OPTIMAL PORTFOLIO SELECTION:

An empirical study of SIC Insurance Company's Investments

By:

Wilhelmina Aryeetey (B.Sc Mathematics)

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DECLARATION

I hereby declare that this submission is my own work towards the Commonwealth Executive Masters of Business Administration and that, to the best of my knowledge, it contains no materials previously published by another person nor materials which has been accepted for the award of any other degree of the university, except where due acknowledgement has been made in the text.

Wilhelmina Aryeetey	……	……
PG3041909	Signature	Date

Certified By:

Dr. Bernard Tetteh-Dumanya	……..	…….
Supervisor	Signature	Date

Certified By:

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Dean of IDL	Signature	Date

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ABSTRACT

Numerous intelligent systems techniques have been used to select an optimal investment portfolio. These techniques take into consideration the return and the risk of each asset in order to build the best portfolio. This research sets up to evaluate the investment performance of SIC portfolio through optimal portfolio selection. The research identifies specifically the overall investment objective of SIC, its assets selection, the portfolio mix and to evaluate their overall portfolio performance using the Sharpe,Treynor and Jensen Alpha models. The research methodology dwells on functionalist philosophy using a case study as research strategy. It uses the inductive approach to help provide new insights into optimal portfolio selection process. The triangulation method was also used to validate the data and quantitative techniques was used for the analysis.

The paper finds out that, SIC Insurance has not been able to make strides expected from their investment management although their returns look good. Application of the Sharpe, Treynor and Jensen Alpha indicates that the performance of the portfolio is below the market index and therefore there is a need to look at the selection procedure. The ability of SIC to undertake good research in order to add value to their various investments may be a key decision in optimal portfolio selection. The work revealed that measurement and management of risk is a central issue in finance and a huge effort must be made in order to analyse it. It concluded by making a number of recommendations that asset allocation should be the mix of asset classes that promises the highest long-term expected investment return.

There is therefore a need to examine investment behavior from the overall risky asset composition.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Research

Portfolio selection process is used to identify the best allocation of wealth among a basket of securities for an investor with a given savings or consumption behaviour over a given investment horizon (Dhaene, *et al* 2005). The optimal portfolio concept falls under the modern portfolio theory which assumes among other things that, investors fanatically try to minimize risk while striving for the highest return possible. The theory states that, investors will act rationally, always making decisions aimed at maximizing their return for their acceptable level of risk. The optimal portfolio was used in 1952 by Harry Markowitz who showed that possible different portfolios may have varying levels of risk and return.

The derivation of any investment is the aspiration to achieve a return on that investment in order to satisfy the investor. It also of truism that, the investors or the fund manager accepts some amount of risk in order to obtain the return desired. The risk taken on by the investor is the price paid for the opportunity for a positive return and the desired level of return.

Optimal portfolio selection involves mathematical formulation techniques in which the risk-reward combination yields the maximum returns or provides the highest utility possible under the current and anticipated circumstances. Investment return and risk can be modeled quantitatively on both the asset and the portfolio levels. The modeling of risk in particular is

inherently complex, since in reality risk is not just a single number but rather an infinite number of possible future states, each with its own implications for the investors' expected cash flow.

Consequently, the need to establish what an asset is, and what characterizes its return and risk are essential for portfolio managers. Optimal portfolio selection has been studied over the years to understand the entire risk spectrum and machine learning approaches have also been applied in finance. (Goel & Kumar,2006). There are several computational techniques developed in order to collect data, validate, analyze and integrate these data to allow their use in different areas of finance such as selecting the best asset for money investment or detecting the best distribution of wealth among several financial assets to diversify risk and achieve a high return at the same time.

An investment portfolio is a distribution of wealth among several financial assets. The objective of every portfolio building is to diversify risk at the same time attain the highest level of returns. However, depending on the situation and the investor's needs, variations of these objectives could be defined. Two most commonly required objectives are maximization of returns for a given acceptable level of risk and minimization of risk to achieve a given required level of return. Nevertheless, the required return and the highest acceptable level of risk are not the only constraints that determine the amount of wealth that should be invested in each asset. Time allocated to achieve the required return dictates the speed at which the wealth should be accumulated. Time to maturity of each asset certainly limits the set of assets available to take part in a portfolio especially when the objective needs to be achieved quickly. Transaction cost,

which could be a fixed amount or a portion of the transferred amount also influences the dynamics of a portfolio.

The choices for optimal portfolio are limited by the preference of an investor whether all the available wealth must be invested or not. These constraints are often taken into consideration when an optimal portfolio selection is done. Numerous assumptions are often made about the market and the assets even though these assumptions do not always hold. Yet, they are pretty good approximations of reality, and therefore still allow accurate and feasible modeling. Some of the assumption may include market price, liquidity levels etc.

The vast amount of complex and ever-changing information being provided to the manager suggests that a more quantitative approach may be warranted, at least in some aspects of the portfolio management and optimal portfolio selection process. This research therefore was to attempt to provide a structured quantitative approach to the subject using an insurance company as a case study. The research work is in five chapters. The first chapter looks at the general overview of issues of optimal portfolio selection and the objective of the research. The second chapter focuses on the various literatures under the topic while the third chapter discusses the methodology applied for the data collection and analysis as well as the rationale behind the choice of the methodology. This was followed by the fourth chapter which was on the findings from the empirical work and it ended at the fifth chapter with discussion, conclusions and recommendations.

Insurance plays a very vital role in the life of individual and the nation as a whole. Insurance is a form of risk management basically used to hedge against the risk of a contingent, uncertain loss. Insurance is defined as the equitable transfer of the risk of a loss from one entity to another in exchange for payment (Gurusamy, 2009). The main function of insurance is risk-bearing which aims to spread the financial losses of all the insured members.

SIC Insurance Company Limited is one of the oldest non-life insurance companies in Ghana. It traces its roots to the year 1955, when the Gold Coast Insurance Company was established. It was renamed Ghana Insurance Company in 1957, when Ghana attained independence. In 1960, Ghana Insurance Company which was primarily a life assurance company, set up a subsidiary company – Ghana General Insurance Company (Ghana General) to underwrite fire and motor businesses. The Government of Ghana (GoG) in February 1962, per an Executive Instrument, took over the Ghana Cooperative Insurance Company and reconstituted it into the State Insurance Corporation to await the completion of takeover negotiations with Ghana Insurance Company and its subsidiary Ghana General. Subsequently after a successful takeover of the two private companies Ghana Insurance and Ghana General, the new company, State Insurance Corporation, commenced business in November, 1962.

In 1995, State Insurance Corporation was converted into a public limited liability company as part of the GoG's divestiture programme. The company became known as State Insurance Company (SIC) of Ghana Limited with the Government of Ghana as the sole shareholder. The State Insurance Company of Ghana Ltd. took over all the business assets and liabilities of the

State Insurance Corporation of Ghana. By a special resolution passed on 22nd October, 2007 the name of the Company was changed to SIC Insurance Company Limited. In accordance with the provisions of the current insurance legislation, the Insurance Act, 2006, SIC has duly separated its general business from the life business with the incorporation of SIC Life Limited.

SIC is a leading provider of general insurance products in Ghana. Its business operations cover fire, motor, marine and aviation, and accident insurance, the Company has been operating for more than 52 years and has developed long-standing relationships with insurance brokerage firms and some independent agents, who constitute some of its primary distribution channels. SIC's business is national in scope. The Company has consistently, over the span of its business life, maintained steady market leadership. It was listed on the Ghana Stock Exchange on January 25th, 2008 .Therefore with the general public holding shares in the Company, a certain rate of return on their investment will be required from the management of SIC Insurance Company Ltd.

SIC's investment portfolios are managed by SIC-FSL, a subsidiary of SIC. SIC-FSL is a leading investment banking firm owned by both SIC Insurance Company Limited and SIC Life Company Limited.

SIC has contributed immensely to economic growth by converting savings made by individuals into portfolios of assets and smoothing investment returns, as well as allowing individuals to share in the prosperity of the economy. This means that the funds generated by SIC must be managed in a way that will bring maximum benefit to the beneficiaries. Proper management of

these funds could provide a formidable pool of long-term funds for industrial investment especially when there is a change in perception and attitude of Ghanaians towards insurance. Although insurance is a useful tool for business risk management and social protection, the insurance culture of Ghanaians is still very low. The industry needs to create public awareness, not only through advertisement of products but also by providing education on the importance of insurance as well as trying to dispel people's mistrust of the industry. For the public to imbibe the culture of insurance and have confidence in the industry, it is imperative that the public know that insurance companies are not there to take advantage of them, but rather they are established to fill an important gap in the socio-economic development of every nation and to provide hope for individuals who incur loss. Discrepancies in the payment of insurance claims arise due to the lack of understanding of insurance products by the insured. The key thing that could also make most people buy into insurance is for insurers to optimally select investment portfolios optimally to generate maximum returns that would assist insurers to pay legitimate claims promptly without having to fraustrate their insureds. Most insurers delay payment of claims due to lack of immediate funds to settle the insurance claims when the insured event occurs.

1.2 Problem Statement

The portfolio selection problem is an important one in investment and finance and it also has applications in actuarial science. This problem is faced by portfolio managers who have to decide on how to allocate their assets across different classes. Protection against the risks related with everyday life is indispensable to every human being in order to enjoy some level of peace of mind. Insurable risks surround everyday life. Some are known and others are unknown.

Therefore insurance is a useful intervention capable of securing people against unforeseen risks. As a social device, it allows the individual to contractually transfer the potential financial consequences of a loss exposure to an insurer. An important benefit of insurance is the reduction of uncertainty and worry. Insurance offers peace. It helps businesses to protect themselves from risk and provides a wide range of services to ordinary people from car and home insurance to pensions, among others.

Global trends indicate that knowledge-based societies are developing faster than those who lack the opportunity to access relevant information on issues affecting their lives. For that reason, clients awareness is also growing very fast and the need for fund managers to adopt prudent fund management strategies are essential. The issue of risk is particularly pertinent to portfolios of assets, since portfolio risk is very complex to describe and manage, and even more difficult to forecast with a particularly high degree of accuracy. Risk management is a vital and challenging component of portfolio management, presenting dangers as well as opportunities every day. The response of portfolio managers to quantifiably measure the risk or variability of investment returns is crucial. For insurance company like SIC General, the estimated cost of claims that may include the direct expenses to be incurred in settling claims, net of the expected subrogation value and other recoveries may pose a change to their portfolio management. The other risk that may also pose a challenge may include financial risk which may arise from open positions in interest rate, currency and equity products, all of which are exposed to general and specific market movements. Interest risk may also result due to the nature of its investments and

liabilities. Other challenge that may confront every portfolio manager is currency risk, liquidity risk among others.

There is also literally tens of thousands of securities to choose from as portfolio manager and it seems quite intuitive that managers should focus on a limited number of stocks. This may lead to an obvious conclusion that managers cannot possibly keep information about every single asset of investment in the country all the time. Even if the portfolio manager is handed a mandate to focus only on a few of them, chances are that he or she will only be able to follow about a hundred of these properly which may be 20% of the total number of eligible stocks since limited number of variable could be considered at any given time.

In spite of these challenges, there is still opportunity to use optimal techniques to achieve the desired investment objective. The problem of how to make a prudent decision must be taken to maximize returns from the investment. There is therefore the need to make careful analysis of the entire investment to achieve the primary aim of maximizing the investor's returns. Portfolio managers employ the use of optimization tools to evaluate the investment performance of a portfolio. This project seeks to use tools such as the Sharpe ratio, Treynor ratio and the Jensen Alpha to evaluate the investment performance of SIC and to determine which investment strategy it has adopted and the impact on its investment returns as well as to ascertain if its portfolio management is efficiently meeting its investment objectives.

1.3 Aims and Objectives

The general objective of this research was to evaluate the investment performance of SIC portfolio and to ascertain if management strategy applied by SIC is efficiently meeting its investment objectives. Specifically to:

- identify the overall investment objective of SIC Insurance Company Limited
- find out how SIC's assets are selected
- analyze the portfolio mix of SIC
- evaluate SIC portfolio performance using Sharpe, Treynor and Jensen Alpha ratios.

1.4 Research Questions

The critical questions needed to answer the objectives are as follows:

- What is (are) the overall investment objective of SIC company?
- How are the assets selection done in SIC?
- What is the portfolio mix of SIC?
- How is the portfolio performamce of SIC, using the Sharpe, Treynor and Jensen Alpha ratios?

1.5 Research Hypothesis

- Optimal portfolio selection may not positively affect the overall performance of any portfolio because returns on investments positively correlate with the variability of the investment.

- Optimal portfolio selection may not lead to mitigation of risk associated with the various assets in the portfolio because returns inversely correlate with volatility.

*1.*6 Scope of Study

This Research sought to investigate a typical portfolio management performance by using portfolio selection techniques from SIC Insurance Company Limited. SIC is perceived to be managing their investment well, Sharpe ratio was used to measure the return of the portfolio in excess of the risk-free rate, compared to the total risk of the portfolio. The Treynor ratio was used to check reward to volatility while the Jensen Alpha was used to find out any abnormal returns in the portfolio management process. The work was also confined to SIC investment objective, asset allocation mix and did not go into objectives and policy framework of insurance operations of SIC.

1.7 Justification

An investment portfolio is a distribution of wealth among several financial assets such as stocks, bonds and their derivatives. The main goal of building a portfolio is to diversify risk while attaining a high level of return. However, depending on the situation and the investor's needs, the goals could be varied. Two most commonly sought goals are maximization of return for a given acceptable level of risk and minimization of risk to achieve a given required level of return. However, the required return and the highest acceptable level of risk are not the only constraints that determine the amount of wealth that should be invested in each asset. Time allocated to achieve the required return dictates the speed at which the wealth should be accumulated. Time to maturity of each asset certainly limits the set of assets available to take part in a portfolio

especially when the goal needs to be achieved quickly. Consequently this research is justified on five grounds and each is addressed in turns as follows:

- The emerging optimal portfolio selection in investment analysis
- Issues of strategic portfolio management
- The role of optimal portfolio selection
- The case study approach used

The first justification is emerging issues in optimal portfolio selection and management which are relatively new emerging concept in Ghana. Therefore such research in portfolio selection represents summary guidance of stages which provide understanding of principles and value in the field. The research provides issues and lessons learned from optimal portfolio selection in the financial industry in Ghana. An investment in emerging market is riskier than in developed countries in terms of total volatility measures. This research also revealed the extent of portfolio diversification in any single country's measure of overall market portfolio. As proportion of Ghana's specific systematic risk, the principle of diversification are all documented in the research.

The second rationale for this research is issues of strategic portfolio management which has assumed a corporate, strategic level process for co-ordinating successful delivery of any organisation's entire set of programmes and projects. The collection of securities which reflects the total set of programmes and projects within an organisation are used to scrutinise and monitor institutions to ensure ongoing alignment with strategic objectives and business imperatives. The research serves as benchmark in assessing other insurance companies and

addresses the challenges that SIC faces in relation to their portfolio selection and suggest an alternative opinion in the way risk and returns are dealt with and the way forward for future investment strategy formulation. It also gives the picture of optimal portfolio selection techniques that will help ensure less financial problem within the rapidly changing financial system in the insurance industry.

The third justification is the role optimal portfolio selection plays in maximization of drift of discounted portfolios with comparable levels of aggregate diffusion. The Research highlighted on the standard expected utility maximization problem that leads to an optimal portfolio strategy. There was clear differentiation through empirical analysis among the ratios of Sharpe, Treynor and Jensen Alpha. The research adds to building theory about how investment analysis and portfolio selection can both be maximized in financial industrys in Ghana. Additionally, it helps to reduce the apprehension that may arise as a result of poor market performance or otherwise. It will serve as an indispensable reference point for new fund managers, consultants and actuaries on how to avoid the pitfall that results from poor portfolio selection.

The final justification is the type of methodology approach used. The case study as defined by Yin (1984) is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomena and context are not clearly evident. This means that, in emerging economy like Ghana the concept of optimal portfolio selection issues are new and the case study strategy helps to bring out the details from the viewpoint of the participants by using multiple sources of data. This helps to get the true reflection of the issues being studied.

1.8 Significance

The Insurance Industry contributes immensely to economic growth by converting savings made by individuals into portfolios of assets and smoothing investment returns, as well as allowing individuals to share in the prosperity of the economy. The funds raised by the industry are long-term in nature especially that of the Life Insurance business, making it the most critical fund for economic development assets. Insurance companies also assist economic growth by using the premium income they receive to provide long-term capital for investment and by providing a large pool of investment funds, cuts the risk and cost of investing, allowing businesses to invest in a wider range of activities.

This indicates that with stable economic conditions in Ghana that is low inflation, low interest rates and high income, the industry could fulfill its important role as the favorite savings vehicle in the country's economic development by providing financial security for businesses and individuals, since people would have more disposable income to start thinking positively about insurance. In view of this, the industry needs to be innovative in engineering products to attract the public's interest in areas such as Life and Health to increase gross premium incomes. Based on empirical evidence, the view is that there is a high correlation between the economic growth rates and the savings ratio of developing countries. There is therefore the need for government and the National Insurance Commission (NIC) to be more innovative to ensure the financial viability of the industry while unleashing the Insurance Industry's tremendous potential through the liberalization of the investment premium, so that the bulk of the funds are invested in longer-

term productive instruments while maintaining the financial soundness of the insurance companies.

1.9 Limitations

There are a number of limitations of the study although these were addressed in the course of the research. First, is the restricted access to internal documents more especially the last two years. Obtaining secondary data for evaluating parameters for analysis from Ghana Stock Exchange was not easily accessible. Another limitation of the research is that, some important information such as portfolio holding mix or optimal mix was not easy to obtain and the responses were not consistent. This was overcome by using the triangulation method to ascertain the facts. Finally, due to time constraints and cooperation, the scope of our literature reviewed had to be somewhat restricted to SIC but did not extend to other insurance companies.

1.10 Definition Of Terms

Asset Allocation

- The allocation of investments such as stocks and shares to make up investment portfolio.

Active portfolio strategy

- An investment strategy which attempts to achieve portfolio outperformance by forecasting broad market trends and/ or by identifying particular mispriced sectors or securities in a market

Alpha

- The abnormal rate of return on a security in excess of what would be predicted by an equilibrium model like CAPM

Alternative investments

- An investment universe consisting of investments outside of the traditional market investments of publicly traded debt, equity, and property, and including investments ranging from hedge funds and managed futures to venture capital and private equity

Annuity

- A payment of a fixed amount of money at regular intervals of time

Asset class

- A broadly defined group of securities that have similar risk and return characteristics, e.g. equities, bonds, cash

Bear Market

- A situation in which share prices are falling (bears are speculators who sell shares at anticipation of falling prices).

Budget

- A plan that details expected future income and outgoings from an activity, normally over the span of a year.

Benchmark

- A pre-selected portfolio, based on an index or peer group, the performance of which is used to compare with the performance of a fund manager's portfolio.

Bull Market

- A situation in which share prices are rising

Capital

- An imprecise term that is unqualified, generally refers to the resources of an organization or a person such as cash, equipment or skills as contributed by owners.

Capital Asset Pricing Model (CAPM)

- A method of weighing risk and return to achieve the best equity value of a company in planning its financial policy.

Cash Flow

- The movement of money through a company from when it is received as income (borrowing) to the time it leaves the company as payments.

Capital market line (CML)

- The highest sloped line achievable on the expected return and standard deviation graph

Correlation coefficient

- A statistic in which the covariance is scaled to a value between minus one (perfect negative correlation) and plus one (perfect positive correlation)

Covariance

- A measure of the degree to which returns on two risky assets move in tandem

Default Risk

- Risk that holders of a security such as bond are confronted with when issuers of such securities default on their obligation to make principal and interest payments if they are unable to generate the needed cash for the bond obligation.

Derivatives

- Instruments linked to other existing securities and whose value depend on the value of the linked securities

Diversification

- Spreading a portfolio over many investments to avoid excessive exposure to any one source of risk

Efficient frontier

- A graph representing a set of portfolios that maximize expected return at each level of portfolio risk

Emerging markets

- Financial markets of developing countries

Expected return

- The probability-weighted average of the possible outcomes

Financial Risk

- It is the risk that an organisation will be unable to satisfy its financial obligation.

Fixed income security

- A financial instrument, such as a bond, which pays a fixed rate of interest

Insured

- One who takes an insurance policy

Insurer

- A company that does insurance

Insured Event

- The loss which is paid for by insurers when it occurs

Interest Rate Risk

The risk of changing interest rates and their effect on the proceeds of early sale.

Inflation Risk

- The risk of unanticipated inflation during the period of investment

Liquidity Risk

- Risk as a result of a security not having a ready market

Money market

- A market for trading short-term debt, with a maturity of less than one year

Passive portfolio strategy

- A strategy of selecting stocks to match a preselected index or portfolio, with minimal analysis or input by the fund manager

Performance attribution

- The process of segregating the performance associated with asset allocation and with stock selection

Performance evaluation

- The process of measuring a fund manager's performance against a chosen benchmark and then assessing how the performance was actually achieved

Portfolio

- Is a selection of securities held by a person or an institution

Portfolio management

- The process of combining securities in a portfolio tailored to the investor's preferences and needs, monitoring that portfolio, and evaluating its performance

Premium

- Money that insureds pay to their insurers when they take an insurace cover

Risk-adjusted return

- Investment performance adjusted for the level of risk that the strategy is exposed to

Risk-free asset

- Assets with a certain rate of return; often taken to be short-term bills

Risk premium

- An expected return in excess of that on risk-free securities providing compensation for the risk of the investment

Security

- Is a fungible, negotiable instrument representing financial value. Securities are broadly categorized into debt securities (such as banknotes, bonds and debentures), and equity securities, e.g., common stocks

Share

- Is a unit of account for various financial instruments including stocks, mutual funds, limited partnerships,

Standard deviation

- The square root of the variance; a statistical measurement of the dispersion about a fund's average return over a specified time period that describes how widely returns vary over the designated period

Systematic risk

- Risk factors common to the whole economy; nondiversifiable risk

Treasury bill

- Short-term, highly liquid government securities issued at a discount from the face value and returning to the face amount at maturity

Unsystematic risk

- Risk attributable to firm-specific risk or non-market risk

Variance

- A measure of risk or the dispersion around the mean

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

Portfolio selection problem has been one of the standard and most important problems in investment and financial Research fields. It has been central to research activity in the real financial field and numerous researchers have contributed to the development of modern portfolio theory. There is rapid transformation in the financial industry. Many researchers' papers have been trying different mathematical approaches to develop the theory of portfolio model (Zimmerman *et al*, 2002). In particularly, the performance measure of portfolio has become one of the most important factors in theoretical and practical investment. As recent studies in the sense of mathematical programming, some researchers have proposed various types of portfolio models under randomness and fuzziness. This research is to add to the body of knowledge that existed by using an insurance company instead of a bank.

2.1 Portfolio Management and Optimal Selection

Portfolio theory assumes that investors are basically risk averse, meaning that, given a choice between two assets with equal rates of return, they will select the asset with the lower level of risk (Maginn 1990). Evidence that most investors are risk averse is that they purchase various types of insurance, including life insurance, car insurance, and health insurance. Buying insurance basically involves an outlay of a given amount to guard against an uncertain, possibly

larger outlay in the future. When insurance is bought, it implies willingness to pay the current known cost of the insurance policy to avoid the uncertainty of a potentially large future cost related to a car accident or a major illness. Further evidence of risk aversion is the difference in promised yield for different grades of bonds that supposedly have different degrees of credit risk (Farrell 1997).

This combination of risk preference and risk aversion can be explained by an attitude toward risk that depends on the amount of money involved. While recognizing this diversity of attitudes, the basic assumption is that most investors committing large sums of money to developing an investment portfolio are risk averse. Therefore, a positive relationship between expected return and expected risk exist in optimal selection process (Peavy 1990).

The basic Markowitz portfolio model derived the expected rate of return for a portfolio of assets and a measure of expected risk, which is the standard deviation of expected rate of return (Markowitz 1952). The expected rate of return of a portfolio is the weighted average of the expected return for the individual investments in the portfolio. The standard deviation of a portfolio is a function not only of the standard deviations for the individual investments but also of the covariance between the rates of return for all the pairs of assets in the portfolio. In a large portfolio, these covariances are the important factors. Different weights of a portfolio held in various assets yield a curve of potential combinations. Correlation coefficients among assets are the critical factor you must consider when selecting investments because you can maintain your rate of return while reducing the risk level of your portfolio by combining assets or portfolios

that have low positive or negative correlation ((Markowitz 1959). Assuming numerous assets and a multitude of combination curves, the efficient frontier is the envelope curve that encompasses all of the best combinations. It defines the set of portfolios that has the highest expected return for each given level of risk or the minimum risk for each given level of return. From this set of dominant portfolios, you select the one that lies at the point of tangency between the efficient frontier and your highest utility curve. Because risk-return utility functions differ among investors, your point of tangency and, therefore, your portfolio choice will probably differ from those of other investors. Optimum portfolio is a combination of investments, each having desirable individual risk–return characteristics that also fit together based on their correlations (Desai *et al,* 2003). This deeper understanding of portfolio theory should lead you to reflect back on our earlier discussion of global investing. The optimal portfolio is the portfolio on the efficient frontier that has the highest utility for a given investor. It lies at the point of tangency between the efficient frontier and the curve with the highest possible utility.

The assumptions of capital market theory expand on those of the Markowitz portfolio model and include consideration of the risk-free rate of return. The correlation and covariance of any asset with a risk-free asset are zero, so that any combination of an asset or portfolio with the risk-free asset generates a linear return and risk function. Therefore, combination of the risk-free asset with any risky asset on the Markowitz efficient frontier results in straight-line portfolio possibilities while the dominant line is the one that is tangent to the efficient frontier. This dominant line is referred to as the capital market line (CML), and all investors target points along this line depending on their risk preferences. Because all investors want to invest in the risky

portfolio at the point of tangency, this portfolio—referred to as the market portfolio—must contain all risky assets in proportion to their relative market values. Moreover, the investment decision and the financing decision can be separated because, although everyone will want to invest in the market portfolio, investors will make different financing decisions about whether to lend or borrow based on their individual risk preferences (Davis & Norman 1990).

Given the CML and the dominance of the market portfolio, the relevant risk measure for an individual risky asset is its covariance with the market portfolio, that is, its systematic risk. When the covariance for the market portfolio is standardized, a well-known beta measure of systematic risk and a security market line (SML) that relates the expected or required rate of return for an asset to its beta. Individual securities and portfolios are plotted on SML to determine the expected (required) return on a security based on its systematic risk (beta). Alternatively, assuming security markets are not always completely efficient, you can identify undervalued and overvalued securities by comparing estimated rate of return to be earned on an investment to its expected (required) rate of return. The systematic risk variable (beta) for an individual risky asset is computed using a regression model that generates an equation referred to as the asset's characteristic line.

Major assumptions of the CAPM required modifications that are reasonably minor and do not change the overall concept of the model. Empirical studies have indicated stable portfolio betas, especially when enough observations were used to derive the betas and there was adequate volume. Although the early tests confirmed the expected relationship between returns and systematic risk (with allowance for the zero-beta model), several subsequent studies indicated

that the univariate beta model needed to be supplemented with additional variables that considered skewness, size, P/E, leverage, and the book value/market value ratio (Elton *et al* 1995). A study by Fama and French in the 70s contended that during the period 1963 to 1990, beta was not relevant. In their study, the most significant variables were book-to-market value (BE/ME) and size. Subsequent studies both supported their findings and differed with them because some more recent authors have found a significant relationship between beta and rates of return on stocks.

2.2 The Investment Management Process

Setting investment policy guidelines begins with the asset allocation decision, how the funds to be invested should be distributed among the major classes of assets. An asset allocation model is used to provide guidance in making this decision (Rubinstein, (2006). While there are many asset allocation models proposed, the critical input in all of them is the expected return for an asset class. The expected return for an asset class is estimated using regression analysis. The process begins with the selection of an asset pricing or asset return model. These models belong to three different families: (1) general equilibrium models, (2) econometric models, and (3) arbitrage pricing models. The first two models rely on the econometric tools, The most well-known general equilibrium model is the capital asset pricing model (CAPM).

Selecting a Portfolio Strategy, clients can request for a money manager for a particular asset class to pursue an active or passive strategy. An active portfolio strategy uses available information and forecasting techniques to seek a better performance than a portfolio that is

simply diversified broadly (Bacon (2008). A passive portfolio strategy involves minimal expectation input, and instead relies on diversification to match the performance of some market index. There are also hybrid strategies. Whether clients select an active or passive strategy depends on their belief that the market is efficient for an asset class. Portfolio manager minimizes the tracking error versus a benchmark but at the same time in the constraint set bounds from above the volatility of the portfolio return. In this way, if the benchmark is volatile, the portfolio manager requires that the portfolio's volatility is bounded. Consequently, most studies have focused on the pricing efficiency of the equity markets. Pricing efficiency refers to a market where prices at all times fully reflect all available information that is relevant to the valuation of securities. When a market is price-efficient, strategies pursued to outperform a broad-based market index will not consistently produce superior returns after adjusting for both risk and transactions costs.

2.3 Insurance Companies and Optimal Portfolio Selection

The investment objectives and constraints for an insurance company depend on whether it is a life insurance company or a nonlife. Life insurance firms collect premiums during a person's lifetime that must be invested until a death benefit is paid to the insurance contract's beneficiaries. At any time, the insured can turn in her policy and receive its cash surrender value. Discussing investment policy for an insurance firm is also complicated by the insurance industry's proliferation of insurance and quasi-investment products. Basically, an insurance company wants to earn a positive "spread," which is the difference between the rate of return on investment minus the rate of return it credits its various policyholders.

Attractive investment returns allow the company to advertise better policy returns than those of its competitors. A growing surplus also allows the firm to offer new products and expand insurance volume. Insurance companies' liquidity needs have increased over the years due to increases in policy surrenders and product-mix changes. Cash outflows are somewhat predictable for life insurance firms, based on their mortality tables. Due to their fiduciary responsibility to claimants, risk exposures are low to moderate. Depending on the specific company and competitive pressures, premiums may be affected both by the probability of a claim and the investment returns earned by the firm. Many insurers now focus on a total return objective as a means to increase their surplus accounts over time. Every investor knows that there is a trade-off between risk and reward. To obtain greater expected returns on investments, one must be willing to take on greater risk. In solving the Portfolio Selection problem, it is good to use quantitative measures of risk and reward to obtain a balance between these two factors that suits the individual investor. No one combination of securities is optimal for all investors (Brinson *et al* 1986). The best portfolio for any one investor depends on their own tolerance for risk. A carefully constructed policy statement determines the types of assets that should be included in a portfolio. The asset allocation decision, not the selection of specific stocks and bonds, determines most of the portfolio's returns over time. Although seemingly risky, investors seeking capital appreciation, income, or even capital preservation over long time periods will do well to include a sizable allocation to the equity portion in their portfolio. Though a policy statement does not indicate which specific securities to purchase and when they should be sold, it

should provide guidelines as to the asset classes to include and the relative proportions of the investor's funds to invest in each class (Tofallis 2008).

2.4 Market Pricing and Optimal Portfolio Selection

Capital Asset Pricing Model (CAPM) basically proposes that an asset's return can be described completely by a combination of a market return and the asset's co-variation with that market. It is used to determine a theoretically appropriate required rate of return of an asset, if that asset is to be added to an already well-diversified portfolio, given the assets non-diversifiable risk.

The model takes into account the asset's sensitivity to non-diversifiable risk also known as systematic risk or market risk. This is represented by the quantity beta (β) in the financial industry, as well as the expected return of the market and the expected return of a theoretical risk-free asset. The idea is that investors are compensated for taking on necessary risk but not for taking on unnecessary risk. It provides a framework for separating risk into necessary systematic or market-related risk and unnecessary unsystematic, asset-specific or residual risk. The CAPM simply postulates that a linear relationship exists between the return on an asset and the return on the market, and that asset returns can thus be explained by a single factor, namely the market return. The market reward-to-risk ratio is effectively the market risk premium and by rearranging the above equation and solving for E (Ri), we obtain the Capital Asset Pricing Model (CAPM).

$$\mathbf{E(R_i) = R_f + \beta_i (E(R_m) - R_f)}$$

Where:

$\mathbf{E(R_i)}$ = expected return on the capital asset

$\mathbf{R_f}$ = risk-free rate of interest such as interest arising from government bonds

β_i = sensitivity of the expected excess asset returns to the expected

The beta is also is defined as

$$\beta_i = \frac{\mathrm{Cov}(R_i, R_m)}{\mathrm{Var}(R_m)}$$

E (R_m) = expected return of the market and

R (R_m) -R_f = market premium or risk premium

The risk of a portfolio comprises systematic risk, also known as undiversifiable risk and unsystematic risk which is also known as idiosyncratic risk or diversifiable risk. Systematic risk refers to the risk common to all securities like market risk. Unsystematic risk is the risk associated with individual assets and can be diversified away to smaller levels by including a greater number of assets in the portfolio. A rational investor will not take only diversifiable risk since non-diversifiable risks are rewarded within the scope of CAPM model. Therefore, the required return on an asset that compensates for risk taken is linked to its riskiness in a portfolio context. CAPM portfolio risk is represented by higher variance i.e. less predictability. In other words the beta of the portfolio is the defining factor in rewarding the systematic exposure taken by an investor.

2.5 The Beta (B) and Optimal Portfolio Selection

Beta of a portfolio is a number describing the relation of its returns with that of the financial market as a whole (Levinson 2006). An asset has a Beta of zero if its returns change independently of changes in the market's returns. A positive beta means that the asset's returns generally follow the market's returns, in the sense that they both tend to be above their respective

averages together, or both tend to be below their respective averages together. A negative beta means that the asset's returns generally move opposite the market's returns: one will tend to be above its average when the other is below its average (Tofallis 2008). The beta coefficient is a key parameter in the capital asset pricing model (CAPM). It measures the part of the asset's statistical variance that cannot be removed by the diversification provided by the portfolio of many risky assets, because of the correlation of its returns with the returns of the other assets that are in the portfolio. Beta can be estimated for individual companies using regression analysis against a stock market index

The formula for the beta of an asset within a portfolio is

$$\beta_a = \frac{\mathrm{Cov}(r_a, r_p)}{\mathrm{Var}(r_p)},$$

Where r_a measures the rate of return of the asset, r_p measures the rate of return of the portfolio, and Cov (r_a,r_p) is the covariance between the rates of return. The portfolio of interest in the CAPM formulation is the market portfolio that contains all risky assets, and so the r_p terms in the formula are replaced by r_m, the rate of return of the market.

The Beta is also referred to as financial elasticity or correlated relative volatility, and can be referred to as a measure of the sensitivity of the asset's returns to market returns, its non-diversifiable risk, its systematic risk, or market risk. On an individual asset level, measuring beta can give clues to volatility and liquidity in the marketplace. In fund management, measuring beta

is thought to separate a manager's skill from his or her willingness to take risk. The beta coefficient was born out of linear regression analysis. It is linked to a regression analysis of the returns of a portfolio (such as a stock index) (x-axis) in a specific period versus the returns of an individual asset (y-axis) in a specific year. The regression line is then called the Security characteristic Line (**SCL**) and is given as

SCL: $r_{a,t} = \alpha_a + \beta_a r_{m,t} + \varepsilon_{at}$

where

α_a = asset's alpha

β_a = asset's beta coefficient.

Both coefficients have an important role in Modern portfolio theory. A misconception about beta is that it measures the volatility of a security relative to the volatility of the market. If this were true, then a security with a beta of 1 would have the same volatility of returns as the volatility of market returns. In fact, this is not the case, because beta also incorporates the correlation of returns between the security and the market. To estimate beta, one needs a list of returns for the asset and returns for the index; these returns can be daily, weekly or any period. Then one uses standard formulas from linear regression. The slope of the fitted line from the linear least-squares calculation is the estimated Beta. The standard estimation of Beta uses the slope of the least squares regression line. This gives a slope which is less than the volatility ratio. Specifically it gives the volatility ratio multiplied by the correlation of the plotted data.

2.6 The Sharpe, Treynor & Jensen Alpha and Optimal Portfolio Selection

The Sharpe ratio which is sometimes called reward-to-variability ratio is a measure of the excess return or risk premium per unit of risk in an investment asset or a trading strategy (Scholz 2007). It is mathematically defined by:

$$S = \frac{R - R_f}{\sigma} = \frac{E[R - R_f]}{\sqrt{\text{var}[R - R_f]}},$$

where R is the asset return, R_f is the return on a benchmark asset, such as the risk free rate of return, $E[R - R_f]$ is the expected value of the excess of the asset return over the benchmark return, and σ is the standard deviation of the excess of the asset return. The Sharpe ratio utilizes the asset standard deviation whereas the information ratio utilizes standard deviation of excess return over the benchmark. It is used to characterize how well the return of an asset compensates the investor for the risk taken. The higher the Sharpe ratio numbers the better.

When comparing two assets each with the expected return $E[R]$ against the same benchmark with return R_f, the asset with the higher Sharpe ratio gives more return for the same risk. Investors are often advised to pick investments with high Sharpe ratios. However like any mathematical model it relies on the data being correct. Pyramid schemes with a long duration of operation would typically provide a high Sharpe ratio when derived from reported returns but the inputs are false. When examining the investment performance of assets with smoothing of returns, the Sharpe ratio is derived from the performance of the underlying assets rather than the fund returns. The Sharpe ratio has as its principal advantage that it is directly computable from any observed series of returns without need for additional information surrounding the source of profitability.

The Treynor ratio which is sometimes called the reward-to-volatility ratio is the returns earned in excess of that which could have been earned on an investment that has no diversifiable risk. (Brown & Reilly 2008) example is Treasury Bills. The Treynor ratio relates excess return over the risk-free rate to the additional risk taken; however, systematic risk is used instead of total risk. The higher the Treynor ratio, the better the performance of the portfolio under analysis. The Treynor ratio is defined as:

$$T = \frac{r_i - r_f}{\beta_i}$$

Where:

T =Treynor ratio,

f_i = portfolio *i*'s return

r_i = risk free

β_i = portfolio's beta

Treynor ratio (*T*) does not quantify the value added of active portfolio management. It is a ranking criterion only. A ranking of portfolios based on the Treynor ratio is only useful if the portfolios under consideration are sub-portfolios of a broader, fully diversified portfolio. If this is not the case, portfolios with identical systematic risk, but different total risk, will be rated the same. But the portfolio with a higher total risk is less diversified and therefore has a higher unsystematic risk which is not priced in the market. An alternative method of ranking portfolio

management is Jensen's alpha, which quantifies the added return as the excess return above the security market line in the capital asset pricing model. As these two methods both determine rankings based on systematic risk alone, they will rank portfolios identically finance.

Jensen's alpha is used to determine the abnormal return of a security or portfolio of securities over the theoretical expected return (Jensen 1968). The security could be any asset, such as stocks, bonds, or derivatives. The theoretical return is predicted by a market model, most commonly the Capital Asset Pricing Model (CAPM) model. The market model uses statistical methods to predict the appropriate risk-adjusted return of an asset. The CAPM for instance uses beta as a multiplier. Jensen's alpha was first used as a measure in the evaluation of mutual fund managers by Michael Jensen in 1968. The CAPM return is supposed to be 'risk adjusted', which means it takes account of the relative riskiness of the asset. After all, riskier assets will have higher expected returns than less risky assets. If an asset's return is even higher than the risk adjusted return, that asset is said to have "positive alpha" or "abnormal returns". In the context of CAPM, calculating alpha requires the following inputs:

- the realized return (on the portfolio),
- the market return,
- the risk-free rate of return, and
- the beta of the portfolio.

Jensen's alpha is calculated as: Portfolio Return − [Risk Free Rate + Portfolio Beta times (Market Return − Risk Free Rate) and is mathematically shown as:

$$\alpha_J = R_i - [R_f + \beta_{iM} \cdot (R_M - R_f)]$$

Jensen's alpha is a statistic that is commonly used in empirical finance to assess the marginal return associated with unit exposure to a given strategy. Generalizing the above definition to the multifactor setting, Jensen's alpha is a measure of the marginal return associated with an additional strategy that is not explained (Levinson 2006).

CHAPTER THREE

METHODOLOGY

3.0 INTRODUCTION

A comprehensive study of historical data is significantly useful for investment managers and it assists them to perceive the trend as well as the individual portfolio dynamics. This section shows the process of enquiry and investigation, the systematic, methodical and ethical approaches used and how the data was analyzed to arrive at the recommendation.

3.1 Research Philosophy

The research methodology used dwelled on functionalist philosophy which sought to provide rational explanations of human affairs in order to give a holistic view between phenomenon and empirical investigation (Saunders *et al* 2003). The data collection and analysis of the research was done in the premise of this philosophy using a case study as research strategy to help build and test various confirmed or rejected theories or research findings on optimal portfolio selection techniques and the role it plays in the management of investment funds. Both qualitative and quantitative techniques were employed and full details are provided in this chapter and 4.

3.2 Research Approach

Many research works combined number of approaches in the research approaches. This work used three different approaches, namely; qualitative, quantitative and inductive.

The qualitative approach was used to achieve an in-depth understanding of a situation and therefore, published text, investment memos and internal documents from SIC was reviewed.

The quantitative approach was employed to calculate the numerical data and the Inductive approach helped to understand cause-effect links and provided new insights into optimal portfolio selection process. Inductive approach is an extremely effective process for obtaining general, observation-based information and it gives close understanding of the research context. According to Gill and Johnson (1991), social world cannot be understood on the bases of causal relationships alone but by essential human actions infused by values, intentions, attitudes and beliefs.

3.3 Data Collection

The study dwelled mostly on interviews which were transcribed for the analysis. The triangulation method was also applied to verify the information collected. Therefore financial statements, internal memorandum, semi-unstructured interview questions were used. The quantitative data collected was used in the analysis.

3.4 Method of Data Collection

The primary method of the data collection was personal interview. An interview is a purposeful discussion between two or more people according to Kahn & Cannell (1957). The use of the interview facilitated gathering of data that were valid and relevant to the research objectives and questions. The questions raised during the interview were based on the literature review which included an identification of corporate information about SIC as an insurance company. This method of data collection was expected to provide in-depth insights into attitudes and perceptions of respondents to a range of issues that straddle SIC and the optimal portfolio selection. Quantitative data were also collected from National Insurance Commission.

3.5 Population, Sampling and Sampling Technique

The research employed purposive sampling which is a non-probability sampling technique. This was useful because the relevant information required for the research work could be obtained from specific persons from SIC , National Insurance .Commission and SIC-FSL which is a subsidiary of SIC and are responsible for most of their investments.In view of the above, four key managers from National Insurance Commission were interviewed to verify data in their annual reports. The deputy managing director of finance of SIC Insurance Company Ltd.was interviewed to ascertain facts on their investments. The Head of Accounting and two schedule officers of the company were also interviewed since financial statements were used. The head of Asset managmment of SIC-FSL was consulted on issues of SIC's assets managements to complement what is documented. The head and two trained scheduled officers from SIC-FSL brokerage department were interviewed and they provided information to verify data on their equities. The managing director of SIC-FSL was also interviewed for general verification of data acquired. On data collected on their investment philosophy, the corporate planner of the company was interviewed to confirm what has been documented. To verify issues raised on internal control, the head of internal audit was interviewed. The managing director of SIC Insurance Company being the chairman of the investment committee was interviwed to verify the entire data collected for the research work.

3.6 Method of Data Analysis

The qualitative and quantitative data acquired were analyzed for this research. The data that were collected were based on answers given by respondents during the interview; the non-standardized data that required classification were all analyzed through qualitative means whereas the data based on meanings and those that were in numerical forms were all analyzed by the use of diagrams such as pie-charts, bar charts etc. and statistics.

3.7 Limitation of the Methodology

There are a number of limitations to the study although these were addressed in the course of the research. First is the restricted access to internal documents more especially from 2005 to 2010. The other limitation is the inconsistent nature of the information in the financial statements as compared with the final audited statements. This was mitigated by contacting the investment section of SIC Insurance Company Limited for confirmation. The methodology for the financial statements varied from year to year although the same basis was used. For instance, in one particular year, the statements did not differentiate between the listed equities and unlisted equities but in another year these differences were shown. It should however be noted that these interviewees are representatives of SIC. Another limitation of the research is that during the interview some important information such as portfolio holding mix or optimal mix of the company was not well disclosed by our respondents as they regarded that information to be too sensitive and confidential.

The classification of SIC investment varied from year to year (Annual report 2009). The categorisation depended on the purpose for which the investments were acquired and management determines each year how the investment should be categorised and classified making it difficult for data consistency. Finally, due to time constraints, the scope of the literature reviewed had to be somewhat restricted to SIC.

CHAPTER FOUR

FINDINGS AND DISCUSSIONS

4.0 INTRODUCTION

The equity investment generally refers to the buying and holding of shares of stock on the stock market by SIC in anticipation of income from dividends and capital gains as the value of the stock rises. It may also refer to the acquisition of equity participation in a private unlisted company or a start-up company.

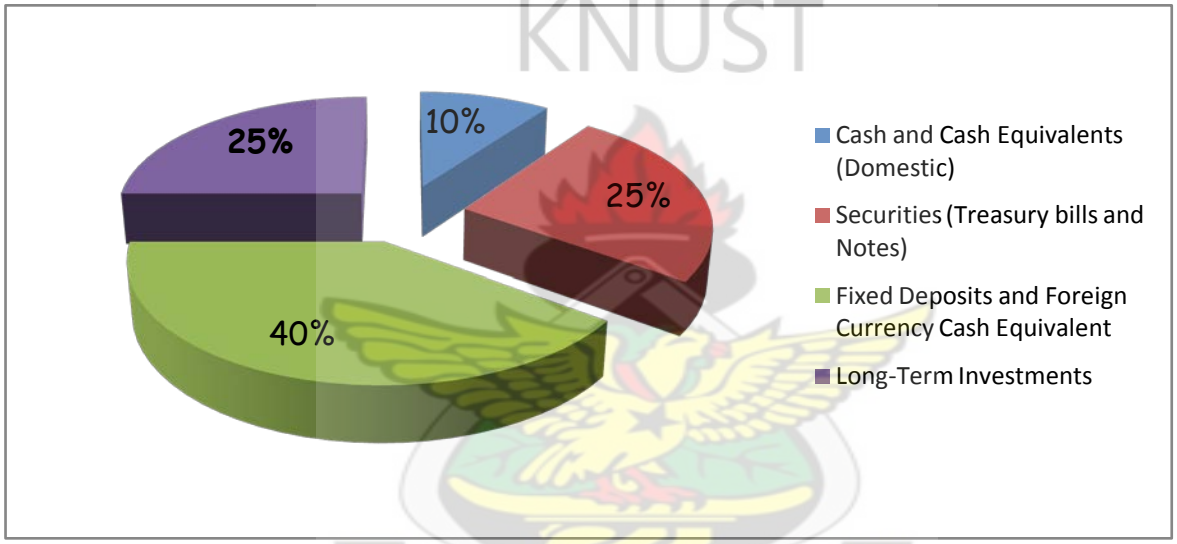
4.1 Overall Investment Objective of Sic

SIC's investment philosophy is to adhere to the guidelines under the Insurance Law and the Company's investment objectives which is the insurance Act, 2006 (Act 724) that requires that general insurance companies invest 25% of their gross premiums written in Government bills and notes, and the remainder in securities approved by the National Insurance Commission. Investments are also structured to meet the company's profitability objectives and solvency requirements. SIC places emphasis on optimizing investment returns over the long term and the portfolio mix consisted largely of high quality, fixed deposits and foreign currency and short-term investments, as well as a significant amount of listed and unlisted equity securities. The Company believes that prudent levels of investments within its investment portfolio are likely to enhance long term total returns without significantly increasing the risk profile of the portfolio.

4.2 Assets Selection and Portfolio Mix

SIC has selected various investments depending on the purpose for which the investment are acquired and management determines the classification at the initial stages and revaluates it every reporting year (Annual Report 2009). The category of investments consists of listed equities, unlisted equities, fixed income and landed properties. The figure 4.1 below shows the composition of SIC's investment portfolio mix.

Figure 4.1 Asset Allocation of SIC



Source : National Insurance Commission Annual Report

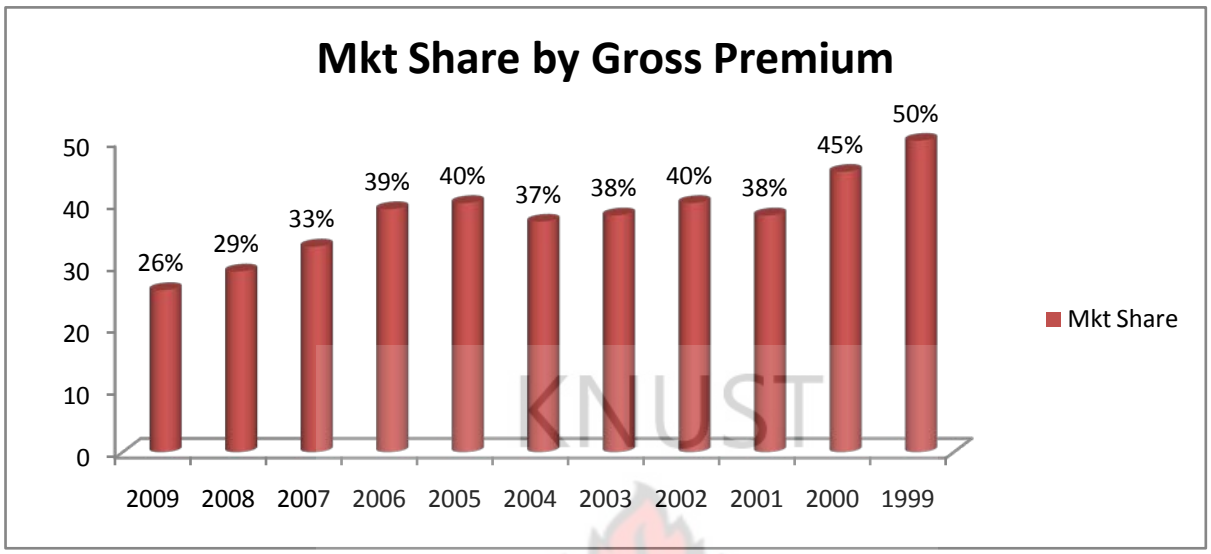
Figure 4.1 clearly shows that 40% of the allocation is for fixed deposits and foreign currency cash equivalents. 25% is allocated for securities which consist of Ghana Government treasury bills and Bank time deposit and these form their short term investments. The long term investment constitutes 25% of the allocation and they are defined as mortgage loans, equity shares and House Bonds. Finally, 10% of the allocation is for cash and cash equivalent which

includes cash in hand, deposits held at call with banks, other short-term highly liquid investments with original maturities of three months or less and bank overdrafts.

4.3 Market Share of SIC By Gross Premium

Despite a highly competitive insurance market and the fact that SIC market share kept on falling, it is significant to note that SIC continues to dominate the market with a market share of about 26% by 2009 from 50 % in 1999. SIC offers its products through registered brokers, company-employed sales representatives, and marketing field staff. It also, to a large extent, depends on walk-in customers. SIC's marketing strategy is to appeal to customers who desire a feature-rich product at a competitive price. The Company uses broadcasting, print media, community events, and the internet to offer its products to its target markets. The Company has a broad marketing reach because of its comparatively larger number of agents. It has approximately 600 in-house trained agents who market its products all over the country to cater for the special needs of its geographical markets. SIC's marketing field officers do not only offer products to its target markets, but also collect market data for the Company to use to enhance its existing product base and develop newer lines of policies. Additionally, the Company uses thirty-seven registered independent insurance brokers to offer its products, particularly for its fire, marine and general accident lines of business. (Website 2011).

Figure 4.2: Market share from 1999-2009



Source: Developed by Researcher

4.4 Sharp Ratio

According to Hendrik (2007), Sharpe ratio is a reward-to-variability ratio that measures excess return or risk premium per unit of risk in an investment asset. It is used to characterize how well the return of an asset compensates the investor for the risk taken. Generally it is interpreted as, the higher the Sharpe ratio numbers the more return for the same risk.Mathematically Sharpe ratio is defined as:

$$S = \frac{R - R_f}{\sigma} = \frac{E[R - R_f]}{\sqrt{\text{var}[R - R_f]}},$$

Where R = return on asset

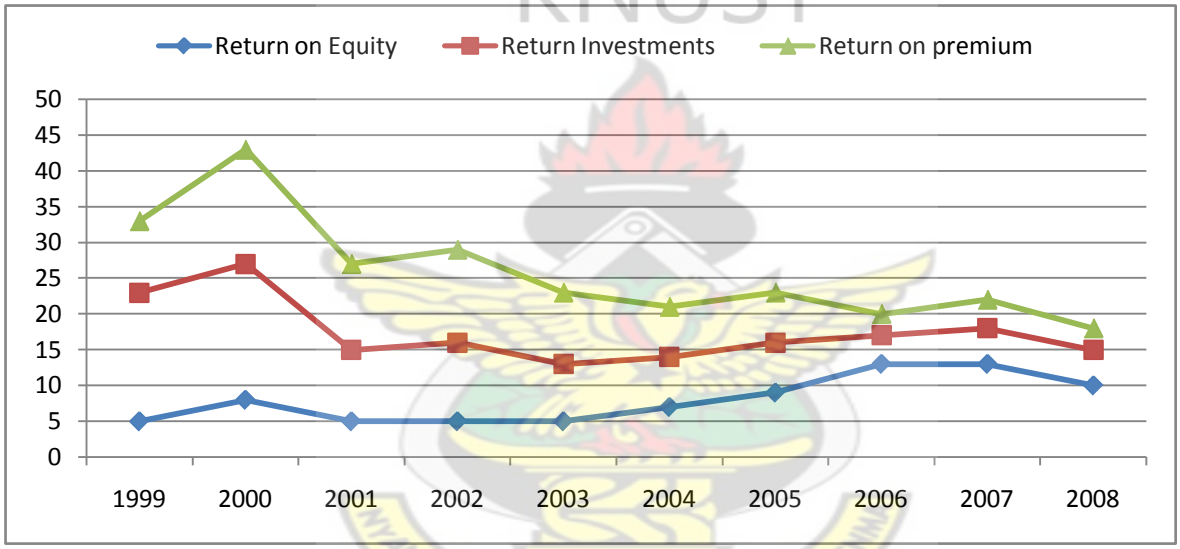
R_f = the risk free rate of return (bench mark)

σ = the standard deviation

4.4.1 Sharpe Ratio Empirical Analysis on SIC

In analyzing investment returns of SIC using the Sharpe ratio, three portfolios were selected. SIC returns on equities, returns on SIC premium and returns on SIC total investments. The figure 4.3 below shows the various levels of returns of the three portfolios of SIC.

Figure 4.3: Average annual returns on equity, premium and general investments (1999-2008)



Source: Developed by Researcher

The figure 4.3 above demonstrates that SIC had the highest returns of the entire portfolio in the year 2000. In this particular year, the company market share was 45% and at the same time, the gross insurance premium growth rate was 51%. Since the year 2000, the market share of the company has declined consistently as shown in figure 4.2 and this is attributed to the increase in

registered insurance companies from 18 to 42. The figure 4.3 as it stands does not show whether the trend was as a result of non-diversify risk or the market risk or unsystematic risk. Consequently the need to compute systematic and unsystematic risk was necessary using the Sharpe and Treynor indexes. As shown in Appendix 1 the results are shown below:

SI_E - Sharpe ratio for return on equity

SI_I - Sharpe ratio for return on Investments

SI_P - Sharpe ratio for return on premium

SI_M - Sharpe ratio for market index

T- bills were one year note/Market Index was All share Index

Overall Sharpe Index for Equity Returns $SI_E = \frac{R_p - R_f}{\sigma}$

$$= \frac{8.0 - 21.71}{3.20}$$

$$= -4.28$$

Overall Sharpe Index for Investment Returns $SI_i = \frac{R_p - R_f}{\sigma}$

$$= \frac{9.4 - 21.71}{5.27}$$

$$= -2.34$$

Overall Sharpe Index for Premium Returns $SI_p = \frac{R_p - R_f}{}$

$$\sigma$$

$$= \frac{8.5 - 21.71}{4.45}$$

$$= -2.97$$

Sharpe Index for Market Index $SI_M = \frac{R_p - R_f}{\sigma}$

$$= \frac{33.84 - 21.71}{58.50}$$

$$= -0.21$$

4.4.2 Treynor Ratio Empirical Analysis on SIC

The Treynor ratio is used to measure reward-to-volatility or used to measure the returns earned in excess of that which could have been earned on an investment that has no diversifiable risk per each unit of market risk assumed. The Treynor ratio relates excess return over the risk-free rate to the additional risk taken; however, systematic risk is used instead of total risk. The higher the Treynor ratio, the better the performance of the portfolio under analysis. It is defined mathematically as:

$$T = \frac{r_i - r_f}{\beta_i}$$

where:

T = Treynor ratio

r_i = portfolio's return

r_f = risk free rate

β_i = portfolio's beta

$$TI = \frac{Rp - R_f}{\beta p}$$

Overall Treynor Index for Equity Returns $TI_E = \frac{R_p - R_f}{\beta p}$

$$= \frac{8.0 - 21.71}{-0.02}$$

$$= 685.5$$

Overall Treynor Index for Investment Returns $TI_i = \frac{R_p - R_f}{\beta p}$

$$= \frac{9.4 - 21.71}{0.01}$$

$$= -1.23$$

Overall Treynor Index for Premium Returns $TI_E = \frac{R_p - R_f}{\beta_p}$

$$= \frac{8.5 - 21.71}{0.03}$$

$$= -440.33$$

Treynor Index for Market Index $TI_M = \frac{R_m - R_f}{}$

βp

= 33.84 – 21.71

1

= **12.13**

4.4.3 Jensen Alpha Index Empirical Analysis on SIC

Jensen's alpha which is sometimes called ex-post alpha is used to determine the abnormal return of a security or portfolio of securities over the theoretical expected return. The theoretical return is predicted by a market model which is called the Capital Asset Pricing Model (CAPM) model. The market model uses statistical methods to predict the appropriate risk-adjusted return of an asset. Mathematically the model is defined as:

Jensen's alpha = Portfolio Return − [Risk Free Rate + Portfolio Beta * (Market Return − Risk Free Rate)] = $\alpha j = R_i - [R_f + \beta_{iM} * (R_M - R_f)]$

From Appendix the computation is as follows:

$$\mathbf{J_I = Rp - [R_f + \beta p * (R_M - R_F)]}$$

Overall Jensen alpha for Equity Returns J_{IE} = 8.0 - [(21.71 + (-0.02) * (33.84-21.71)]

= 8.0- **[21.69 * (12.13]**

= 8.0 -263.10

= -255.10

Overall Jensen alpha for Invest. Returns J_{Ii} = 9.4 - [(21.71 + 0.01) *(33.84-21.71)]

= 9.4- [21.72 * 12.13]

= 9.4 -263.46

= -254.06

Overall Jensen alpha for premium Returns J_{Ip} = 8.5 - [(21.71 + 0.03) * (33.84-21.71)]

= 8.5 - [21.74 * 12.13]

= 8.5 -263.71

= -255.21

Overall Jensen alhpa for Market Index J_{Ip} = 33.84 - [(21.71 + 1) * (33.84-21.71)]

= 33.84 - [22.71 * 12.13]

= 33.84 -275.47

= -241.63

Table 4.1: Summary of the average calculation using the various models.

	Sharpe	Treynor	Jensen Alpha
Equity	-4.28	685.50	-255.10
Investments	-2.34	-1.23	-254.06
Premium	-2.97	-440.33	-255.21
Market Index	-0.21	12.13	-241.63

Source: Developed by Researcher

The above analysis indicates that all the three portfolios selected had their Sharpe indexes below the market returns when the returns were related to the total risk. The calculation of Treynor also revealed that equity had highest return relative to the systematic risk. This implies that the models exhibit two different scenarios and the difference in results means the portfolios have different levels of diversification. The Jensen Alpha measure shows that all the three portfolios and the market indexes are negative. This also confirms the risky nature of investment in an emerging economy. Although Equity portfolio shows considerable returns in the Treynor, the risky nature is still prevalent.

CHAPTER FIVE

SUMMARIES, CONCLUSIONS AND RECOMMENDATION

5.0 INTRODUCTION

The research considered an optimal portfolio selection of an insurance company with the intention to identify its investment objectives and to further evaluate its portfolio management using Sharpe, Treynor and Jensen Alpha ratios techniques. This chapter looks at the summaries, conclusions and recommendations.

5.1 SUMMARIES

5.1.1 Overall Investment Objective of SIC

Every insurer aims at using investment strategies that focus on creating value for both policyholders and shareholders and avoiding excessive risk. In the insurance industry, attaining the balance of risk and return remains a challenge. The investment philosophy of SIC is to invest 25% of their gross premiums written in Government bills and notes, and the remainder in securities approved by the National Insurance Commission. The philosophy translates to their investment objectives that are structured to meet the company's profitability objectives and solvency requirements. SIC optimal portfolio selection considers portfolio mix that consisted largely of high quality, fixed deposits and foreign currency cash equivalent and short-term investments, as well as a significant amount of listed and unlisted equity securities.

SICs investment philosophy is centred on the key belief that capital markets generally are efficient and therefore market forces exist to eliminate deviations from equilibrium. This is also

in line with what is generally believed by academia and practitioners that investors cannot consistently earn a higher return without incurring higher risk.

Consequently, SIC investment management team have the efficient markets principle as a reference point. They have had realistic expectations of returns and pragmatic view of the department (SIC-Financial services) that manages their investment for them. The asset managers have managed to differentiate and focus on three sources of returns namely; risk free return, market based return and skilled based return.

This work revealed that, non-life insurance companies face significant and unpredictable policy liabilities. The nature of the business has a substantial effect on investment policy. Sufficient funds are needed to cover unpredictable liabilities, which restricts the ability to accept risk. As a result, such insurers have very low risk tolerance. Given the low ability to accept risk, non-life insurers have limited ability to earn significant returns. However, higher returns do allow for more competitive policy pricing and improved profitability. Furthermore, growth in the surplus allows the company to underwrite more business, improving the overall firm condition. As a result of the conflicting objectives, risk and return policies vary widely as seen to associate with non-life insurers.

5.1.2 Assets Selections and Allocation

Asset allocation combines an investor's objectives and constraints with long-term capital market expectations into an investment policy statement-permissible set of asset classes. The purpose of asset allocation is to satisfy the investor's objectives and constraints, and the process leads to a set of portfolio weights known as the policy portfolio. With regard to risk, investors expect compensation for any risk that cannot be diversified away (systematic risk). Distinct asset classes have distinct risk exposures, and strategic asset allocation aligns the portfolio's risk profile with the investor's objectives to effectively control risk exposures. It also provides investors with a set of benchmarks outlining the appropriate long-term mix of assets and risk tolerance.

Brinson *et. al.* (1991) stated that "investment policy dominates investment strategy and this explains on average 93.6% of the variation in total plan in returns." This conclusion has caused a great deal of confusion in both the academic and financial communities. The research indicated that, portfolio's performance over time is due to asset allocation. The impact of asset allocation on returns depends on an individual's investing style. For example, the asset allocation decision may far be the most important for passive investor for a long time while active investor will appreciate it for a short time.

SIC has interesting selection of assets that can be classified mainly into three categories. These are equities which comprise all their long term investments, fixed income which consist of short term investments and what has been named landed property which has the characteristics of both long and short term investment. The long term investment comprises equity shares which are

both listed and unlisted, mortgage loans and housing Bonds. The short term investments are basically the Ghana government treasury bills and bank deposit.

The land and buildings comprise mainly outlets and offices occupied by the group. Land and buildings are shown at fair value, based on periodic, but at least triennial, valuations are done by external independent appraisers, less subsequent depreciation for buildings. Property held for long-term rental yields that are not occupied by any unit subsidiary or associate of the group is classified as investment property. This includes freehold land and buildings. Investment property that is being redeveloped for continuing use as investment property, or for which the market has become less active, continues to be measured at fair value. Other property that is held under operating lease is classified as investment property as long as it is held for long-term. This research reveals that management determines the classification of its investments at initial recognition and re-evaluates this at every reporting date and therefore selection and allocation differ slightly from year to year.

Below is a table that compares the performance of SIC'S investments with the industry average

Table 4.2: SIC Performance / Industry Average

	EQUITY		INVESTMENT		PREMIUM	
YEAR	SIC %	INDUSTRY %	SIC %	INDUSTRY %	SIC %	INDUSTRY %
2009	10	10	5	14	3	9
2008	13	21	5	9	4	6
2007	13	18	4	10	3	6
2006	9	17	7	9	7	9
2005	7	20	7	11	7	9
2004	5	16	8	11	10	9
2003	5	19	11	17	13	13
2002	5	18	10	16	11	12
2001	8	23	19	22	16	8
2000	5	21	18	18	10	18

Source: Developed by Researcher

Return on equity is the net profit after tax as a percentage of shareholders funds (equity). It measures the profitability of companies. The higher the percentage, the more profitable the company. The average of the industry is the bench mark for measuring how well a company has performed. From table 4.2. above, it is significant to note that, with the exception of the year

2009, SIC Insurance Company Ltd. has consistently recorded lower return on equity as compared to the industry average.

Investment income as a percentage of total investment measures the rate of return on investments. In a way, it gives an indication of the quality of the investments made and held by a company. From table 4.2, as in the case of return on equity, SIC Insurance Company Ltd. investment income as a percentage of total investment, over the years under consideration, constantly fell below the industry average with the year 2000 being the only exception.

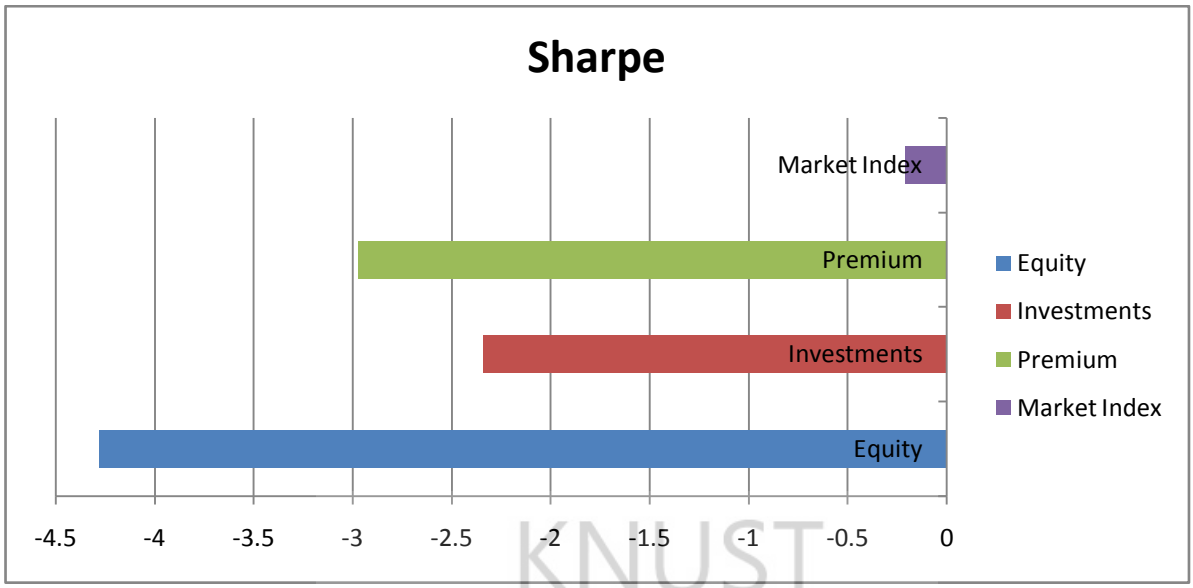
Investment income as a percentage of premiums tries to compare a company's income from investments to its premium income. This ratio measures the extent of support from investment income. This is very relevant considering the fact that most companies incur underwriting losses and have to depend on income from investment to make profits. From the table 4.2, as the trend is, SIC investment income as a percentage of premiums over the years fell below the industry average. However, comparatively, these returns performed better than the investment returns and the equity returns as shown in the years 2001 and 2004. SIC performance was above the industry average for these years.

From the above analyses, using the industry average as a benchmark and a performance indicator, it is obvious that the overall investment performance of SIC Insurance Company Ltd. fell below the industry performance for the years under consideration.

5.1.3 Sharpe, Treynor & Jensen Alpha Ratios.

The essence of using Sharpe index was to check whether the returns on the various selections relate to each other and also whether the expected returns and variances are also the same. Considering appendix 1, the returns on investments and premium have better performance than that of the equity but both investments and premium are below the market index. Sharpe ratio considers the ratio of a given portfolio's excess return to its corresponding standard deviation. Excess return is commonly thought of as a performance indicator whereas standard deviation is considered as a risk adjustment factor. However, such considerations are relevant in a developed economy but unfortunately, in an emerging economy like Ghana it is difficult to interpret it fully and therefore caution must be taken in explaining the results.

Figure 5.1: Sharpe model indicating investment performance of SIC

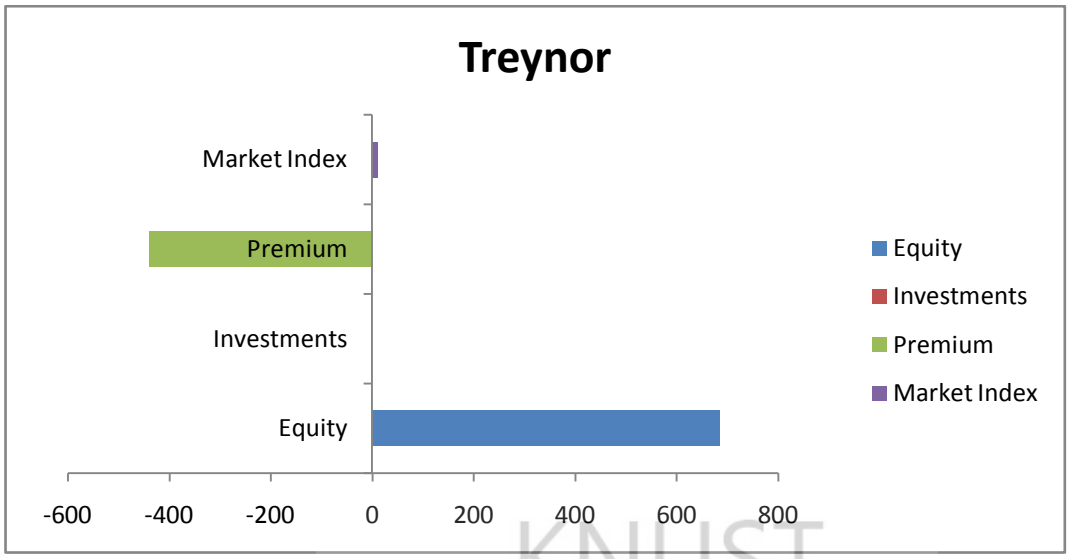


Source: Developed by Researcher

Sharpe ratio as previously indicated is a reward to variability ratio, the numerator of the sharpe index measures the excess return over the risk- free rate. Thus sharpe measures the ratio of excess return to risk.

From the figure 5.1 above, it is evident to note that, the sharpe index calculated for the various portfolios are far below the market index. The equity recorded the worst index, followed by the premium and then the investment recording the best of the three. The analyses of the performance of SIC returns as compared to the industry in Table 4.2 reinforces the sharpe index evaluation of the portfolios return to that of the market. The research also reveals that the higher the sharp ratio, the better the performance. Figure 5.1 shows that, the market has the highest sharp ratio and therefore has outperformed SIC's investments

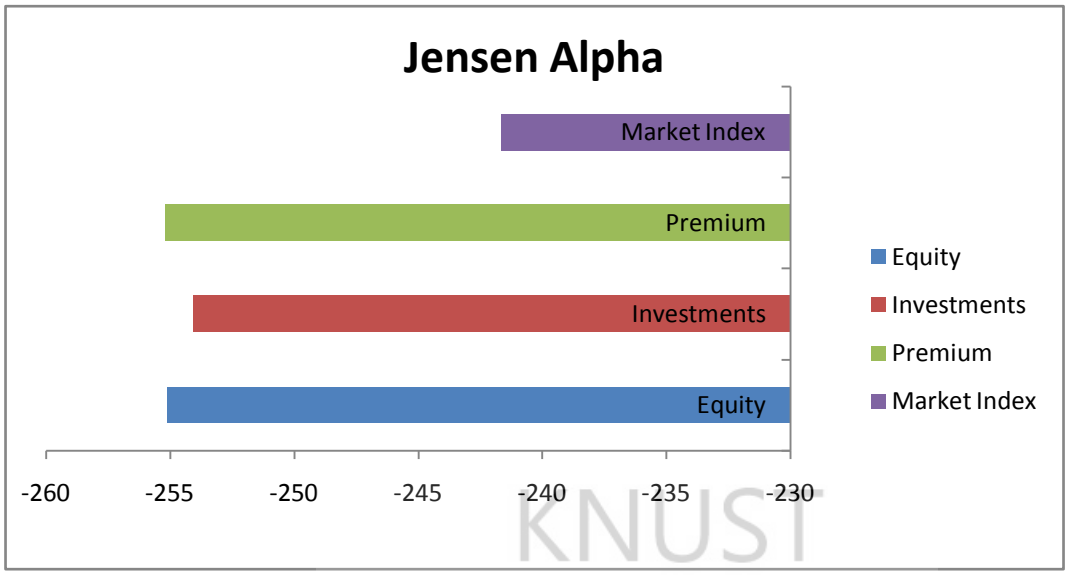
Figure 5.2: Treynor model indicating investment performance of SIC



Source: Developed by Researcher

The Treynor Index is a reward to volatility measure and it is the ratio of the average excess return on a portfolio to the beta of the portfolio. The beta measures the systematic risk. In the calculation of Treynor index, systematic risk is considered as the appropriate measure of risk unlike the sharpe where the total risk is considered. From figure 5.2, return on equity demonstrated that systematic risk was properly controlled and reduced in managing the equity portfolio than the market. Investment and Premium however fell below the market which shows that returns of the two portfolios did not compensate for the level of systematic risk taken as compared to the market.

Figure 5.3: **Jensen Alpha model indicating Investment Performance of SIC**



Source: Developed by Researcher

Jensen's alpha quantifies the added return as the excess return above the security market line in the capital asset pricing model. It takes account of the relative riskiness of the asset. Riskier assets will have higher expected returns than less risky assets. From figure 5.3, the portfolios all had negative alphas; however, using the market as a benchmark, SIC portfolios performance was below the market. The initial analysis using the industry average in Table 4.2 buttresses the results of the Jensen evaluation of SIC performance which is below the industry performance.

5.2 CONCLUSIONS

Insurance companies sell protection to their customers. Their customers pay premiums for the protection bought. Insurers also hold investments to generate returns to cover future claims or

benefits, administrative expenses and profits for their shareholders. Regulators require insurance companies to hold sufficient assets as reserves in every insurance business. The reserves must suffice to pay out expected claims and benefits, even in the unplanned case that the insurer stops writing new business. Thus, regulators ensure that insurers do not rely on new premiums to pay for claims and benefits underwritten in the past, thereby preventing the creation of pyramid or pansy schemes.

As insurers continuously underwrite new business, they generally hold significant and relatively stable amounts of investments as reserves on their balance sheet. The role of insurance investment management is to manage professionally the funds generated by the insurance business, maximizing risk adjusted returns while meeting regulatory requirements on its assets and other financial constraints. Insurance investment management must ensure that investment returns preserve the solvency, both regulatory and economic, of the insurance company, earn the return commensurate with the use of its capital and enable it to continue to underwrite profitable insurance business.

Insurance investment risk is different from what the typical fund manager would describe as investment risk. The typical fund manager invests on behalf of its clients and is usually focused on maximizing the value of the investments relative to a prescribed market benchmark. Investment risk for fund managers is both absolute and relative. The absolute risk is the chance that the market value of the underlying fund will rise or fall in a particular time period. The relative risk is the chance that the fund manager may out- or under perform his benchmark in a particular time period.

5.3 RECOMMENDATIONS

The measurement and management of risk is a central issue in finance and a huge effort is made in order to analyze it and to understand all the related problems. Optimal portfolio selection from the developing economies point of view should hinge on three things; Asset selection, asset allocation and investment implementation. The selection can add extra returns to selected portfolios. Selection requires significant research and it is costly. Therefore careful analysis of investment selected for a particular portfolio may add to active portfolio management. It is therefore recommended that asset classes are scrutinized before adding to the portfolio.

The allocation of investment to different asset classes is also necessary in optimal portfolio selection. Asset allocation is based on the idea that in different years a different asset is the best-performing one. It is difficult to predict which asset will perform best in a given year. Therefore, although it is psychologically appealing to try to predict the best performing asset, it makes sense to carefully do the allocation based on the regulatory framework. This research finding confirm the widely held belief that market returns and asset allocation policy in excess of market return are collectively the dominant determinant in total return variations. Accordingly, it is recommended that asset allocation should be the mix of asset classes that promises the highest long-term expected investment return.

Investment implementation must take into consideration risk-free investment position. Systematic risk taking enhances returns on the portfolio construction to generate extra skill-based returns. Each portfolio must have defined investment guidelines that are related to the market benchmark to help to assess the manager's performance. The research recommends that, to manage investment risks relative to insurance liabilities, there is a need to take into account existing leverage of the investment portfolio versus shareholders' equity. The research also stresses the importance of examining investment behaviour from their overall risky asset composition.

It also proposes further research that will reveal the interaction relationship of portfolio selections between risky financial assets and non-risky financial assets in the analysis. It is important to analyze whether certain types of investments are risky and may affect the entire portfolio. Future research should use a more advanced technique that will allow for endogeneity of the risky investment variables. Future research should make more efforts on investigating how the components of various assets may also affect portfolio construction

A better understanding of portfolio choice through optimal selection may also be important to policymakers and practitioners for a number of reasons. It will aid in financial planning by the State in relation to risky asset composition. There could be a more congenial tax policy toward entrepreneurial saving and investment and potential effects on entrepreneurial saving and investment could be mitigated.

REFERENCES

Bacon,C. (2008) "*Practical Portfolio Performance Measurement and Attribution 2nd Ed*: Wiley,. ISBN 978-0-470-05928-9

Brinson, G., and Beebower, G.(1991), "Determinants of Portfolio Performance II: An Update," *Financial Analysts Journal*, 47, 3, pp. 40-48.

Brinson, G.P., Diermeier, J.J. and Schlarbaum, G.(1986). "A Composite Portfolio Benchmark for Pension Plans." *Financial Analysts Journal* 42, no. 2.

Brown, K. C. and Reilly F. K. ("25" (in English). *Analysis of Investments and Management of Portfolios* (9th International ed.). Cengage Learning. pp. 941

Davis, M., and Norman, A. (1990). ''Portfolio Selection with Transaction Costs,'' *Mathematics of Operations Research15:676–713.*

Desai, R. T., Lele, T and Ens, F. (2003) " A Monte-Carlo method for portfolio optimization under partially observed stochastic volatility", Proceedings of Computational Intelligence for Financial Engineering, , Competitive solutions for online financial

Dhaene J.S., Vanduffels, S., Goovaerts, M. J, Kaas, R and Vyncke, D. (2005) "Comonotonic Approximations for Optimal Portfolio Selection Problems" *The Journal of Risk and Insurance* Vol. 72, No. 2, pp. 253-300

Elton, J. E. , Gruber M. J., Brown S. J., and Goetzmann W. N., (1995) "*Modern Portfolio Theory and Investment Analysis"* 5th ed. New York: John Wiley & Sons, Inc.

Fama, E. F. (1970).“Efficient Capital Markets: *A Review of Theory and Empirical*

Farrell, J.L. (1997) “*Portfolio Management*”:*Theory and Application*, 2nd Ed. New York: McGraw-Hill.

Goel, M. and Kumar, S. K. (2006) “A risk-sensitive portfolio optimization problem with stochastic interest rate”, *Journal of Emerging Market Finance*, vol. 5.

Gurasamy, S.(2009) “*financial Services and System*” 2nd Ed., Tata McGraw-Hill.

Handa, P., Kothari, S. P. and Wasley, C. (1989). “The Relation between the Return Interval and Betas:Implications of the Size Effect.” *Journal of Financial Economics* 23, no. 1

Harrington, D.R. (1987) “*Modern Portfolio Theory, the Capital Asset Pricing Model, and Arbitrage Pricing Theory:* A User’s Guide”, 2nd Ed. Englewood Cliffs, N.J.: Prentice-Hall.

Jensen, M.C.(1968) “The Performance of Mutual Funds in the Period 1945-1964,” *Journal of Finance* 23, pp. 389-416.

Levinson, M. (2006). “*Guide to Financial Markets”*. London: The Economist (Profile Books). pp. 145–6. ISBN 1-86197-956-8.

Maginn, J.L., Tuttle, D. L., McLeavey D.W. and Pinto J.E (1990) “*Managing Investment Portfolios*: *A Dynamic Process*”, 2nd Ed. Sponsored by The Institute of Chartered Financial Analysts. Boston: Warren, Gorham & Lamont.

Markowitz, H. (1952) “Portfolio Selection.” *Journal of Finance* 7.

Markowitz, H. (1959) "*Portfolio Selection: Efficient Diversification of Investments*". New York: John Wiley & Sons.

Peavy, J., (1990) "*Cases in Portfolio Management"*. Charlottesville, Va.: Association for Investment Management and Research.

Rubinstein, M. (2006). "*A History of the Theory of Investments. Hoboken"* :John Wiley & Sons, Inc.

Saunders M., Lewis, P., Thornhill, A., Hair J.F. and Babid, B. (2003) "*Research methods for Business Students*" Pearson education.

Scholz, H. (2007). "Refinements to the Sharpe ratio: Comparing alternatives for bear markets". *Journal of Asset Management* **7** (5): 347–357..

Tofallis, C. (2008). "Investment Volatility: A Critique of Standard Beta Estimation and a Simple Way Forward". *European Journal of Operational Research* **187** (3): 1358–1367.

Zimmermann, H. G., Neuneier, R. and Grothmann R. (2002) "*Active portfolio management"* based on error correctio

Appendix 1: Sharpe ratio,Treynor Rtio and Jensen Alpha on returns on Equity, Premium and General investments

Year	Return ***(R)*** on Equity (%)	**Return Invests**	**Return on premium**	T-Bills Rate (R_f)	**Market Index**	$\frac{R-(R_f)}{\sigma}$ (equity)	$\frac{R-(R_f)}{\sigma}$ (invest)	$\frac{R-(R_f)}{\sigma}$ (premium)	$\frac{R-(R_f)}{\sigma}$ (market)
2009	10.0	5.0	3.0	20.75	**-46.58**	-3.36	-2.99	-3.99	-1.15
2008	13.0	5.0	4.0	17.29	**58.06**	-1.34	-2.33	-2.99	0.70
2007	13.0	4.0	3.0	12.38	**31.84**	0.19	-1.59	-2.11	0.33
2006	9.0	7.0	7.0	15.46	**4.97**	-2.02	-1.61	-1.90	-0.18
2005	7.0	7.0	7.0	17.70	**-29.85**	-3.34	-2.03	-2.40	-0.81
2004	5.0	8.0	10.0	18.39	**91.32**	-4.18	-1.97	-1.89	1.25
2003	5.0	11.0	13.0	29.67	**154.67**	-7.71	-3.54	-3.75	2.14
2002	5.0	10.0	12.0	26.63	**45.96**	-6.76	-3.16	-3.29	0.33
2001	8.0	19.0	16.0	31.57	**11.42**	-7.37	-2.39	-3.50	-0.34
2000	5.0	18.0	10.0	27.26	**16.55**	-6.96	-1.76	-3.88	-0.18
Mean	**8.0**	**9.4**	**8.5**	**21.71**	**33.84**	**- 4.28**	**-2.34**	**- 2.97**	**0.21**
Std. Dev	**3.20**	**5.27**	**4.45**	**6.58**	**58.50**				
Beta	**-0.02**	**0.01**	**0.03**						

Source: author's compilation from GSE 2011