



Strathmore
UNIVERSITY

**REINSURANCE SPIRAL AND ITS CONTAGION EFFECT:
KENYAN INSURANCE INDUSTRY**

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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This Research Project has been submitted for examination with my approval as the Supervisor.

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ABSTRACT

The purpose of this study is to identify potential reinsurance spirals and the different contagion effects of failed reinsurance covers on the stability of Kenyan insurers. The study looks at the Kenyan insurance market as a possible market for the existence of a spiral and based on simulated effects such as failure of one reinsurer, establish the influence levels on their stability of the insurers it covers. Also considered is the influence of regulations on reinsurance arrangements. A sample of reinsurance companies based on their market share will be used to assess the direct effect on insurers' financial position and the extent to which they are affected by a particular shock in the insurance industry, looking at the solvency, profitability, capital and size of the company. Based on the results it shows that there is no significant level of systematic risk within the insurance market and that very little effect resulting from the failure of individual reinsurance companies occurs.

Key words

Reinsurance, catastrophic losses, retrocession, contagion

ABBREVIATIONS

EU - European Union

XL - excess of loss reinsurance

IRA - insurance regulatory authority

Chapter 1: Introduction

1.1 Background

The proper functioning of a financial system is important for the smooth running of economic activities. The insurance industry plays a big role which involves diversifying the financial risks of the otherwise risky businesses. This also means that they protect themselves with other parties with bigger appetite for risks who are reinsurers. For the reinsurer, there is need to know how much of all the reinsured risks it can handle especially since the businesses it tends to cover have claims of huge amounts. To protect themselves from losses they may need to diversify their risks as done by insurance companies. One of the methods of diversifying its risks is retrocession. This in modern reinsurance is commonly where the reinsurer seeks cover from another reinsurer (Rasmusson, 2014). This has resulted in a worldwide marketplace of insurers and reinsurers; developed to share out these risks. It is however noted that despite the fact that an insurer can also do the task of reinsurance, there are dominant reinsurance companies within the international market¹ that tend to take up bigger shares of the reinsured risks.

A reinsurance spiral can be defined by the direct links, in terms of business, of several reinsurance companies with each other. In this case a reinsurer may retrocede for two other reinsurance companies who have retroceded for each other. These links create risks of contagion within the industry and in the event that the risks are concentrated, may cause drastic effects to either of the companies.

It is of importance to therefore understand the effect of having these major reinsurance players in the insurance industry and the effect on the market's stability in future and especially for smaller insurance markets like Kenya.

¹Significant names within the insurance market as of 2014 based on size of firms being Lloyds of London, Swiss Re, Berkshire Hathaway Re, Hartford Re, and Everest Re.

Looking at the importance of regulation, the insurance industry is seen to be of no exception to continued supervision. As of the late 1990's most countries had introduced insurance legislation and supervision and opened up their markets for foreign insurers, although some only allowing minority interest (Falush, 1997). As witnessed through the decade, the insurance market has grown through mergers and acquisitions with also a developing trend in product development with the issue of insurance-based securities, as a way of advancement from traditional insurance products (Powers & Shubik, 2001). This implies that the growth of business within this industry should also illustrate growth in its risk management procedures.

The Lloyds market had groups of companies known as syndicates operating under it for which syndication allows companies to pool their resources and share risks (Bain, 1997). A crisis between 1988 and 1992 led to losses within the market of £8 billion from claims from America on litigation cases for asbestos and pollution cases, as well other strings of disasters. Several names who provided the market's capital had unlimited exposure to Lloyd's risks but pulled through, however more than 1,500 of these (from the 34,000) were financially ruined, which included insurers who had placed business with them. Thus it may occur that several insurance companies linked together would affect their stability given financial losses on one of them.

Research within the area of reinsurance concentration of risks have mostly been within the banking industry, on the interbank exposures (Van Lelyveld, Liedorp, & Kampman, 2011) with hardly any within the insurance industry. Van Lelyveld et al (2011), outline some of the reasons being the lack of data from insurers on their reinsurance exposures and also of the history of hardly any contagion effect from failed reinsurers. However, as quoted by (Park & Xie, 2014) works of several other researchers such as (Swiss Re, 2003), in this area that have established small contagion effects within the insurance market.

1.2 Motivation of study

In the study by Myskowski, Klein & Field (1998) on intra-industry effect of Lloyd's financial distress on publicly traded US insurance companies; they identified how the large losses witnessed by an insurer can have drastic results on the market. The findings supported an

existent contagion effect between the Lloyd's financial distress and the US insurance industry. It elaborated that the major factors that may have contributed significantly to this distress were, a tendency for retrocession business to be placed in the market and remain within the market, also underwriters' misjudgments regarding their exposure coupled with failures to purchase sufficient reinsurance to protect accounts against known exposures, and an irrational premium structure for catastrophe reinsurance and retrocession within the markets (Bain, 1997) contributed to its distress. The prominence of Lloyd with international insurance industry gave importance to understanding management capacity of reinsurers given certain types of risks and the financial solvency of insurers, if an unexpected loss of a bigger magnitude were to occur within the insurance industry.

It is however important to try and look through the various relations existent with different insurance companies in Kenya and try to illustrate the effects of this spiral.

1.3 Problem statement

Ideally reinsurance is one of the methods that is considered for transfer of risk by insurers. If several companies reinsurer with each other it may lead to circulation of risks within the market players that would mean that an effect on one company may create a domino effect on the rest of the companies since they are financially linked. Establishing the network of linkages between the companies is therefore important in order to understand if at all there are high levels of contagion within the industry. Previous research has mostly concentrated on the performance of the industry based on pandemics in general and the solvency characteristics of companies, as in Upper and Worms (2004), without looking at the placement of business by its participants on the direct contagion risks and its relationship with regulations on the particular reinsurance arrangements. This can be justified by the low exposure of the industry to losses from previous reinsurance failures. The additions therefore to previous knowledge considers this combined influence on regard Kenyan market which has not been studied.

1.4 Research objective

The overall objective of this study is to illustrate the likely impact of a reinsurance spiral from its direct financial linkages on the Kenyan insurance market.

1.5 Research questions

- Who are the retrocession participants of the reinsurers, what is their level of concentration of business?
- How do reinsurance arrangements lead to contagion?
- What are the effects of an adverse event to a reinsurance company and its ultimate effect to the insurance market in terms of solvency?
- What is the portion of reinsurance business within Kenya that comes from insurance companies in Kenya?

1.6 Significance of the study

The analysis of this study in general will look at the direct contagion effect arising from the direct financial links existing between different insurance and reinsurance companies in the Kenyan market. This will provide significant information on the financial stability of the industry given different shocks and the level of exposure that insurers have on the financial fortunes of reinsurers. The study provides additional literature exploring the organization of insurance within the Kenyan market also through the reinsurance matrix indicating the different links between reinsurers and insurers and the regulators influence on such arrangements.

The rest of this paper is structured as follows, chapter two is the literature review that gives an illustration of the understanding of reinsurance arrangements and further on a description of the reinsurance spiral and how it can lead to contagion. Chapter three looks at the methodology used to analyze the scope of risk concentration within the market. Chapter four describes the data and regulation implication of the interlinkages between reinsurers and the market and the results of our contagion analysis. Chapter five gives the conclusions and recommendations.

Chapter 2: Literature Review

2.1 Understanding reinsurance

A reinsurance agreement is a contractual obligation by the reinsurance company that serves to enhance the fundamental financial risk-spreading function of insurance. This level of risk transfer helps the direct insurer to increase their capacity to write insurance. It will help them stabilize their financial results and thus enhance financial growth but with a major function of protecting them against catastrophic losses (Raim & Langford, 2007). There are certain elements that may influence the reinsurance and retrocession arrangements, such as regulations, risk appetites and business strategies of a company. Obligatory sessions tend to also affect these arrangements.

The type of reinsurance and retrocession contracts are either influenced by the company or in most cases the insurance industry regulator. Meaning that the arrangement at least should meet the minimum requirements of the regulations or at least the company's business strategies and risk management strategies. This thus also contributes to the type of links that exist within markets. There are proportional contracts where the reinsurance premium is paid by the insurance company at a certain proportion to the reinsurance cover received. Another type of contract is the stop-loss contract in which the cover is set above a certain limit.

Identifying the required level to maintain as non-ceded premiums will depend on the model adopted by the organization but as regulated by the standards of insurance business. Deciding the proportion of risk to transfer to the reinsurer, the insurance company should consider the amount which leads to smaller risk margins, which will protect it from volatility in liabilities. (Quick, 2014), in his article states that ultimately, the best reinsurance structure will be determined by the client's own risk preferences.

Insurance business has grown all through and the levels required to diversify the ceded risks developing at a faster rate. As a result varying retention levels and reinsured events are generated with each contract (Sakálová, 2010). This means that different companies will face

different exposure levels to concentration of risk. To establish the potential of losses to the company is therefore important before any business is undertaken.

More important to an insurance industry is its regulation. The process of trying to regulate the insurance market towards acceptable methods of operating business has seen the development of solvency II assessment basis. From Quick (2014), the Solvency II Directive, which is an overhaul regulation on the European Union insurance industry, tackles both the insurance and reinsurance continued course of business. It provides a uniform set of rules to be applied even by other regulators.

2.2 Insurance spirals

In practice spirals are most likely to occur when reinsurers provide cover for each other on similar lines of business (Bain, 1997). This mostly happens when they write and retrocede for XL reinsurance. The main characteristic of the insurance market spiral is that when a reinsurer makes a claim on business it has reinsured, they will pay out and may additionally receive claims from business they have reinsured with regard the same event. For the same loss events it will happen that reinsurance companies seeking XL reinsurance will also write XL business because it will be hedged with the purchased XL reinsurance. For an event with a huge amount in claim, the insurer claims from the reinsurer. At this point normally, the amount of claim is above the insurers retention limit.

For an insurance market spiral, the claims in excess of an insurer's retention limit are spirally claimed from the companies reinsuring them. It happens then that the companies continue to pass on, in full the amounts above their retention levels until some reinsurers run out of cover and they have to cater for their losses. If it happens that it circulates within a particular market then it is a risk that could result in losses for market participants. It is important therefore to highlight use of effective systems of control to avoid these duplications (Bain, 1997).

Further consequences of an existent spiral in the market would be that the probability of a claim being made will be undetermined. In an insurance spiral the direct connection between the level

of insured losses and the triggering of claims on any given layer of reinsurance is broken. The total of claims is inflated by the recirculation of claims amongst insurers as it keeps moving from one level to another. If claims are not passed on in full, premiums should fall to the extent that claims passing through to higher rounds are eroded by deductibles contracts. In reality, acquiring the necessary detailed knowledge is unlikely to be practicable for retrocession business.

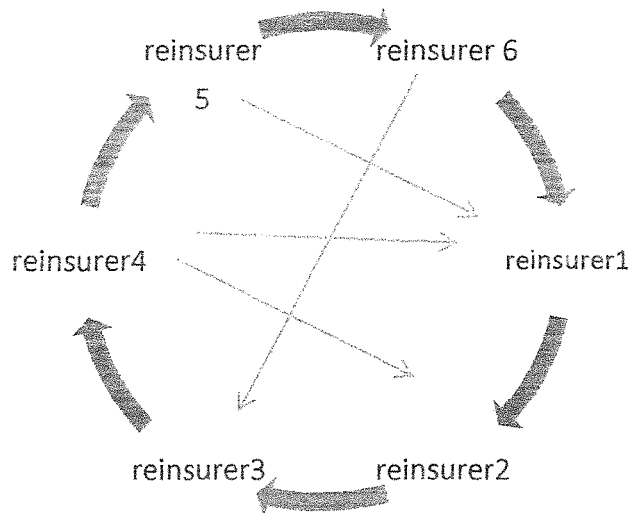


Figure 2. General reinsurance spirals. The figure shows relation between one reinsurer to another in terms of ceded and retroceded risks.

Reinsurance cover of all the inside reinsurers is exhausted at a point and the reinsurer has to retain any further claims that fall on them as from the loss incurred. Thus whether it is the outside or inside reinsurer, they will have to bear the risks falling on them. Given existence of mutual reinsurance, if they had purchased sufficient cover from this outside reinsurer then they will be able to have any amount above their deductibles covered by their reinsurer (Bain, 1997). If at all the amount of gross claims is extremely high which would be the case for catastrophic losses, the reinsurer will have limits of cover and thus any residual amount is left in the hands of the insurer.

Many models adopted in research to show the spiral within financial systems mostly looked at the banking industry. Comparable models are as those adopted by Upper and Worms (2006), Van Lelyveld and Leidorp (2006) on interbank contagion from credit exposures. The matrix models developed is as borrowed from the models adopted for the banking industry.

2.3 Reinsurance contagion effect

Reinsurance and retrocession methods are widely applied risk management tools within the insurance industry. The wide breadth of reinsurance from its business spectrum and operations creates good diversification of portfolios in catastrophic and non-catastrophic events. Successfully measuring the exposures of a company needs accurate probability measures of their business claims. Prudent methods should be used to diversify the reinsurer's risks. Among the considerations should be a diverse geographical area, diverse types of business and the like.

The situation where a shock within an economy or region spreads out and affects other group's results from an existent relation between it and the market is defined as a contagion (Van Lelyveld, Liedorp, & Kampman, 2011). The significant economic changes may spread from one country to another. Looking at the Kenyan reinsurance segment it is possible that an unprecedented event from within the market to one reinsurer might affect the whole industry if not those outside it. The London market had several risks it may have reinsured outside the UK with some of it always coming back to London (Bain, 1997).

Reinsurance spirals exist when different reinsurers, also known as secondary insurers, also insure their exposures further. For example 50% of exposures insured in a state may be reinsured; with maybe 20% of this retroceded to another reinsurer.

Reinsurance requires large amounts of money. As stated by Raim & Langford (2007), most risks requiring secondary insurance are too big for any one company to underwrite alone. The concentration level of the insurance and reinsurance markets is high and continues to increase (Cole & McCullough, 2006). This is also the case with Kenyan firms with existent reinsurance companies and the upcoming insurance companies. As mentioned by Frank et al (2011), other

than the increasing concentration levels at market level, the risks insured are also becoming increasingly related. This means that the desired diversification of business will require more innovative methods to spread its risks. Some other methods considered for risks transfer include post funding where the insurer or reinsurer seeks funds after the event has occurred. Alternatively, securitization on the capital market² is considered. Where contracts are bundled into bonds which will obtain a higher payout when it is triggered by some predefined event. This transfers the insurance risk to the bondholder.

As quoted by Van Lelyveld et al (2011), the contagion channels of a reinsurer to insurance companies can either be through direct or indirect exposure.

Direct exposures is created by the direct financial link between the insurer and re-insurer. Therefore the failure of the reinsurer results in financial losses to the insurer who can no longer claim for the reinsured business since the reinsurance cover is lost. In the event that this losses are too large for the insurer, it could lead to its failure. Swiss Re (2003) considered global risk potential on reinsurance to be low because of the fact that the percentage of retroceded global premiums is only at 6% and credit ratings of reinsurance companies shows a certain level of stability of reinsurers.

For an insurer, with reinsurance being the primary transfer of insurance risk, having to adequately cover itself against losses from the prospective claims, is essential. Some of the covered perils by reinsurers involve catastrophic events and terror risks that take up huge amounts of money. The inherent problem with this is when the insurers play both direct insurer and reinsurance roles. The Lloyds insurance market for example, insurance companies provided mutual reinsurance and retrocession cover for each other. The problem is in the event of catastrophic losses, claims arising from the same loss event would circulate within the market until one reinsurer has to suffer losses. This means they have to pay out from capital and assets not reserved to paying claims and thus incur losses in amounts dependent on the value of the claim. Insurance spirals thus serve to concentrate rather than disperse risks.

Indirect exposures also lead to contagion effects. In this case the exposures result from the provision of asymmetric information, where the contagion is information based (Van Lelyveld,

² See Swiss Re(2006) for full description of securitization

Liedorp, & Kampman, 2011). This means that it stems from the fact that some piece of information on shocks hitting the insurance companies is not as qualitative. Thus some information about one company is considered to be the case for the others as well. For the banking industry a collapse to one may result in excessive withdrawal of deposits to the other banks causing liquidity risks. For the insurance industry, Van Lelyveld et al (2011) quotes that high monitoring costs result in uninformed investments by investors as they do not have information on insurance company portfolios. Thus whatever information is obtained for one company is used as a representation of its rival firms too. This indicates some level of indirect contagion.

2.4 The concentration of the insurance market

As of June 2015, there were a total of 50 insurance companies and 3 locally incorporated reinsurance companies that are licensed to operate in Kenya. Out of all these licensed companies, 25 were general insurers and 14 long term life insurers and 11 were composite (both life and non-life) according to (Insurance Regulatory Authority, 2015).

Kenya is still a developing market for insurance with 3.4% percent growth from 3.1% penetration of the total population. Kenyans' uptake of insurance cover, both at corporate and personal level, remains predominantly in the motor, fire industrial and personal accident (mainly group medical cover) classes (PWC, 2015).

Legislations to regulate the market, as those modelled on EU directives for Europe, constantly changed as the need for an efficient supervisory structure grew. Supervisors continued to authorize new companies that could be relied upon to maintain their solvency, and established monitoring systems to assure continuing reserve adequacy. To maintain this efficiency was and still is important as conditions of rapid growth, high rates of inflation and underdeveloped financial markets continue to expose both insurers and also supervisors to challenging decisions on especially management of the company (Falush, 1997).

The stability of the insurance industry with particular regard to concentration of risk, needs constant monitoring. The reinsurance and retrocession arrangements need to be assessed by the company to ensure that risks like counterparty risk are mitigated and the initial objectives of seeking such covers is still in effect.

Within Kenya it is a requirement by law that every insurer be able to spread its claim liabilities to other reinsurance companies. Within the Kenyan laws, the Insurance Act part XIV, requires that certain business be ceded to Kenya Reinsurance Corporation [No.7 of 1997, s.16.]. Every insurer must reinsure with the Kenya Reinsurance Corporation Limited in proportion, for each policy issued or renewed subject to such terms and conditions as are prescribed. Also on the same act, every insurer shall also place with Kenya Re, in addition to the reinsurance to Kenya Re, such proportion of its reinsurance business from Kenya placed in the international reinsurance market, excluding those reinsured under facultative reinsurance given proportional reinsurance (IRA, 2013).

In Kenya, insurance regulations are set forth by law and also the regulatory body IRA to ensure that the industry is stabilized and that there are no eventual losses to the participants and stakeholders in general. The regulatory body in Kenya, IRA provide guidelines on appropriate reinsurance arrangements that companies should undertake to ensure that there is efficiency in operations.

2.5 Factors influencing reinsurance arrangements in Kenya

Since the reinsurance companies and insurance companies in Kenya operate under the particular rules and regulations governing the country it is important that they recognize the requirements to undertake business in Kenya. It is a requirement that companies should act in accordance to the Insurance act in Kenya and the regulations under the Insurance Regulatory Authority (IRA).

In Kenya, the insurers are free to decide the company they want to reinsurer with, even then, some of the ways that IRA is trying to ensure that the companies are placing business negotiations considering the other companies within the industry and stakeholders' interest, is

by looking through the reinsurance arrangements. The IRA commissioner, appointed as a member of the board of directors of the regulator, on a yearly basis or on summoning, requires the insurer to provide all lists of reinsured and non-reinsured business and from there assess the suitability of this treaties after which if not suitable, either a recommendation for the terms and conditions to be changed or a requirement that the business is not renewed in future, is given to the company. By law the commissioner can direct that the insurer shall make arrangements concerning reinsurance or retrocession as he so specifies. The Commissioner shall not approve of arrangement strategies where in their opinion have very low or too high retention levels.

From the requirements of reinsurance, a company does not have to be registered with the Insurance Act, as is with the insurance companies, to receive business. This means that the insurer is free to place business with any reinsurance company that is licensed to operate in Kenya or out of Kenya with also concentration of risk in mind. Such regulations therefore, create a sense of responsibility for the (re)insurer to ensure that their business is placed at the lowest level of risk to their company.

Results show that each company is expected to have its own risk based model to assess and approve the reinsurance arrangements it undertakes, which is based on the reinsurance strategy developed by the board of the company with consideration of their risk appetite. This will ensure that there is limited exposure to concentration of risk to a particular company. The board is expected to set limits on the net risks to be retained per class of business and aggregate risks for the company and also the maximum foreseeable amount of reinsurance protection to be obtained from approved reinsurers. They are expected to review this biannually to ensure the initial objectives of the cover are met.

Solvency requirements

To avoid insolvency of a company, in case of large claims or losses, there are certain requirements companies should meet to operate with regard to the amount of capital it can hold. A life assurance company business shall be kept at all times with total admitted assets greater than total admitted liabilities plus 10 million shillings or 5% of total admitted liabilities

whichever is higher and for general insurance it should be total admitted assets greater than the total admitted liabilities plus 10 million shillings or 15% of the net premium income from the last preceding year whichever is greater.

Mandatory cessions

This is one of the ways established to ensure that there is a control on the way reinsurance is undertaken in Kenya. For every insurer it is expected that a percentage of their business is reinsured with the Kenya Reinsurance Company in Kenya. Within the African context, Kenya participates in the treaty set forth to ensure regulation of the industry in Africa, with a requirement set that Kenyan reinsurers are expected to retrocede at least 5% of their business with Africa Reinsurance, being one of the members of African Union. Africa Re, being a larger reinsurer, most of the business is secured, with reduced chance of the reinsurer collapsing due to large claims. From Africa reinsurance annual review 2014, insurers are also to give part of their reinsured business in the following manner Kenya Re 18%, PTA Re 10%, East Africa Re 5%. Experience shows that the larger the portfolio of similar reinsurance contracts, the smaller the relative variability about the expected outcome. In addition, a more diversified portfolio is less likely to be affected across the board by a change in any subset of the portfolio. Noted however is the fact that its collapse would affect a significant number of reinsurers.

Credit rating of companies also influence the business placed with different insurers and reinsurers. According to the Insurance Act of Kenya, 2014, it is expected that they shall transact insurance business with reinsurers having minimum investment grade rating of BBB provided by international ratings agency like Standard and Poor, or their equivalent. It is of interesting to note that Kenya has the highest ceiling applicable of AA, whereas other African markets that have ceilings, can only have a maximum of A, for their reinsurance company ratings

The Kenyan insurance market has had its better share of liquidated insurance companies. From 2005 there had been 5 insurance companies that were rendered insolvent due to experiences of high claims, even though none of them showed direct significant effect on the stability of the

insurance market. Some of the reasons that lead to their collapse are; a company's inability to meet its obligations as an insurer including the payment of claims and creditors, inability to meet its statutory obligations including the payment of levies as prescribed in the Insurance Act, and also fraud cases within the company that lead to bankruptcy³.

³ This was as reported in the Standard digital newspaper on Tuesday, July 16th 2013
Read more at: http://www.standardmedia.co.ke/article/2000088537/members-of-collapsed-insurers-to-find-solace-in-new-compensation-fund?articleID=2000088537&story_title=members-of-collapsed-insurers-to-find-solace-in-new-compensation-fund&pageNo=1

Chapter 3: Research Methodology

3.1 Introduction

To achieve the objectives of this study, we look at the Kenyan reinsurers and how they cede their risks and if at all there exists a spiral or chain within the market that directly links them. The methodology proceeds as follows, the first subsection defines the adopted research design, the second shows the sample and data highlighting the extent of information to be used from the Kenyan market, the third subsection shows a matrix model used to show the different claims of insurers to reinsurers and looks at a scenario analysis example simulating failure of a reinsurance company then assess the average impact on the other companies. Further on statistical analysis is carried out to measure the impact of a possible reinsurance failure on the companies' solvency and capital levels.

3.2 Research design

The adopted research design is an exploratory one that looks to determine the effect of reinsurance arrangements on the rate of contagion risk and its effect on the insurance industry participants. The study seeks to explore the insurance industry on the various factors that influence the different links between reinsurers and insurers. The particular concentration was on the claims and level of business taken up defined by the premiums they received as they are useful measures of concentration of risk. The methodology adopted will be an establishment of the direct links that the Kenyan insurers are part of. The information on this links will be collected from which a matrix will be developed. Due to the complexity of the whole process, various assumptions are made about the existent practices of the insurance market in Kenya with common practice being reinsurers majorly do not reinsurer with insurers. The relations considered are represented in a matrix form (see figure 3) of the outstanding claims with reinsurers and insurers. The data will then be analyzed based on several situations establishing the effect of this links on the market.

From the matrix above, the rows represent individual (re)insurance company's claims they have as liabilities for businesses from other insurance companies that they insure. " P_i ", shows the pure insurer and " R_i ", shows the pure reinsurance company. The columns shows the individual (re)insurance company's assets in terms of what is owed to them in claims from other (re)insurance companies for the businesses they ceded to them. The last column and rows show the totals. With $I_i \dots I_n$ showing the total amount in assets to company P_i, P_j, P_n from ceded business and the row totals, $A_i \dots B_n$ as the total liabilities they owe. Example " P_{ij} " shows the amount owed by a pure insurance company, " i " in claims to company j , " R_{ij} " shows the amount in claims that a reinsurer(R) i , is to pay another company j . We assume that there is no reinsurance business ceded out to direct insurance companies by the reinsurance company and, so that part of the matrix remains empty. The case applied for reinsurance between a reinsurance company and another reinsurance company is not well defined.

An illustrative example

Consider the matrix model in equation (2) given the Kenyan industry. Assuming the industry has the following insurance companies, Jubilee, UAP, ICEA LION and reinsurers Kenya Re, Africa Re, East African Re. Each column input shows the levels of claims ceded by each company

$$\begin{array}{l}
 \text{jubilee insurance}_i \\
 \text{UAP insurance}_j \\
 \text{ICEA LION insurance}_n \\
 \hline
 \text{Kenya Reinsurance}_i \\
 \text{Africa Reinsurance}_j \\
 \text{East African Reinsurance}_n
 \end{array}
 \left[\begin{array}{ccc}
 \text{jubilee}_i & \text{UAP}_j & \text{ICEA}_n \\
 0_{ii} & 0_{ij} & 0_{in} \\
 0_{ji} & 0_{jj} & 0_{jn} \\
 0_{ni} & 0_{nj} & 0_{nn} \\
 \hline
 0.5_{ii} & 0.6_{ij} & 0.5_{in} \\
 0.3_{ji} & 0.4_{jj} & 0.0_{jn} \\
 0.2_{ni} & 0.0_{nj} & 0.5_{nn} \\
 \hline
 1.0_i & 1.0_j & 1.0_n
 \end{array} \right]
 \begin{array}{l}
 R \\
 \\
 \text{empty} \\
 \hline
 \text{unknown}
 \end{array}
 \left[\begin{array}{l}
 (2) \\
 0_i \\
 0_j \\
 0_n \\
 1.6_i \\
 0.7_j \\
 0.7_n
 \end{array} \right)$$

The last column shows the total liabilities each company owes in claims with the first, second and third columns showing the totals in assets for ceded risks owed to the insurance companies from their reinsurers. Kenya Reinsurance for example shows that it owes the three insurance companies 0.5, 0.6, 0.5 in claims respectively.

Note that a (re)insurer cannot reinsure itself, so the diagonals are equal to 0. The effect of the failure of one company say “ P_i ” would be that every other insurance company in that row of that matrix will suffer 100% loss for the claims they expected to receive from “ P_i ”. That is every value across the row will be 0. It could be less than 100% loss if the reinsurer’s sold assets have been used to recover some of the claims to those they reinsured. With the Kenyan market if a (re)insurer fails then the regulatory authority will try recover from the assets of the collapsed company, what will be used to pay out to those it reinsured. A primary insurer will fail if the sum of the losses following the failure of one or several (re)insurers is larger than its equity. That is

$$\left(\theta * \sum_{j=1}^N P_{ij}, R_{ij} \right) > E_j \quad (3)$$

Where θ denotes the loss rate which can range $[0,1]$, and P_{ij} is the claim outstanding to P_j from another insurance company P_i that they have reinsured with. R_{ij} - The claim outstanding to P_i from the reinsurance company. E_j - The amount of equity to the primary insurer.

3.5 Scenario analysis

A hypothetical scenario is adopted to help elaborate the effect of a large size in loss and the spiral effect on syndicates within the reinsurance circle, established from the different companies. Plausible scenarios include could be the effect of insolvency of one reinsurance company, the effect of failure of two of the largest reinsurance companies in the market. We will evaluate the impact of these shocks on a system level (contagion) and on an individual

level. The major assumption will be that there is a 100% loss rate for claims charged to the insolvent reinsurer. Further analysis is done to help establish exactly how many companies within the industry will be affected if the loss ratio is higher than 100%.

3.6 Statistical analysis

The indicators of solvency of the insurance company to be reflected are the solvency ratio, and equity effect on the company due to a shock in the market. To look at the contagion effect, the different scenarios established we measure the number of institutions that have failed the number of rounds this failure spans and the percentage of assets that is lost. Thus measure the severity of contagion effects. Given the failure of a reinsurer, the subsequent failure of an insurance company will be if the loss following this failure is greater than its equity.

First is to establish what percentage the reinsurance claims are represented by the company assets and the equity. Thus show what effect it would have on the financial stability of the company.

Equity

The measure of the equity is to show the buffer reserved by the company as the amount that will cover for losses the insurer may face. Thus a reduction in the amount of equity reflects the reduced capacity of the company to cater for losses.

Solvency

The financial strength of a company reflects its ability to cater for its liabilities. To calculate the impact of failure on the solvency of a company calculation based on Frank et al. (2011) equation

$$solvency = \frac{equity}{technical\ provisions - \sum_{j=1}^N reinsurance} \quad (4)$$

The analysis of the change in the solvency ratio will enable us to understand if the shock on it will affect the company's solvency.

Chapter 4: Results and analysis

4.1 Introduction

For the reinsurance contagion analysis on the spiral we only consider the general distribution of reinsurance business by region and type of contract. The matrix consideration is based on the largest reinsurance companies in Kenya and the insurance companies they reinsurer.

The scenario analysis is done on three reinsurers' business distribution.

The rest of this chapter proceeds as follows; section 1 shows the market characteristics from the market analysis on the Kenyan insurance market; and the general arrangements between reinsurers and insurers within the insurance sector; section 4 shows the results from the scenario analysis of the different links that the reinsurers have with the insurance companies.

4.3 Market characteristics

For the analysis, consideration was only given to the reinsurance and insurance companies that provided information on their reinsurance arrangements. From the data collected the results show the companies' 2014 financial status in terms of business liabilities and concentration of risk. The data represents the claims due from reinsurers to insurance companies and the amounts due to reinsurers from retroceded business by region.

The current insurance penetration into the Kenyan market stands at 4% as of 2015. The data that was obtained showed that on average Kenyan insurance companies reinsure 26% of their business, with the general insurance companies reinsuring 28% and life insurers 23% of their business. The largest reinsurers by market share in Kenya are Kenya Re (owned by the government of Kenya at 60% share) with 53%, 68.8% in general insurance and 36.4% in life, followed by East Africa Re with 47%%, at 35.2% in general business and 58.8% in life, Continental Re has 11% market share. This means that the largest company Kenya Re. The percentage ceded by reinsurance companies on average is 12.5% of their business.

Ratings

The reinsurance companies in Kenya at the moment are Kenya Re: AA, East Africa Re: A+, Continental Re: B+, Zep Re: B+, which are the domestic ratings above the level set out by the regulations of Kenya.

The level of business placed with each reinsurer by the insurance companies is reflective of the potential influence that rating have on the arrangements. From the data analysis the potential business received from Kenya remains as the highest at 53% followed by East Africa Re with 47%.

Reinsurance and retrocession matrix

The assessment by company reflects the different levels of risk concentration under each reinsurer to the insurers and from the retroceded business. Reflected also is the simulation for each of the companies individual failures and later the system failure based on this data. Some of the data collected on percentage business is based on assumptions such as the level of business at minimum from mandatory reinsurance and cessions.

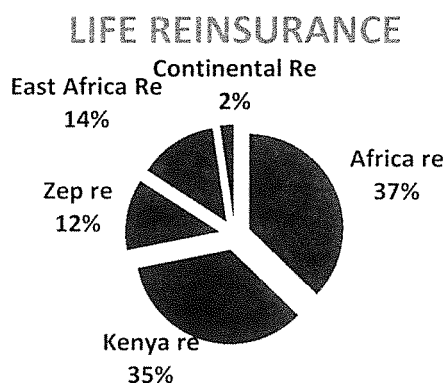


Figure 1 Distribution of the life reinsurance market in Kenya. Source AKI reports 2014.

The reinsurance market in Kenya shows that in life business it is expected that the companies reinsurer with local companies and thus mostly the businesses are within the industry

Most business being within Kenya shows that the risk of claims is concentrated within the market. The reinsurers however do not retrocede much of this business. This can be explained by the stability of life business claims in the past and its long term nature. For the concentration of risk levels it is widely mitigated through retrocession and the fact that the companies have a wide capital base to manage large claims. Thus risk of collapse of the companies is less likely to happen in this case causing losses to the insurers.

From the assessment of reinsurance of general business it shows that there are several companies that are expected to retrocede with several reinsurance companies.

Concentration by region and reinsurance size

East Africa re

From the analysis of the insurance industry, for retrocessions in Kenya, it shows that for long term business, the most utilized reinsurer is Swiss Re which is an international company, followed by Kenya Re, Africa Re and Zep Re in that order. This means that risk of concentration of business within Kenyan Reinsurers is marginalized thus they only face a total of 33% liabilities in claims from the Kenyan companies. This means that a failure of either of the Kenyan reinsurance companies will not result in extremely adverse loss rates to either of the reinsurers. Swiss Re holds most of the business but being one of the largest reinsurers in the world with international business is less likely to fail due to large claims from ceded business or also operation problems that would result in loss of the reinsurers' funds. This concentration of risk with Swiss Re may affect it if they decided to reduce or withdraw the level of retrocession to the continent.

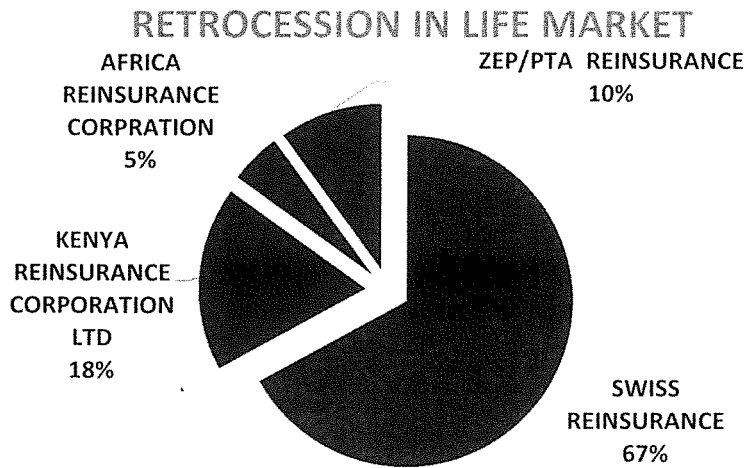


Figure 2 Distribution of retrocession in Kenya

The figure above shows the reinsurance companies on average that East Africa Re has retroceded. The percentage of retrocession band for the company shows that the average credit rating is 25% at A+ with the average being B+. This means the financial strength of the retrocessions are good as compared to superior ratings as presented by A+ ratings.

The retrocession level by region for general business and life are presented below

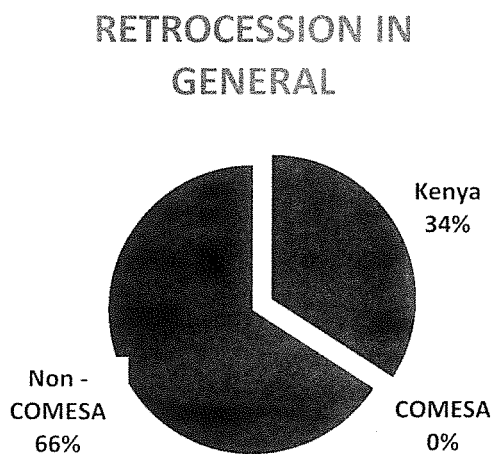


Figure 3. The East Africa Re retrocession for general business

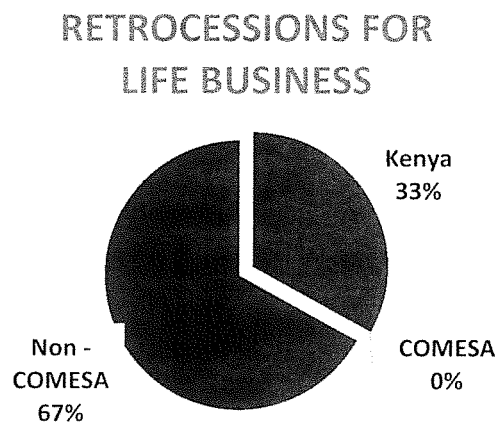


Figure 4. The East Africa Re retrocessions for life business

It is clear that they do not consider business for regions outside Kenya within the COMESA region. This increases their adopted diversification levels.

For reinsurance business within Kenya the total business received from Kenyan insurers takes up 50% of their premiums earned. This means that Kenya is their highest source of business. In this case the effect of failure of the company would have the largest impact on its Kenyan business.

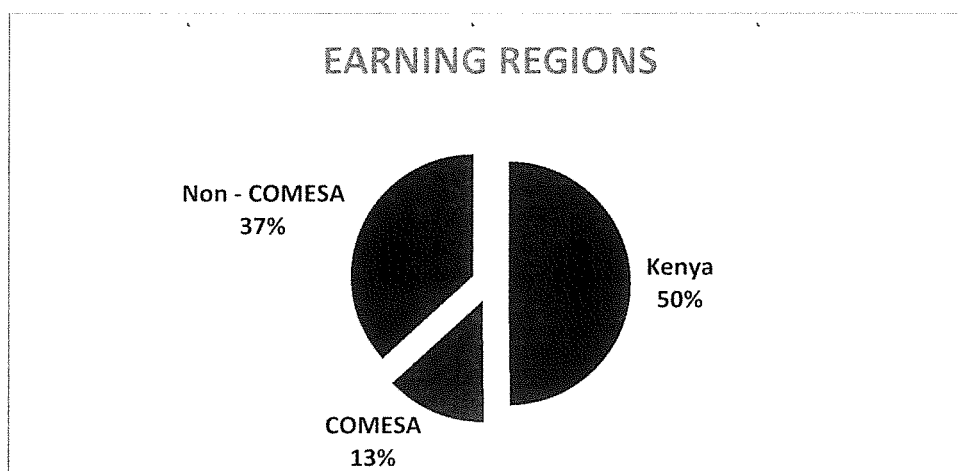


Figure 5. The level of business from reinsurance at East Africa Re

The figure above shows the level of business received from their role as reinsurers.

However concentration of its retroceded is only based on a small percentage of their business levels. They retain 94.99% of their business and retrocede only 5.01% of their total business. This reflects the fact that the company maintains that it can sustain its level of claims based on its reserves and assets.

Kenya re

Kenya Re concentrations of business by region for retroceded business is at 7.12% of their business. Overall, the lead retrocessionaires on all lines (GIC India) is rated A- internationally, with 26% of retrocessionaires rated in A band. The rest of its remaining counterparties are presented below

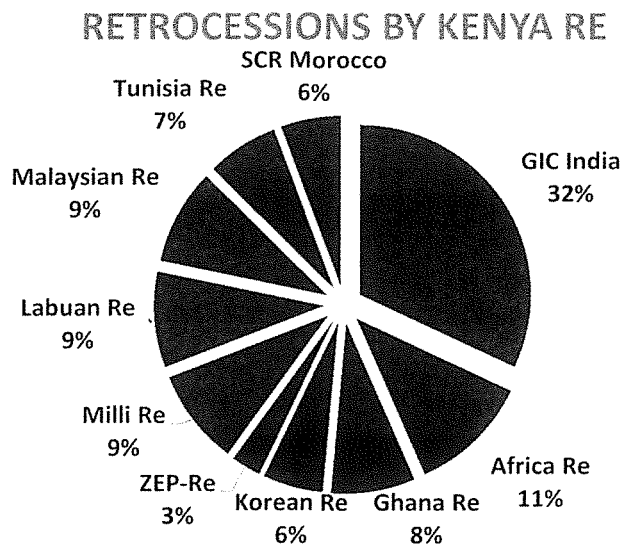


Figure 6. The retrocession of Kenya Re business

The figure above shows the level of retrocession that it has accorded to each of the reinsurance companies on average.

The assessment in general show that the investment within African markets is representative of 5 of the 10 companies. The concentrations of business is however diversified with more placed with companies out of Africa.

Companies like Kenya Re however as a single company have higher concentration risk as most of their reinsurance earnings are from the Kenyan market and therefore there is risk that any form of interference that may cause it to collapse would also mean a greater degree of loss to the insurance companies reinsured with Kenya Re.

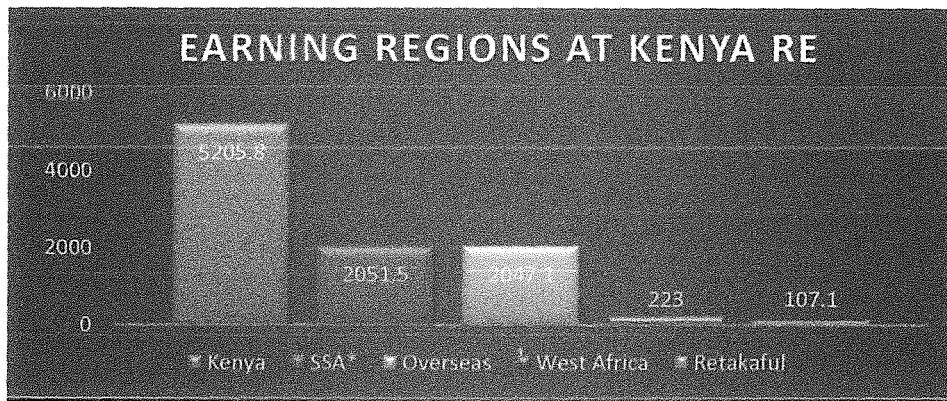


Figure 7. The Kenya Re earnings distribution at the 2014.

It shows how Kenya Re as the largest reinsurer in Kenya has distributed their earnings from their reinsurance role.

The graph shows that the most business acquired in Kenya increases concentration risk. It however does reflect that the diversification could grow in the recent future as they expand. As of 2014 they had from 38% in 2008 to 46% in 2013 expansion to non-domestic markets improving their level of impact from this risk (GCR, 2014). One of their expansion strategies is to set up a subsidiary in Zambia to enhance delivery of service to southern African markets in particular Zimbabwe, Zambia, Botswana, Lesotho, Namibia, Mozambique and Swaziland (Kenya re reports, 2014).

It is however evident that the reinsurance companies only reinsure a small percentage of their received business and therefore a small percentage in comparison to the asset size and capital.

Continental Re

The distribution of their business shows that most of the retroceded business is not within Africa.

Retrocession distribution

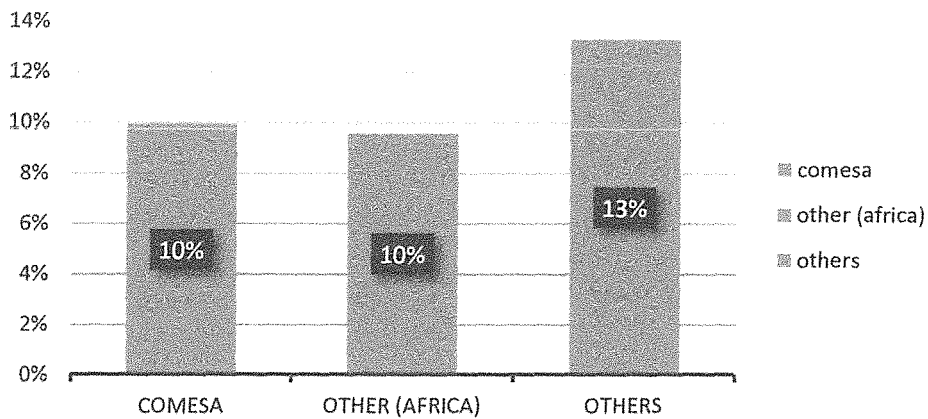


Figure 8. Retroceded business of Continental Re

Being a larger more diverse reinsurer with more regions of market within Africa, there is need to ensure that all its retrocession are well distributed.

Its representation of within Kenya is however as low as 4% of the total business it receives within Africa. Therefore a calamity will not have the most significant influence on Kenyan insurers.

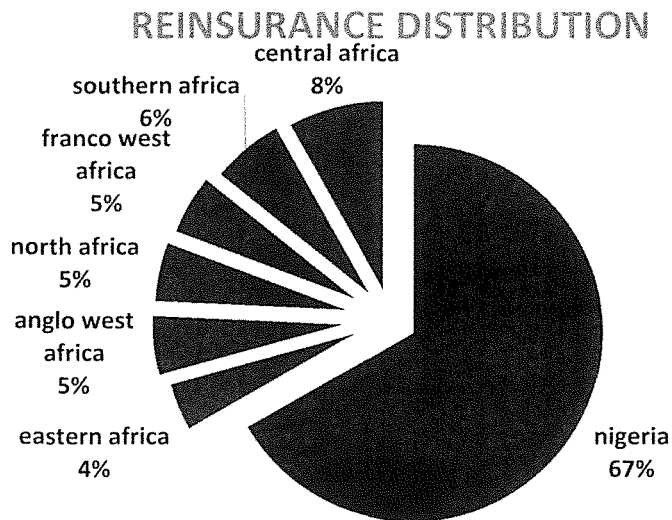


Figure 9. The reinsurance distribution of Continental Re

It shows that most of the risk of concentration is represented by its business in Nigeria, then the West African countries.

4.3 Scenario analysis

A scenario analysis is run to detect whether there are any contagion effects. First we simulate the probable failure of the whole system single reinsurance company. We also analysis failure of more than one reinsurance company (the two largest reinsurance companies). We also analyze impact of all reinsured business failure. Evaluation is also given considering 100% loss rate. The insurance companies assessed are those reinsured by the three reinsurers.

For the matrix simulations we only consider those insurers that provided details about their equity. This gave a 10 by 10 matrix showing the reinsured business liabilities and assets. The data obtained shows that majority of reinsurers do not reinsurer with the same group of reinsurers. This is shown in the geographical distributions of retroceded business. From the reinsured business also no insurer as expected reinsurers with a local insurer explained from

the consideration of the insurance business being small thus cannot cover reinsurers' huge portfolios requiring reinsurance.

The other section of analysis shows that the total proportion that insurers mostly reinsurer is 26% of total premiums and majority in general insurance are the large firms and for life assurance are the smaller firms. This rate is a smaller percentage of received business, which could mean lower direct insurance with reinsurers and alternative forms of cover such as use of derivatives and post funding (which is seeking funds after the insured event occurs) options.

Failure of one and more than one reinsurer

From the failure of all three reinsurers none of the insurance companies become insolvent at 100% loss rate. At this point there is a higher level of technical reserves than reinsured portion of liabilities and the ratio of equity to the liabilities is still greater than 100% from all the insurers' measure of solvency. The effect of then a ratio greater than 100% might cause at least more than one insurer to become insolvent. The assessment of what ratio this might be from the assessed matrix is 800%, where just one insurer has a negative ratio. The level at which most of the insurers will become insolvent is at 3500% with at least 75% failing with the most being the smaller insurance companies. When the rate is at least increased to this percentage certain medium sized insurance companies become insolvent as well.

The failure in all scenario analysis of one reinsurer at the maximum 100% rate to the failure of none of the insurers it covers.

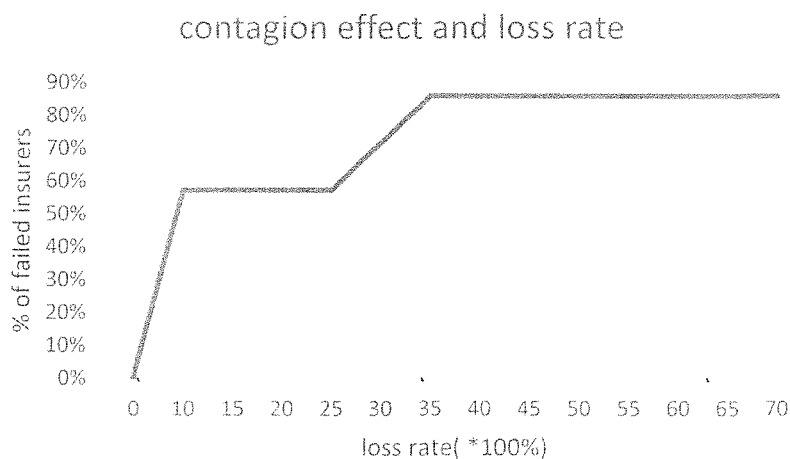


Figure 10. The effects given different loss rates on solvency of insurers

The figure above shows the percentage of insurance companies that fail given the failure of the reinsurance companies it ceded with. The rate above 100% shows the percentage at which different concentrations of reinsurers would fail. With the highest percentage at 80% illustrating failure given a 3500 percentage loss rate.

The results in this chapter suggest that the reinsurance sector does not pose a threat to the systematic stability of the insurance companies. Given the case where individual reinsurance companies collapse only a small percentage of it affects the level of stability of the individual insurance companies. The concentration of business with Kenya Re from all insurers may pose the most significant level of effect from its collapse. The general distribution of retroceded business by the reinsurers result in a limited level of exposure to concentration of risks. Also from the distribution of business to the reinsurers it is evident that a small percentage of the retroceded business is distributed by the reinsurers to other reinsurance companies.

Chapter 5: Conclusion

5.1 Introduction

In this chapter we look at the scope of the study, followed by the general limitations of the study. A summary of the important elements of the analysis based on the research objectives, is addressed and additionally presented are the general conclusions and recommendations.

5.2 Discussion and recommendations

The scope of my research is the Kenyan reinsurance industry, looking at their various correlations within the reinsurance industry in terms of ceded and reinsured business on direct contagion. Thus studying the concentration of risk in the insurance industry. The sample selected for this study was limited to the reinsurance companies with significant market share that provided details of their retrocession arrangements and the insurance companies they reinsured as of 2014. Due to this representation the ability to categorize the entire industry by their specific links is limited. The sample however provides information on the particular concentrations by region that gives a similar nature of comparison of the general company businesses. The data sourced is from the Kenyan insurers and reinsurers on their retention and retrocession levels based on premium and claim payments.

In this study we looked at the different levels of concentration of retroceded business and assessed the impact of direct contagion, which is how the direct financial links between reinsurers and insurers affect the stability of the industry, in the event of a reinsurer failing. No evidence of a significant level of a reinsurance spiral is found and thus negligible direct contagion on the insurers business is obtained. There is limited influence on the level of concentration of business from the regulation side with the worst case effect resulting from mandatory cessions that may also show an increase in concentration of business for a single reinsurer. However the reinsurer analyses its exposure to risks and may not necessarily take up an insurers business.

This study only undertakes credit risks of the companies thus excluding other risks influencing their financial position such as the indirect contagion effects and macroeconomic effects such as changes interest rates and level of debt and cross- participations between the insurance companies. Included however is the macroeconomic effects of regulations and legislations on the level of concentration. These restrictions may underestimate the effect of the concentration of risks to stability of the industry.

Further on the lack of reported information available on the different size of retrocessions and where the risks are ultimately based limit the analysis and extent of risks to the industry. We also consider that the reinsurance arrangements changes over short term periods do not change significantly. Additionally the type of reinsurance contract under each arrangement was not highlighted which could pose additional difference in the level of effect of this reinsurance and retrocession arrangements.

From the reinsurance matrix, as expected there is generally no significant risk from retrocession spiral levels from links in the reinsurance market. In general the domestic insurers do not reinsurer with each other thus limits the exposure to internal concentration of risks. As much as the role of reinsurance is mostly a global business the regulations tend to be internal, changing for different countries thus in Kenya is undertaken by the IRA. It is therefore a limitation on the extent of retrocession between the different reinsurers as it is difficult to assess who exactly has the ultimate risks the retrocession. Therefore provision of this information will help create further transparency on the arrangements of these investments and reinsurance links.

The reinsurers should increase their scope of business beyond the Kenyan market to reduce on the level of concentration and should also diversify further on their regions of retrocession.

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