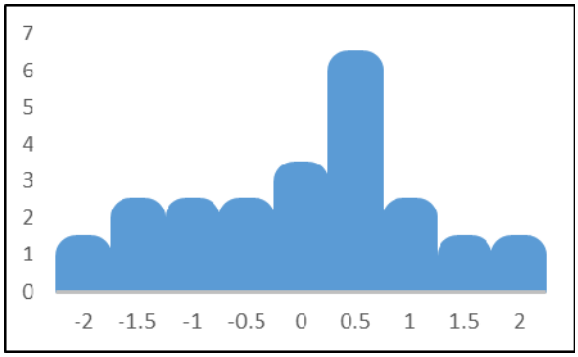
A Normal Distribution Histograms

Figure 7: Smooth Bonus funds Normal Distribution Histogram for 5 year Horizon



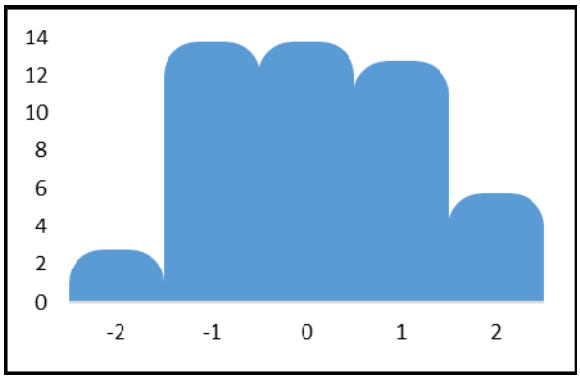
Source: Author

Figure 8: Traditional funds Normal Distribution Histogram for 5 year Horizon



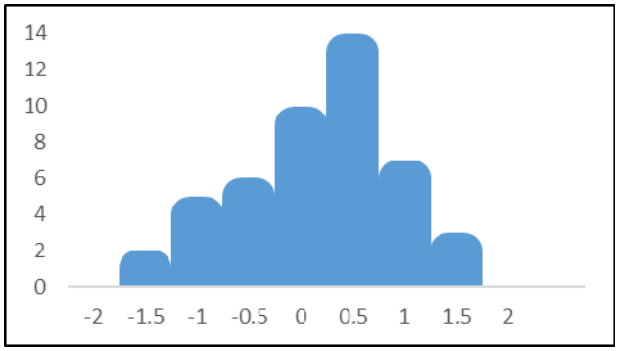
Source: Author

Figure 9: Smooth Bonus funds Normal Distribution Histogram for 10 year Horizon



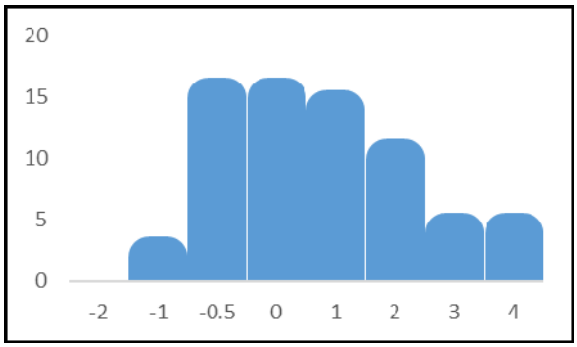
Source: Author

Figure 10: Traditional funds Normal Distribution Histogram for 10 year Horizon



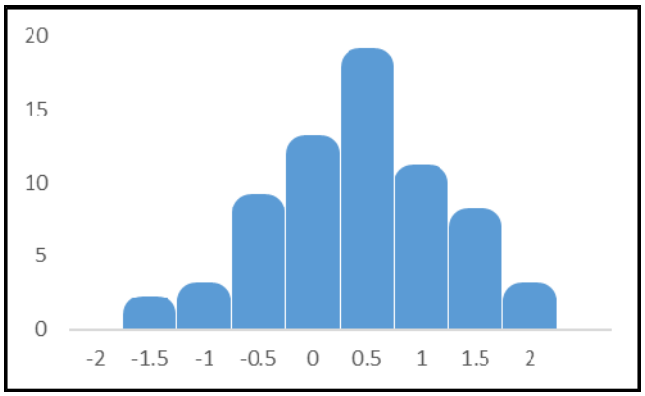
Source: Author

Figure 11: Smooth Bonus funds Normal Distribution Histogram for 15 year Horizon



Source: Author

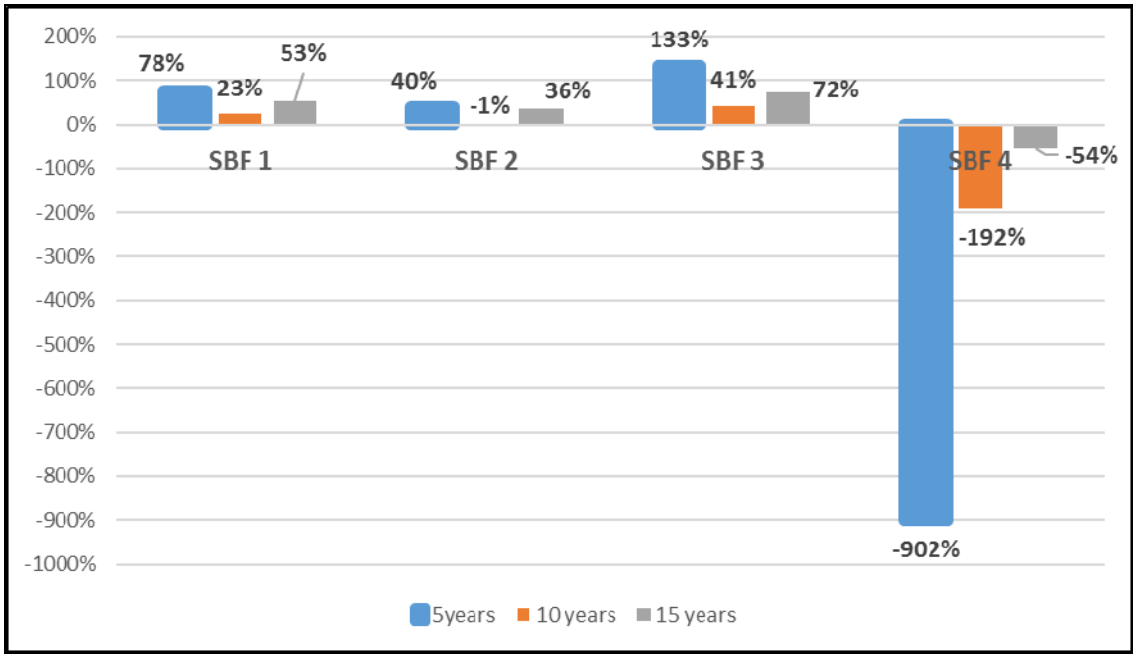
Figure 12: Traditional funds Normal Distribution Histogram for 15 year Horizon



Source: Author

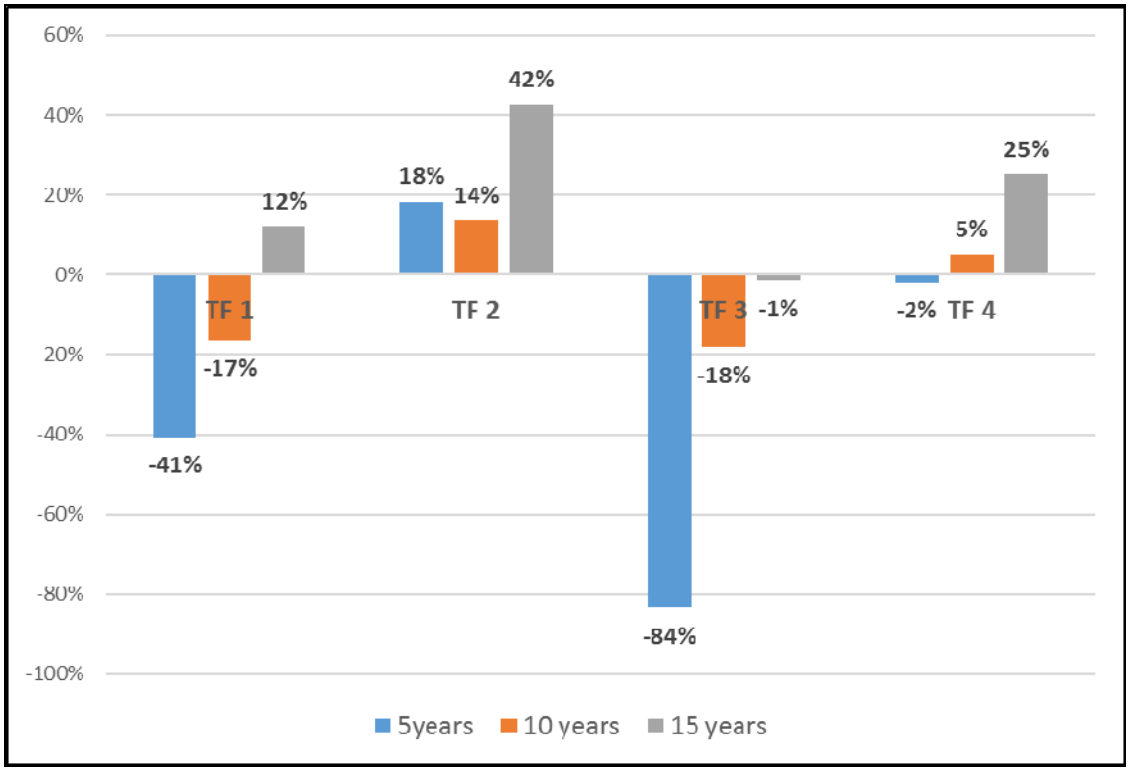
B Average Risk Adjusted Returns over different time span

Figure 13: Average Risk Adjusted return for Smooth Bonus funds over different time Horizon



Source: Author

Figure 14: Average Risk Adjusted return for Traditional funds over different time Horizon



Source: Author