EFFECTS OF ACTUARIAL FUNCTION ON THE FINANCIAL PERFORMANCE OF PRIVATE HEALTH INSURANCE PROVIDERS IN KENYA

SUBMITTTED BY

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DECLARATION

This research project is my original work and has not submitted to any other university for any award. All the sources used herein are duly acknowledged.

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This research project has been submitted with my approval as the University supervisor.

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DEDICATION

I dedicate this research project to my wife and children for the encouragement and providing the support I needed to undertake and finish my studies.

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ABSTRACT

The study sought to establish the effect of Actuarial Function on the financial performance of health insurance providers in Kenya. Actuarial function is a fulfilment of the requirement of EU, article 48 of the Solvency II Directive. International Association of Insurance Supervisors (IAIS) describes actuarial function as a structure of operational and oversight controls focused on making technical provisions and expressing judgement on underwriting policy and reinsurance arrangement (IAIS, 2015). The study first established whether health insurance firms had adopted the actuarial function and the year of such establishment for each firm. Financial performance was measured using Underwriting Profit for medical business, Return on Assets (ROA) and Solvency. Financial data for 3 years pre and post adoption of each firm was obtained for the purpose of the study. The study population comprised of 21 insurance firms offering health insurance of which a census was carried out. The study used secondary data being the financial results for each company as published IRA. Dates of adopting actuarial function was obtained by calling head of actuarial function in each of the companies. From the data analysis, it was confirmed that the combination of the three indicators of firm performance (Return on Assets, solvency and Underwriting Profits) were significantly influenced by adoption of actuarial functions. Underwriting profit was strongly correlated to adoption of actuarial function. The correlation coefficients establish some significant relationship between actuarial function and firm performance. The findings gives confidence to health insurance firms and policy makers to adopt actuarial function as a measure to improve firm performance. It would be recommended that insurance firms and stakeholders undertake a follow-up study to determine whether actuarial functions have significant influence on the financial performance.

ACRONYMS AND ABBREVIATIONS

AIBK -	Association of Insurance Brokers of Kenya
AF -	Actuarial Function
AKI -	Association of Kenya Insurers
BRITAM -	British American Company
FCR –	Financial Condition Report
IRA -	Insurance Regulatory Authority
IAIS -	International Association of Insurance Supervisors
NHIF -	National Hospital Insurance Fund
HMO's -	Health Maintenance Organizations
UHC –	Universal Health Care

CHAPTER ONE: INTRODUCTION

1.1 Background of Study

One of the paramount roles of the IRA is the promotion of an inclusive, competitive and stable insurance industry (Insurance Act, 2006). IRA issued guidelines in 2013 requiring all insurance companies to establish actuarial function as a risk control tool and to better the performance of insurance firms financially (IRA Circular, 2013). Actuarial function was envisaged to anchor prudent actuarial and financial practices within the insurance companies. For many years, health insurance business has reflected poor performance and sometimes heavy losses. Some of the prolonged contributory factors to the meager performance include inadequate information management systems, high cost of healthcare services, poor underwriting practices, week regulatory framework, fraud, and poor pricing patterns amongst others (Teresa, 2013). Poor fundamentals not only act as an indicator of poor investment opportunity but also deters development.

The study was anchored and guided by risk management theories that are based on practical approaches the regulator and insurance companies employ to ensure stable and sound financial performance. These theories include credibility theory which is a measure of the credibility that the actuary trusts its attachment to a certain body of experience for development of the correct rating (Mowbray, 1914); the ruin theory also referred to as collective risk theory which is the use of mathematical models to explain insurer's predisposition and susceptibility to bankruptcy and/or collapse (Ashley, 2015); and the agency theory that stresses the alignment of managers' interests with those of the shareholders through risk management which also plays a critical role in improving the firm's financial performance (Osiemo, 2016).

Failure of National Hospital Insurance Fund (NHIF) to provide adequate medical insurance coverage to Kenyan citizens led to emergence of insurance companies as strong players in the delivery of private health insurance. However, continued dismal performance invited intervention from IRA by issuing the actuarial function guidelines to stabilize the industry. Babbel and Klock (1994) observed that there is nothing worse than insured customers realizing the potentiality of their respective insurer's financial incapability to pay out if faced with a large proportion of claims.

1.1.1 Actuarial Function

International Association of Insurance Supervisors (IAIS) describes actuarial function as a structure of operational and oversight controls focused on making technical provisions and expressing judgement on underwriting policy and reinsurance arrangement (IAIS, 2015). Actuarial function is a fulfilment of the requirement of EU, article 48 of the Solvency II Directive. Emphasis has been placed on the role and qualification as opposed to definitions. Directive 2009/138/EC on the Solvency II Framework states that actuarial function shall be performed by individuals skilled in financial and actuarial mathematics, proportionate with the scale, complexity, and nature of the unavoidable risks in the business of the insurance or reinsurance performance, and who have the ability to validate their pertinent proficiency with applicable professional and other standards (IAIS, 2009). IAIS standards leaves the definition to its members.

In 2013 IRA issued guidelines to the Insurance industry on actuarial function. The guideline defined actuarial function as the actuarial staff to be engaged by each insurer, which includes the head of the actuarial function (IRA Circular, 2013). IRA requires all insurers to develop and sustain a tough actuarial department that is well resourced, well positioned, and properly staffed and authorized. The objective of the guideline was to certify that each insurer has a successful actuarial

department that possesses the ability to evaluate and provide advice to insurer on matters such as premium and pricing actions, technical provisions, and compliance with associated statutory and regulatory laws. The guideline further aims to ensure that insurer's technical functions, including product pricing and reserving of technical provisions are carried out in a prudent and transparent manner. The actuarial function is further required to evaluate and provide advice on the insurer's financial and actuarial jeopardies; the insurer's prospective solvency position; risk modelling and use of internal models, where applicable (IRA Circular, 2013).

1.1.2 Financial Performance

One of the methods of measuring financial performance is analyzing a company's liquidity, solvency, and profitability. Profitability specifies the degree to which a company makes profit from its assets or factors of production.

There are various measures of profitability; however, according to Zenios et al., profitability analysis concentrates on determining the revenue versus expenses relationship and the profitability proportion in relation to the size of investment through the calculation of profitability ratios. The commonly used profitability measures are return on assets (ROA) and return on equity (ROE) (1999).

Solvency is the measure of a firm's capability to meet its financial obligations through its assets. It also helps in analyzing how capable the company is in continuing operating especially after facing a significant financial crisis (Omasete, 2014). But according to Quach (2005), solvency assesses the difference between borrowed capital and shareholders' equity capital in financing the company with the objective of determining the level of the creditors' safety of interests in the firm.

Consequently solvency margin is defined as the minimum excess on firm's assets over its liabilities required by the Regulator (Komen, 2012).

Liquidity signifies a company's capability to finance its current and arising financial obligations without having any disruptions in the normal business operations. There are two methods of analyzing liquidity: structural and operational. Structural liquidity symbolizes the components of the statement of financial position while operational liquidity denotes the measures of cash flow (Quach, 2005).

1.1.3 Actuarial Function and Financial Performance

The chief focus of actuarial function is to improve financial performance of insurance firms. A robust actuarial function should anchor prudent risk management practices to ensure actuarial and financial prudence of insurance firms. Actuarial function is therefore paramount in ensuring sound financial performance of insurance firms. Actuarial function is a recommendation from IAIS in fulfilment of the requirement of European Union, article 48 of the Solvency II Directive specifically and broadly as section of response to risk management requirement of insurance firms.

Numerous studies on risk management and financial performances have recommended entrenchment of risk management practices within the firm's operation, having noted significant relationship between the two variables. Tripp et al. (2008) reviewed over 60 studies on enterprise risk management and suggested that actuaries should work closely with other experts to develop prudent risk control systems across the organization. Njeru (2013) found out that risk management practices strongly influenced the financial accomplishment of firms which had adopted the practices. Omasete (2014) noted that the inability to manage risk could cause most organizations to collapse, especially those whose core business revolve around daily risk handling.

Angima (2017) tested the relationship between underwriting risk, actuarial risk management practices (ARMP), firm characteristics and performance of P & C insurance firms in established in East Africa. Contrary to most studies on related subject, the study established insignificant connection between ARMP and financial accomplishment. Consequently, financial statements from various health insurance providers was tested in this study to establish difference in results pre and post establishment of actuarial function.

1.1.4 The Health Insurance Providers in Kenya

The insurance industry in Kenya is regulated through the Insurance Act, Cap 487 Laws of Kenya. The Act has undergone various amendments to strengthen the operations of the industry. The Insurance Regulatory Authority (IRA) was established in 2006 following the enactment of the Insurance (amendment) Act number 11 of 2006 which commissioned the head of the IRA as the CEO/commissioner of insurance. The obligation of IRA according to the stated Act is regulation, supervision and development the insurance industry in Kenya.

The authority is also mandated to ensure effective control, supervision, administration, and regulation of the insurance and re-insurance commerce in Kenya; to develop and impose canons of conduct for insurance and re-insurance trade in Kenya; safeguard the interests of the insurance beneficiaries and policyholders; issuance of the prudential and supervisory guidelines for the better administration of the licensed players; and license the insurance industry players; promote the development of insurance industry (Insurance (amendment) Act, 2006). There are however efforts for self-regulation of the industry players through various associations including Association of Insurance Brokers of Kenya (AIBK) and Association of Kenya Insurers (AKI) amongst others.

During the year 2017 IRA licensed 52 Insurance companies, 221 insurance brokers, 9 risk managers, 31 medical insurance providers, 4 reinsurance companies, 126 motor assessors, 11 reinsurance brokers, 142 insurance investigators, 32 loss adjusters, 32 insurance surveyors, 5 claim settlement agents, 9320 Insurance Agents, and 28 Bancassurance Agents (IRA Report, 2017).

1.2 Research Problem

A properly constituted and mandated actuarial function can lead to improved financial and actuarial performance of an insurance firm. Risk management practices of the actuarial function makes it possible for organizations to reduce and achieve better results (Angima, 2017). Correct and efficient risk control systems by insurance firms are crucial for their continued existence (Ashby et al, 2013). Risk management practices can be achieved at industry or individual firm's level. At the industry level IRA has issued a number of regulations and prudential guidelines to guide on risk management practices. These include regulations on board composition, qualifications for key position, setting minimum rates for particular classes of business and most recently the risk based underwriting/supervision amongst others.

Under the risk based underwriting, each firm is required to put in place adequate capital and risk management practices to support the business they underwrite. Actuarial function is key to achieving the objectives of risk based supervision. IRA, 2013 issued guidelines on actuarial function to entrench self-awareness and risk management practices within the individual insurance firms. Establishing actuarial function is however an expensive affairs necessitating an evaluation of its effectiveness in realizing the set objectives.

There are numerous studies that have been conducted on the topics of risk control and financial performance. Angima (2017) in her thesis conducted a study on how actuarial risk control

procedures (ARMP), firm characteristic, and underwriting risk affect the performance of East African firms specializing in Property and Casualty sections. The study ascertained insignificant connection between ARMP and financial performance. Ng'ang'a additionally investigated the influence of adopting risk-based supervision on the economic performance of insurance firms and found out that the adoption resulted to increased premium collection and overall growth (2014). Njeru (2013) investigated the connection between financial performance and risk management practices of insurance companies in Kenya. He established that firm's which had embraced risk control measures in their operations had unwavering influence on their performance financially.

However, no academic research has looked specifically at the influence of actuarial function on the financial performance of health insurance companies. Therefore, there was a literature gap concerning the connection between actuarial function and financial performance of insurance companies in Kenya. The question that arose and which formed the subject of this study is whether establishing actuarial function would influence the financial performance of health insurance firms in Kenya?

1.3 Research Objective

The aim of the study was to establish the effect of actuarial function on the financial performance of private health insurance providers in Kenya.

Specific Objective include;

1. To establish the effects of adopting actuarial function on underwriting profitability of private health insurance providers

2. To establish the effects of adopting actuarial function on return on assets of private health insurance providers
3. To establish the effects of adopting actuarial function on solvency of private health insurance providers

The research is supported by the following hypotheses;

1. H_0: $\mu_1 = \mu_2$ (The underwriting profit before adopting actuarial function is equal to underwriting profit after adopting actuarial function (AF))
2. H_0: $\mu_1 = \mu_2$ (The return on assets before adopting AF is equal to return on assets after adopting actuarial function (AF)
3. H_0: $\mu_1 = \mu_2$ (The solvency before adopting AF is equal to solvency after adopting actuarial function (AF) among private

1.4 Value of the Study

The insurance sector plays an invaluable function in the growth of the economy and significantly contributes to the stability of the country's financial system. The sector regulator, Insurance Regulatory Authority is mandated to promote development of the sector through appropriate regulations. In adopting the risk based supervision it was important that IRA promotes adoption of a professional self-control mechanism for insurance companies. This culminated to the introduction actuarial function guideline in 2013. Establishment of actuarial function is an expensive venture and the benefit need to be weighed against the related cost.

By investigating this relationship, the outcomes of this research will assist insurance companies in making prudent choices on the size of the actuarial function to be established and resources to be

employed. Policy makers and IRA will also benefit from this research to measure the effectiveness of the guideline and shape discussion on necessary amendments. Finally, this research will also profit intellectuals who would be interested in undertaking subsequent studies and increase the body of knowledge on the topic of research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter summarizes the various hypothesis and works already done by other researchers in this field. I looked at the common actuarial and financial pricing theories/model as applying to the health insurance and impact on organization performance.

2.2 Theoretical Review

The theoretical background of this research can be best explained by insurance and risk management theories that deals with agency problem and premium pricing. Three hypotheses specifically; the credibility theory, the ruin theory and the agency theory are reviewed here below.

2.2.1 Credibility Theory

The theory was originally conceptualized by North American actuaries in early 1990's. The earliest of the most practical solution to premium calculation was developed by Mowbray and given the name American credibility theory (1914). This work is occasionally denoted as the fixed effect credibility or the limited credibility theory. The term credibility initially found its way into actuarial science by being used as a gauge of the weight that the actuary judges to be given to a specific body of experience for rate development objectives.

This theory received a lot of criticisms from many researchers including Whitney (1918). Whitney proposed the natural randomness of claims which rendered the adoption of the fixed effects model as invalid. Moreover, the American credibility theory was faced with the challenge of fractional credibility which made the determination of the value of the credibility factor difficult. Due to this,

the Whitney's random effect theory was adopted after the World War II. This has opened a broad platform of actuarial application including rating and reserving of premiums. Despite the wide research findings, it was observed that the limited credibility theory was unable to solve the problem of credibility.

A major breakthrough was made in the year 1967 and 1970 following the introduction of the credibility premium formula by Bullhmann in a distribution free-way such that it eliminated the assumption of prior distribution of claims. The Bulhmann Straub (B-S) model was further extended by Hachmeister (1975) for a class of business by use of matrix methods. The vast literature developed thus far is referred to as The Empirical Bayes Credibility theory, Greatest Accuracy credibility theory or The European Credibility theory.

This theory fitted well with the study since it is considered the most applicable in actuarial risk management practices. It is popular amongst the actuaries in selection of the risk to accept or reject and appropriate premium to charge.

2.2.2 Ruin Theory

Ruin theory was introduced by Lundberg (1907). Also known as the collective risk theory, the Ruin theory is a section of actuarial science that utilizes mathematical models to predict the insurer's susceptibility and exposure to bankruptcy and/or collapse (Ashley, 2015). Ashley (2009) observed that the sustainability of an insurance operation can only be guaranteed is by routinely assessing the risk correlated with the collection of insurance contracts. Under this theory, one studies the probability that an insurance company does not have enough money to cover the claims i.e. the probability of insolvency.

Ruin transpires if a company's income fails to cover expenses given its initial wealth (Wuthrich, 2015). The ruin theory is therefore an important risk management tool for companies looking to maximize profit. However they may also face a lot of competition from other businesses and may be willing to take some risk, for example by reducing the premiums thus increasing the probability of ruin in order to become more marketable (Powers, 1995). Ruin theory has been reviewed and refined by various researches since its development in 1907 by Lundberg. The earliest review and refining was done in 1930 by Cramer. Since then may researcher have reviewed the theory attesting to its significance.

This theory was salient for this study since one of the objectives of actuarial function is premium pricing and claim reserving activities which are paramount for any insurance company to remain solvent and profitable. Adequate pricing and reserving will improve financial performance of health insurance firms.

2.2.3 Agency Theory

Barry Mitnick and Stephen Ross independently and strangely concurrently developed this theory in the year 1973 (Mitnick, 2019). It expands the firm analysis to embrace separation of control and ownership and the issue of managerial stimulation. According to Panda and Leepsa (2017), separation of control and ownership is the sole cause of conflict of interest and further developed by moral hazards, information asymmetry, and different risk preferences. Agency conflict in the area of corporate risk management has been established to influence the level of managerial attitude towards risk taking and hedging (Smith and Stulz, 1985). The theory also establishes a possible mismatch of interests between the management, shareholders, and debt holders due to disproportionateness of earnings distribution. This could cause the company to take too much risk

or not engage in projects that create a positive net book value (Mayers and Smith, 1987). Therefore, risk management should be emphasized as a means of aligning the interests of the different stakeholders and to the overall profitability of the firm (Osieno, 2016).

A number of researchers have, however, shown weaknesses of the agency theory in expounding the general mechanisms of corporate governance. Brudney (1985) argued against the analysis of retraining misbehavior of the management through private bargaining or contract. Instead Brudney (1985) argued for Institution. Roe (1991) also discovered the legal and political factors to be the cause of the 1930s initial separation of control and ownership in the United States; and not as an automatic response to the growth of their companies. The agency perspective was also challenged by Aguilera et al. (2008) by terming it as "closed system." They propose a better method of capturing the patterned deviations that arise from interdependence between companies and their environment to be organizational sociology approach as compared to corporate governance.

Agency theory fitted well to the study since response to risk-based underwriting required a robust actuarial function with reporting responsibilities to the board and IRA on any issue that may have an extreme material effect on the insurer's financial stability (IRA circular, 2013). Actuarial function is a risk control tool to address the agency problem between ownership and management.

2.3 Determinants of Financial Performance of Private Health Insurance Companies

2.3.1 Actuarial Function

A properly constituted and mandated actuarial function can lead to improved financial and actuarial performance of an insurance firm. Risk management practices of the actuarial function makes it possible for organizations to reduce and achieve better results (Angima, 2017).

Actuarial function concerns itself with making technical provisions and expressing opinion on underwriting policy and reinsurance arrangement (IAIS, 2015). A robust actuarial function is purposed to entrench adequate risk management practices to ensure sound financial and actuarial performance of firms. Actuarial function plays both operational and oversight roles in addition to providing independent assurance thus effectively operating in all the three level of defenses.

2.3.2 Solvency

Solvency is the measure of a company's capability to meet all its financial obligations using its assets. It also helps in analyzing how capable the company is in continuing operating especially after facing a significant financial crisis (Omasete, 2014). According to Quach (2005), solvency assesses the difference between borrowed capital and shareholders' equity capital in financing the company with the objective of determining the level of the creditors' safety of interests in the firm. Consequently, solvency margin is defined as the minimum excess on firm's assets over its liabilities required by the Regulator (Komen, 2012). Solvency is expressed as a percentage of net income (after tax) and non-cash expense divided by liabilities. A healthy firm exhibits solvency of not less than 20%.

2.3.3 Liquidity

Liquidity signifies a company's capability to finance its current and arising financial obligations without having any disruptions in the usual operations of the business. There are two methods of analyzing liquidity: structural and operational. Structural liquidity refers to the components of the balance sheet while operational liquidity refers to the cash flow measures (Quach, 2005). Komen (2012) further describes that the severity, timing, and frequency of insurance benefits or claims are uncertain, therefore, insurance companies ought to carefully plan their liquidity. Liquidity is

expressed as ration of current assets to current liabilities. A heathy firm exhibit liquidity of 1 or more. A healthy firm exhibits liquidity of not less than 1.

2.3.4 Interest Rate

Hoyt (1994) defines interest rate as the cost of borrowing. Insurance firms invest much of the premium in short term and long term assets. Falling interest rates are often associated with delayed investment income growth which negatively affects the insurance firm‘s financial performance (Staking and Babbel, 1995). Continued decrease in market interest rates makes it almost impossible for insurers to offer high returns for their customers, thereby making it difficult for them to maintain high profitability. Interest is a factor when pricing insurance product thus fluctuations in interest rate will significantly affect financial performance of insurance firms.

2.3.5 Competition

According to Schich and Kikuchi (2004), a key trend in the insurance industry is the formation of mergers and acquisition amongst insurance carriers and agencies. It is believed that one of the determinants of competition conduct is the population of firms and distribution of market share. Less firms with more concentration of market share are more probable to engage in anticompetitive practices than when the industry is populated by a large number of small firms (Omasete, 2014). Mugge, 2010 proposed widening of the market as a strategic response to competition. Blundell et al. (2008) proposed a revenue and cost structure approach to competitive behavior. He used the perfect competition framework and argued that and industry operating under perfect competitive environment are unable to take up any cost increase. They pass the cost to consumers through price rise without affecting the output. This is in contract with monopolistic environment where the firm will decrease the output and increase the price leading in to a shrinkage in total revenue. Anynitha,

2018 observed innovation to be the strategic tool for the creation, enhancement, and improvement of business in this important competition to create competitive advantages that equate to or are better than those in other countries in order to achieve sustainable growth.

2.3.6 Size of the Firm

Referencing the work of Ahmed et al. (2010), financial performance is often in many ways affected by the size of the firm. Large corporations can take advantage of economies of scale, therefore, achieve greater efficiency compared to small companies. Net premium is used to determine the size of a firm. Net Premium earned is arrived at after deduction of the reinsurance premium ceded from the Gross Premium. Additionally, quantum of the policy liabilities to be tolerated by an insurer is determined through the premium base. (Teece, 2009). Net Premium is calculated by subtracting the Reinsurance ceded from the Total Premium earned. Choi (2010) in his study on the connection between growth and size of the firm established that older firms do not grow as firms as younger firms, however he also established that economies of scale has a positive relationship with growth of the firm.

2.3.7 Age of the Firm

Age also influences the level of financial performance. Older firms enjoy more experience, are not prone to newness liabilities, have enjoyed the benefits of learning, and can therefore; achieve greater performance (Shiu, 2004). However, Ahmed et al. (2011) researched that insurer's profitability is not significantly determined by age following examination of the influence of company level characteristics on the performance of Pakistan's life Insurance companies.

2.3.8 Profitability

Tracking profitability levels of a firm can also be another method of measuring financial performance (Omasete, 2014). A company's profitability depicts the extent of its ability to earn profit from its factors of production or assets. The return on assets (ROA) and return on equity (ROE) are two widely used measures of profitability. ROA computes the income a firm is generating through its investments/assets and it should fall in the 0.5-1% range for a life insurer. ROA is computed as a percentage of net income divided by total assets. On the other hand, ROE shows the earnings a firm is generating on the shareholders' investments. ROE is expressed as a percentage of net income divided by shareholder's equity. The policy holders' surpluses are used as the denominator in the policyholder owned case and the ratio should fall between 10-15%. Insurance companies use underwriting profit as a measure of profitability. Underwriting profit is expressed as difference between the net premium earned (NPE) and claims incurred less expenses. Positive underwriting profit, ROE of 15 – 20% and ROA of 5% and above are considered healthy.

2.4 Empirical Studies

Lurie (2007) investigated the actuarial strategies being used for health insurance advice by Appointed Actuaries to private health insurance funds in Australia. In his study he focused on pricing, reserving, and forecasting the models and methods used by actuaries when advising private health insurance funds especially when conducting the required functions of the health insurance Appointed Actuary. The risk margin survey revealed that the future claim risk was more likely to lower in a stable claim environment, however, the view becomes less plausible if future potential risk variations are taken into consideration.

Oross and Smith (2012) conducted a study on enterprise risk management (ERM) for health insurance from an actuarial view. The study focused on the ERM and tactical business control for health insurer. The study discussed risk control for health insurers in the perspective of financial stability II and the wider European Commission regulatory necessities. The study recommended implanting ERM within the organization and making sure it becomes a part of every operational and strategic decisions DNA. The implementation hinges on people and culture.

Angima (2017) performed a study to determine the relationship between underwriting risk, ARMP, firm characteristics and performance of P & C insurance firms in East Africa. The research first investigated the correlation between ARMP and firm performance and then explored the effect of moderating and intervening factors on the model. The study employed exploratory design making use of both secondary and primary data. Primary data was gathered from all the 82 Property and Casualty firms in Tanzania Uganda, and Kenya. The results showed that ARMP, Underwriting risk and firm characteristics jointly significantly influence the non-financial firm's performance.

Tripp et al. (2004) also performed a study that sought to study the use of actuarial methods to operational risk. They considered the value of working with other experts in developing plausible actuarial models. In the study they surveyed the application of stress and scenario testing, casual modelling, statistical curve fitting and extension of dynamic financial analysis to include operational risk. They found out and concluded the absence of a single right approach and that application and choice of modelling assumption is critical.

Teresa (2013) observed that the most important determinant of ROA (Return on Assets) for insurance company was the company size. She regressed volume of capital, liquidity, company size, and underwriting risk on ROA using financial data for the year 2010.

Omasete (2014) researched on "The Effect of Risk Management on Financial Performance of Insurance Companies in Kenya". She noted the ability of risk to cause the collapse of most companies if not well managed especially those whose core business is related to daily risk handling. The research involved the use of an exploratory research design, with the Forty Nine (49) licensed insurance companies in Kenya forming the target population. The study discovered high adoption of risk control systems by the insurance firms in their operations and that this had a significant influence on financial performance. She recommended and advocated for adoption of Enterprise Risk Management (ERM) amongst the Kenyan insurers due to its effect on the financial performance of the organization.

Njeru (2013) also investigated the connection of risk control practices and the performance of insurance companies in Kenya. Similarly, this study used an exploratory research design with the 46 registered insurance companies forming the target population. Both secondary and primary data was used. The study discovered that risk identification was the most significant in influencing financial performance. The study recommended the adoption multidimensional approach to risk management by insurance companies in order to achieve greater benefit from risk management efforts.

2.5 Conceptual Framework

A conceptual framework is a diagrammatic representation of the relationship between the variable (Mugenda, 2008). This study was conceptualized as follows:

Figure 2.1: Conceptual Framework

Independent Variable **Dependent Variable**

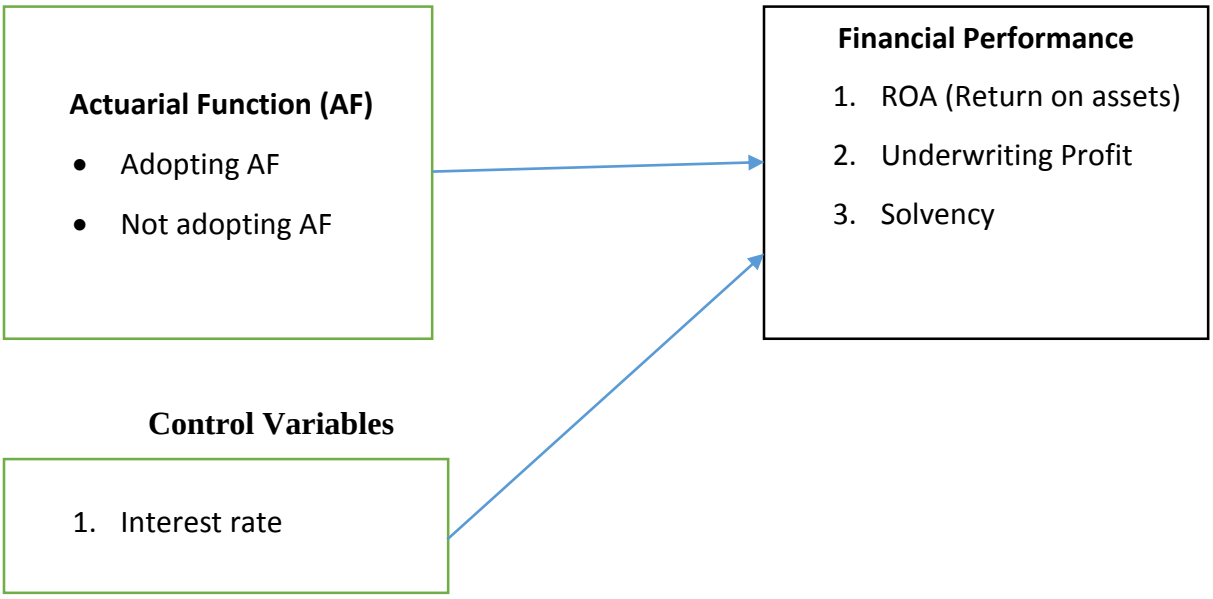

Figure 2.1 Conceptual framework

The framework conceptualizes that actual function has an influence on financial performance of the private health insurance firms. It is expected that AF positively influences return on assets, underwriting profits and solvency of the health insurance firms. It is also conceptualized that not adopting the actuarial function is associated with low underwriting profits, low ROE, ROA and solvency.

2.6 Summary of Empirical Studies

Various studies have been conducted that focus on the impact of risk control and pricing practices on the financial performance of insurance organization. Most of these studies showed risk management practices influencing financial performance of insurance companies to a greater extent. Whereas many studies have concentrated on risk management practices broadly there is however literature gap in the effect of actuarial function as a regulatory measure on financial performance on health insurance providers.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter focused on the research design, data collection, data analysis and data presentation methods. Data collection instruments and procedures are also discussed as well as the target population. The research methodology lays down the procedures and methods which were used in undertaking the research study.

3.2 Research Design

Claire, Wrightsman and Cook (1962) define research design as the systematic collection and analysis of data in a way that combines the research objectives, purposes and relevance. The procedure also needs to the economical. The study employed the use of descriptive research design to help understand the factors in study and offer ideas for further investigation and research. Descriptive research design was advocated in this study as it explains whether adopting AF has an influence on financial performance of private health insurance firms.

3.3 Target Population

The target population for this study comprised insurance companies undertaking medical insurance business in the industry as the target population, which is a total of 21 insurance companies (IRA Report, 2017). The study covered a period of 9 years beginning 2010 to 2018 and included any insurance firm that had adopted actuarial function. The inclusion of the firms was based on whether the firm had existed and regulated by IRA for at least three years prior to adopting the AF and that a period of three financial years had elapsed after adopting the AF. The list of the private health insurance firms is shown on appendix 2.

3.4 Sample Design

Sampling is the process of selecting an appropriate number of subjects from a defined population (Kothari, 2008). In this regard, the research considered only those health insurance providers who have adopted actuarial function (AF). From the list of the private health insurers, those who have adopted AF was selected to provide information for data analysis and ultimate conclusion on the research objectives.

3.5 Data Collection

The study used secondary data that was collected through desk search techniques from IRA & AKI websites for a nine year period from 2010-2018. At least three years reports pre and post compliance for each firm was be considered for the purposes of this study. Data collected was converted to the required form for easy analysis. Since the required data was the figures on underwriting profits, ROA and solvency, some calculations was performed. Information collected was filled on data collection form shown on appendix 1.

3.6 Validity and Reliability (Diagnostic Test)

Reliability and validity must be achieved if quality is to be achieved in any piece of study Mohamad et al. (2015). To achieve this I relied on the annual financial data submitted by the insurance companies to IRA.

3.7 Data Analysis

Data collected was be subjected to scrutiny to ensure it is correct and reliable. After information had been filled into the data collection form, it was transferred into SPSS (Statistical Package for

Social Scientists) software. The data was combined for the periods before and after the adoption of actuarial function. The dependent variable was whether an insurance firm has adopted AF or not. Values of the independent variables was be taken for three years before and after establishment of the actuarial function for each firm. Three years report before AF for medical underwriting profit (UP) was combined into one variable, "the mean UP before AF" and the three years medical underwriting profit after adopting AF was combined into "the mean UP after adoption of AF". The two variables were thus subjected to an independent *t*- test, where the hypotheses was tested. The process was repeated for ROA and solvency, establishing mean for before and mean for after adopting AF.

The independent sample t–test of difference was used to determine the effect of actuarial function on the financial performance of health insurance provider in Kenya. The independent sample t-test was selected as it allows comparison of two independent groups to establish whether there is statistical difference between the two population means. The use of independent sample t-test was to test statistical differences between the means of two interventions, in this case, the adoption of actuarial function. The t-test was used as there are only two groups, one for performance before and performance after adopting AF.

There are requirements that need to be met for the data to be subjected to independent t-test. The dependent variable needs to be continuous, either interval or in form of ratio, while the independent variable is categorical (having two options). The cases need to have both independent and dependent variables, as well as having normal distribution. It is also assumed that there are no outliers in the data and that there is homogeneity of variances across the groups.

From the group statistics table, the researcher explained the figures, focusing on the comparison of the two sub-variables, on their means, and standard deviations. From the independent sample test table, test for equality of means section was be used for the interpretation of the results. Significance value (*p)* was used to express the difference between the two means. If the *p* (abbreviated as sig. in the table) is less than the selected significance level (*a)* of 0.05 (representing 95% confidence interval), then the null hypotheses is rejected and the alternative hypothesis adopted.

CHAPTER FOUR: EFFECT OF ACTURIAL FUNCTION ON FIRM PERFORMANCE

4.1 Introduction

Chapter four discusses the findings on the effects of adopting the actuarial function on performance of firms. The focus on actuarial function influencing financial performance components of underwriting profitability, return on assets, and solvency are discussed.

4.2 Validity and Reliability Test

The study variables were subjected to reliability coefficients and the following was the results.

Table 4.1 Reliability Test Results

Cronbach's Alpha Based on Standardized Items	N of Items
0.757	6

From the Cronbach's alpha, the combined reliability of the variables was 0.757, meaning that the data was internally reliable and thus could be used for the interpretation of the study.

4.3 Response Rate

Data was sought from the listed 21 companies, and one refused to share information on when and whether they had adopted the actuarial function. Two of the firm had not adopted the actuarial function. The remaining firms were thus eighteen, representing a response rate of 85.7%, which according to Mugenda and Mugenda (2003) was satisfactory for the analysis of the data.

4.4 Test of Normality

The study was subjected to a normal distribution test where the Shapiro-Wilk tests.

Table 4.2 Test for Normality of Data

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
UW profit before AF adoption median	0.3	18	0	0.892	18	0.142
UW Profit after adopting AF(actuarial fx)	0.279	18	0.001	0.767	18	0.067
ROA before adopting AF Median	0.1	18	.200*	0.975	18	0.892
ROA post AF Adoption Median	0.218	18	0.024	0.91	18	0.085
Solvency before AF Adoption median	0.115	18	.200*	0.964	18	0.673
Solvency post AF adoption Median	0.141	18	.200*	0.922	18	0.142

* This is a lower bound of the true significance.

a Lilliefors Significance Correction

From the Shapiro-Wilk normal test, the significance values were all above 0.05, thus the data was normal distribution. The independence sample t-test was therefore the best approach to ascertain whether the variables means were closely associated or not. Since the data was normally distributed, normal t-test was conducted.

4.5 Information about the Health Insurance Firms

The information on the health insurance firms was gathered from the Insurance Regulatory Authority (IRA). The selected insurance firms were eighteen out of the possible 21 firms. It was noted that seven firms out of eighteen had established their actuarial function (AF) in 2013,

forming a 43.75% of the listed forms. Those who established their actuarial function in 2014 were five, forming a 31.25% of the total firms selected. Another 6.25% of the firms adopted the actuarial function in 2016, signifying a near 90% of total health insurance firms adopting the actuarial function.

4.6 Effects of Actuarial Function on Underwriting Profitability

Actuarial functions are expected to influence how firms decide on pricing and reserving. The paired (dependent) t-test was run to show the mean differences. The effects of the actuarial functions are expected to positively impact on the firm performance, especially its profitability. In comparing the pre- and post-measure periods, the nature and strength of correlations also needed articulations.

4.6.1 Paired Samples Statistics for profitability

Table 4.3 Paired Samples Statistics for profitability

	Mean	N	Std. Deviation	Std. Error Mean
UW profit before AF adoption	-20804.6	18	60874.77	14348.32
UW Profit after adopting AF	6118.778	18	153970.7	36291.25

Key: UW- Underwriting profit, AF- Actuarial function

There was a negative mean for the profitability of the firms at -20804.6 before they had adopted the actuarial functions. The means for the profits after adopting the actuarial function was high at 6118.7, showing that there was a change experienced in terms of positive profits when actuarial functions were adopted.

4.6.2 Paired Samples Correlations for UW Profitability

Table 4.4 Paired Samples Correlations for underwriting profitability

	N	Correlation	Sig.
UW profit before AF adoption median & UW Profit after adopting AF median	18	0.554	0.017

Underwriting profits before and after embracing actuarial functions were positively and strongly correlated (*p* value of 0.017 and correlation of 0.554). In general, there was a strong positive significant and established effect that adopting the actuarial function was associated with increased profitability of the firms.

4.6.3 Hypothesis Testing for AF and profitability of the firms

It is expected that an association between AF and profitability is witnessed.

Table 4.5 Paired Samples tests for AF and Profitability

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
UW profit before AF adoption median - UW Profit after adopting AF	-26923.4	130523.2	30764.62	-91831.1	37984.28	-0.875	17	0.394

From the paired samples tests, it was noted that the significance levels were 0.394. The null hypothesis states that H0: μ1 = μ2, and that the difference between the two is zero. Since the

significance value (P=0.394) is over the cutoff point of 0.05, the null hypothesis is rejected and the alternative hypothesis is picked. It confirms that underwriting profit is dependent on the adoption of actuarial function among other factors. The alternative hypothesis that the two means were not equal, and that the difference between the two means was not zero points to the fact that there was a significant change in firm performance due to adopting actuarial function.

4.7 Effects of Actuarial Function on Return on Assets

The effects of actuarial functions on return on assets (ROA) is expected to be positive. For instance, a control on the premium charged and the interest rates on the assets is likely to produce more profits for the insurance firms.

4.7.1 Paired Sample Statistics for Return on Assets

Table 4.6 Paired Sample statistics on ROA

	Mean	N	Std. Deviation	Std. Error Mean
ROA before adopting AF Median	6.0944	18	4.76784	1.12379
ROA post AF Adoption median	3.5333	18	5.21356	1.22885

The return on assets (ROA) presented a mixed results as it was shown that rate of return on assets before adopting the actuarial function was high, at six (6.09) times that of the period after adopting the actuarial function. The mean for the period after adopting the AF was 3.5, showing a reducing in ROA, which can be attributed to possible increase in investments which are likely to reduce the returns on assets due to reinvestments.

4.7.2 Paired Samples Correlation

The correlation shows how the two variables have a relation coefficient.

Table 4.7 Paired Samples Correlations for ROA

	N	Correlation	Sig.
ROA before adopting AF Median & ROA post AF Adoption Median	18	0.377	0.123

The study established that there was a positive but weak correlation between the variables (p=0.123 and correlation of 0.377). The weak correlation shows that the actuarial function was not significant in influencing profitability of the firms.

4.7.3 Paired Sample Tests and Hypothesis Testing

Table 4.8 Paired Sample Tests for Hypothesis Testing on ROA

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
ROA before adopting AF Median - ROA post AF adoption median	2.56111	5.58255	1.31582	-0.21503	5.325	1.946	17	0.068

The null hypotheses was subjected to test as shown on the table. The null hypotheses was as follows; H0: $\mu 1 = \mu 2$ (The return on assets before adopting AF is equal to return on assets after adopting actuarial function (AF). The p-value of 0.068 showed that the null hypothesis should be rejected and the alternative embraced. The study thus concluded that there was a relationship between adopting actuarial function and firm performance since the two means were not the same.

4.8 Effects of Actuarial Function on Solvency of Insurance Firms

Solvency is expected to reduce once the firms embrace robust reserving for technical provision but progressively increase as the firms becomes more profitable. The study sought to understand whether adopting actuarial function amounted to changes in organizational performance. The results were shown on table 4.9;

4.8.1 Paired Samples Statistics

The mean, standard deviation and error are shown on the table to explain about the variable.

Table 4.9 Paired Sampled Statistics on Solvency

	Mean	N	Std. Deviation	Std. Error Mean
Solvency before AF Adoption median	9.3722	18	7.95264	1.87446
Solvency post AF adoption Median	6.9222	18	8.02676	1.89193

The mean solvency for the group before adoption was 9.37 while for the group after the adoption was 6.9. This points out to the reduced solvency of the firms after engaging the actuarial function, a component that would otherwise be used for improving solvency status.

4.8.2 Paired Samples Correlations

The focus on paired samples correlation is to show how the variable influence the other.

Table 4.10 Paired Sample Correlations

	N	Correlation	Sig.
Solvency before AF Adoption median & Solvency post AF adoption Median	18	0.4	0.1

The result show that there was an insignificant weak correlation between the variable and financial performance since the p value was 0.1 and a correlation of 0.4.

4.8.3 Paired samples tests and Hypothesis testing for solvency

Table 4.11 Paired Sample Test statistics

Paired Differences					t	Df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
			Lower	Upper			
2.45	8.75108	2.06265	-1.90181	6.80181	1.188	17	0.251

The null hypothesis was as follows; $\mu 1 = \mu 2$ (The solvency before adopting AF is equal to solvency after adopting actuarial function (AF) among private insurance firms). Since the hypotheses suggest that the study adopted the alternative hypothesis, it is concluded that actuarial function was a predictor of firm performance.

4.9 Correlations Coefficients for the Independent Variables

The correlation coefficients focus on explaining the relationship between the dependent and the independent variables.

Table 4.12 Correlation coefficients for the variables

		UW profit before AF adoption median	UW Profit after adopting AF	ROA before adopting AF Median	ROA post AF Adoption median	Solvency before AF Adoption median	Solvency post AF adoption Median
UW profit before AF adoption median	Pearson Correlation	1	.554*	0.099	0.058	-0.033	0.097
	Sig. (2-tailed)		0.017	0.695	0.82	0.898	0.702

	N	18	18	18	18	18	18
UW Profit after adopting AF	Pearson Correlation	.554*	1	0.237	0.188	0.154	0.266
	Sig. (2-tailed)	0.017		0.344	0.454	0.541	0.286
	N	18	18	18	18	18	18
ROA before adopting AF Median	Pearson Correlation	0.099	0.237	1	0.377	.945**	.518*
	Sig. (2-tailed)	0.695	0.344		0.123	0	0.028
	N	18	18	18	18	18	18
ROA post AF Adoption Median	Pearson Correlation	0.058	0.188	0.377	1	0.311	.950**
	Sig. (2-tailed)	0.82	0.454	0.123		0.209	0
	N	18	18	18	18	18	18
Solvency before AF Adoption median	Pearson Correlation	-0.033	0.154	.945**	0.311	1	0.4
	Sig. (2-tailed)	0.898	0.541	0	0.209		0.1
	N	18	18	18	18	18	18
Solvency post AF adoption Median	Pearson Correlation	0.097	0.266	.518*	.950**	0.4	1
	Sig. (2-tailed)	0.702	0.286	0.028	0	0.1	
	N	18	18	18	18	18	18
* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).							

Introduction of actuarial function influenced the financial performance of health insurance providers. There was a strong positive significant relationship between underwriting profits before and after adopting actuarial functions. Return on Assets had a weak positive insignificant influence on the financial performance while Solvency had a weak positive insignificant influence on the financial performance as the Pearson correlation was 0.097, but a p-value of 0.702 showed that the relationship was not significant. Apart from the underwriting profit before and after adoption of actuarial function, other components had weak insignificant relationship with firm performance.

4.10 Chapter Summary

Chapter four has focused on data and the findings. It has presented results as drawn from the analyses, and interpretations. It can be concluded that the adoption of actuarial function had statistical significant positive influence on health insurance firms in Kenya. Underwriting profit had strong significant relationship with adoption of actuarial function. There was a weak insignificant correlation between ROA & Solvency and adoption of the actuarial function.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Chapter five presents the conclusion and the recommendations. The recommendations are drawn from the finding of the study. The study was carried out to determine whether adopting the actuarial function was associated with increased firm performance.

5.2 Summary of Findings

The findings point to the need of embracing more studies to know how exactly the actuarial function influences firm performance. The data had a high internal reliability with a Cronbach's alpha of 0.757. The test of normality was conducted with the Shapiro-Wilk tests showing significance of above 0.5, meaning that the data was normally distributed. From the underwriting profitability statistics, the insurance firms had a negative mean of 20804.6 before adopting the actuarial function while after adopting the AF, the mean profit changed to 6118.8, showing some changes in profitability. The changes before and after adopting the AF were positive and strongly correlated (corr. 0.554, *p*-value 0.017). Despite the changes showing positive significant correlation, the hypothesis testing showed that the means of the profits before and after were not the same, hence there were changes in underwriting profitability, resulting from the adoption of the actuarial function.

On objective two on the effects of actuarial function and return on assets, the mean return on assets was 6.1 and 3.5 before and after adopting actuarial function respectively. There was weak insignificant correlation for ROA before and after adopting actuarial function (corr. 0.377, *p*-value 0.123). The null hypothesis that the two means are the same or the difference between the two

means is zero was rejected, meaning that there was difference in return on assets after adopting the actuarial function for the health insurance firms.

On the third objective of the study relating solvency to the adoption of the actuarial function, it was observed that the mean for the period before and after adopting actuarial function was 9.3 and 6.9 respectively. There was also a weak insignificant correlation between the performance before and after adopting actuarial functions. The hypothesis testing led to rejection of the null hypothesis which stated that the two means were the same, concluding that there was an influence on the solvency of the firms after adopting actuarial function.

5.3 Conclusions

Based on the three research objectives, it was found that the adoption of actuarial function had some significant effect on firm performance. In addition, changes in underwriting profit were associated with adoption of actuarial function as expected. The rejection of the three null hypotheses showing that the performance results before and after adopting actuarial function were not the same confirms there was significant changes in performance of firms. The study thus concluded that the influence of actuarial function on firm performance was, at this stage (three years after adopting actuarial function) significant.

5.4 Implication of Research Findings

The implications of the study is that, policy makers and the health insurance industry need to adopt the actuarial function as a measure to drive firm performance. The strong correlation between the underwriting profit and actuarial function should encourage firms to invest in the function. The findings also show that firms which are likely to adopt the AF have increased chances to make

profits in the long term and have better returns on assets. There is however need to do more studies to establish the long term effect of adopting the actuarial function on solvency since initial years of adoption are associated with correcting reserving malpractices. The findings are thus important for the insurance industry in shaping their investments and reducing risks in premiums ratings.

5.5 Limitation of Study

The study was limited in terms of the data accessibility. Despite the challenges experienced in bureaucracy of getting data from individual insurance firms, the researcher managed to get quality data even for the last ten years. A few companies were not ready to provide data on the date of adopting the actuarial function. The study was limited to three years pre- and post-AF adoption, a case that would have been more reliable if the information was presented for at least five or ten years performance. The results show that there were significant changes in performance of firms, even when there could be possible influence from other factors like the improved economic environment of the firms. Another limitation was the possible bias of the reported performance by the firms. Since the reports are made for the public, this could make some firms to doctor the reports to fit the targeted audience, hence the data could have some errors. This points to the fact that the researcher could not have identified any biases in the original primary data, and could not ascertain the quality of data apart from being given by the IRA, the responsible body for controlling insurance industry in Kenya. The use of secondary date also restricted the researcher on establishing the influence of actuarial function on other pertinent determinants of financial performance.

5.6 Suggestion for Further Study

It would be recommended that future studies be narrowed down to specific components of firm performance like solvency and ROA, and how they have been influenced by the actuarial functions. In addition, the challenge of using secondary data given by IRA (insurance Regulatory Association) could have affected the results of the study since secondary data is prone to bias and manipulation. A follow-up study focusing on five or ten-year data would be recommended. It would also be recommended that a study on the control variables of competition, government policies, and market interest rates be conducted to see how actuarial function influences firm performance. A case study on specific firm would reveal more insights on other moderating and control variables.

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APPENDICES

Appendix I: Data Collection Form

Name of the Firm:_____

Date of Establishing Actuarial Function:_____

Data for five (5) years pre-establishment of the actuarial function.

Financial Indicators	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**
Underwriting Profit					
ROA					
Solvency					

Data for five (5) years post-establishment of the actuarial function.

Financial Indicators	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**
Underwriting Profit					
ROA					
Solvency					

Appendix II: Private Health Insurance Providers in Kenya as at 31st December 2017

1. AAR Insurance Kenya Limited
2. APA Insurance Company Limited
3. Britam General Insurance Company (K) Limited
4. CIC General Insurance Company Limited
5. First Assurance Company Limited
6. GA Insurance Company Limited
7. ICEALION General Insurance Company Limited
8. Kenindia Assurance Company Limited
9. Kenya Orient Insurance Company Limited
10. Madison Insurance Company of Kenya Limited
11. Metropolitan Cannon General Insurance Company Limited
12. Pacis Insurance Company Limited
13. Resolution Insurance Company Limited
14. Saham Assurance Company Limited
15. Sanlam General Insurance Company Limited
16. Takaful Insurance Company of Africa Limited
17. Tausi Assurance Company Limited
18. The Heritage Insurance Company Limited
19. The Jubilee Insurance Company of Kenya Limited
20. Trident Insurance Company Limited
21. UAP OLDMUTUAL Insurance Company Limited

Source: ***www.ira.go.ke***

Appendix III: List of Private Health Insurance Firms, years adopted AF and whether adopted AF

S/No.	Insurance Firm	Adopted AF (Y/N)	Year Adopted AF