Risk Management, Investment Rate and Performance of Insurance Industry in Nigeria

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF BANKING AND FINANCE (ACTUARIAL SCIENCE PROGRAMME), FACULTY OF MANAGEMENT SCIENCES, UNIVERSITY OF BENIN, BENIN CITY. IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF SCIENCE (B.Sc.) DEGREE IN ACTUARIAL SCIENCE

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DECLARATION

I**, Chidiebere Best KALU** do hereby declare that this project is entirely my work and composition .The work embodied in thus project has not been submitted by other candidates for any degree and is not currently being submitted for any other degree. All references made to the works of other persons have been duly acknowledged.

_____ _____

Chidiebere Best KALU **Date**

CERTIFICATION

This is to certify that **Chidiebere Best KALU** with matriculation number: **MGS1706475** worked extensively on the Final Year Project, **RISK MANAGEMENT, INVESTMENT RATE AND PERFORMANCE OF INSURANCE INDUSTRY IN NIGERIA** to satisfy, partially, the requirements for the award of degree in Bachelor of Science in **ACTUARIAL SCIENCE**.

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DEDICATION

I dedicate this project to God almighty for all the grace he has shown me. And to my late Dad I love you. Also to my late brother and best friend, Ikechukwu, This is for you.

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ABSTRACT

The study investigates the effect of risk management and investment rate risk on the performance of insurance industry in Nigeria for the period 1991 to 2021. The cointegration analysis and the fully modified ordinary least squared (FMOLS) econometric analysis was employed. The findings from the analysis showed that insurance premium risk (PREMR) and claims settlement risk (CLAIMSR) have insignificant positive relationship with the performance of the Nigerian insurance industry; Insurance penetration risk (PER) and inflation rate risk have significant positive impact on insurance industry performance; while investment rate risk (INVR) has significant negative impact on performance. The study recommends that management and relevant policy makers should formulate the right policy that will deliberately encourage the rate of investment among investors in the industry and by so doing, it will help to minimize the associated negative risks. In addition, the government and relevant regulatory authorities of insurance firms in Nigeria should evolve a multifaceted approach to risk management in order to derive greater benefits from their risk management

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Risk is curious and complex concept, and in a sense, it is sometimes unreal in that it is always concerned with the future, with possibilities, with what has not yet happened (Elms, 1992). In contrast to our ancestors who believed that the future is determined solely by the acts of God (Bernstein. 1996), we now have the conviction that we can analyse and manage risk in a rational way. Insurance companies are in the core and business of managing risk (Gupta, 2011). Insurance companies play a important role in the financial services sector of most countries by lowering total risk, contributing to economic growth and efficient resource allocation, reducing transaction costs, creating liquidity, facilitating economics of scale and spreading financial losses (Duompos, Gaganis & Pasiouras, 2012). They do this through underwriting of risks inherent in most sectors of the economy and provide a sense of peace to most economic entities. Consequently, the financial performance of insurers is of major importance to various stakeholders such as shareholders, policyholders, agents and policymakers (Charumathi, 2012).

As a result of globalization, technological advancement, population increase, immigration and specifics work influx risks are increasing work cluster and hence the need for effective risk management for the success of any organization becomes vital and compelling. The insurance companies stand to fill this gap. The companies manage the risks of both their clients and their own risks. This requires an integration of risk management into the companies' systems, processes and culture (Eric, 2005) . The process of risk management includes, identification of loss exposures, measure and analysis, Selection of risk Technics and implementation and

monitoring of the risk management program. By implementing risk management, the insurance company eliminates costly surprises and efficient allocation of capital becomes more visible. It improves communication and helps the senior management in making informed decisions. However the insurance company in managing risks are exposed to risk themselves. They face risks concerned with the performance of their investment.

The Insurer utmost need is the profitability of its investment which is determined by the interest rate applied. Investment rate means, for each fund with a fixed rate of return the annual interest rate applicable to such a fund is determined by the committee from time to time. Many of these investments are in corporate bonds, and if the defaults on these bonds are above average then the profitability of insurance company will suffer. This insurance firms are faced with the challenges of managing risks associated with investments of which interest rate is a major component. Interest rate risk is therefore the potential impact changes on the company's investment or even investors and in life insurance, it is more difficult to manage and more complex to assess A negligence of it would affect the financial performance of the insurance firms.

The capital insurers use for investment are premium collected, the more people buy insurance cover the more the insurance premium paid. Hence for increment in capital, the need for premium growth which have been defined as the difference between the total gross premiums in the current year and the previous year compared to the total gross premium in the previous year ... Premium growth can be achieved in two ways, namely, through increasing the number of policyholders (exposure growth) or by raising the average price of the products (rate – level growth) , both of which have different outcomes and risk implications (Barth & Eckles , 2009).

1.2 Research Problem

Over time, Insurance firms in Nigeria have witnessed inconsistent pattern in it's performance, ranging from low claim settlement, reporting financial losses. low market penetration (resulting to drop in premium growth or stagnation), to the market going under. This may not be unconnected to inadequate funding, liquidity risk, underpricing, management issues and high tolerance to investment risk.

Usman (2008) research on Nigerian insurance market have shown that one of the reasons for the market failure is poor attitude to claim settlement. Albert (2009) cited by Nigerian Punch (2010) revealed that the reason for poor penetration of insurance market in Nigeria is due to delay in settling claims. Their positions are well agreed by many researchers who have conducted research on claim. However, scanty research exists on the causes of low claim settlement in Nigeria Ahmde (2011). Again, previous studies such as Ahmade et. al (2011), Dan Tiahun (2012) , Sumara and amjad (2013) amongst others have concentrated their research on the effect of liquidity risk on the profitability of commercial banks in Nigeria and non-financial institutions . Little exist on the premium growth rate which is a performance determinant of insurance firm's performance in Nigeria. Therefore, the focus of this research is on the impact of investment rate risk, claim settlement, premium growth and performance of insurance firms in Nigeria.

1.3 Research Questions

The study seeks to provide answers to the following research questions;

i. What is the relationship between premium risk and performance of insurance firms in Nigeria?

ii. What is the impact of claim settlement risk and performance of insurance firms in Nigeria?

iii. To what extent does insurance penetration risk affect the performance of insurance firms in Nigeria?

iv. What is the impact of interest rate risk on performance of insurance firms in Nigeria?

v. What is the relationship between investment rates and performance of insurance industries in Nigeria?

1.4 Objective of the Study

i. To uncover the relationship that exists between premium risk and performance of insurance firms in Nigeria.

ii. To determine the impact of claim settlement risk and performance of insurance firms in Nigeria.

iii. To verify the extent of insurance of penetration risk effect on the performance of insurance firms in Nigeria.

iv. To verify the impact of interest rate risk on the performance of insurance firms in Nigeria.

v. To expand the impending relationship between investment rates and performance of insurance firms in Nigeria.

1.5 Research Hypothesis

H_o: There is no significant relationship between premium risk and performance of insurance firms in Nigeria.

H_1: There is a significant relationship between premium risk and performance of insurance firms in Nigeria.

H_o: There is no significant relationship between claim settlement risk and performance of insurance firms in Nigeria.

H_1: There is a significant relationship between claim settlement risk and performance of insurance firms in Nigeria.

H_o: There is no significant relationship between insurance penetration risk and performance of insurance firms in Nigeria.

H_1: There is a significant relationship between insurance penetration risk and performance of insurance firms in Nigeria.

H_o: There is no significant relationship between interest rate risk and performance of firms in Nigeria.

H_1: There is a significant relationship between insurance penetration risk and performance of insurance firms in Nigeria.

H_o: There is no relationship between investment rates and performance of insurance firms in Nigeria.

H_1: There is a relationship between investment rates and performance of insurance firms in Nigeria.

1.6 Significance of the Study

It is hoped that the findings of this paper shall be of immense benefit to the government and Nigerian insurance firms in addressing the problem of claim settlement and premium growth in Nigeria. This is hoped to also to help to Actuaries appreciate investment rate pecularies to claim settlement and premium growth, which would result to setting costumer friendly premium rates for effective claim payout which invariably would instill public confidence in insurance industry and allow for more insurance market penetration.

1.7 Scope of the Study

The study being on the relationship between risk management, investment rate and performance of insurance firms in Nigeria, will cover a period of 20 years (2001 to 2020). The choice of this period is based on numerous policy reforms and recapitalization of the Nigerian insurance industry which would have taken place. This will enable to have a fair evaluation of the extent to which risk management and investment rate have affected the overall performance of insurance firms in Nigeria overtime.

1.8 Limitation of the Study

A study like this cannot be carried out without some limitations. It would be oblivious not to note them. Hence, obvious limitations to the said study would include but not limited to;

i. Lack of enough reliable data of claim issues and premium growth.
ii. Time constraint; the time frame available for the research is quite limiting to carry out a well detailed research.
iii. Finance to fund the research is another compelling factor undermining this research work.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Introduction

The chapter will examine the concepts and theories on the topic with major focus on skill acquisition. By reviewing relevant literatures from diverse past authors, the chapter forms the theoretical framework, conceptual framework and empirical review of the study.

2.1 Conceptual Review

2.1.1 Risk Management

Risk management is described by Vaughan and Vaughan (2001) as a scientific approach to dealing with pure risks by anticipating potential accidental losses and designing and putting into place procedures that lessen the likelihood of loss occurring or the financial impact of losses that do. The authors go on to say that the primary goal of risk management is to make sure that losses that might result from the organization's operations do not prevent it from achieving its primary goals. The performance of the risk management function typically marks the beginning of the achievement of these goals.

Alternately, the job of risk management should go to someone else inside or outside the company who has the necessary qualifications. Risk must first be identified before it can be managed. Identifying potential risks that could have a positive or negative impact on the business's goal is known as risk identification. Risk management is an essential component of sound corporate governance, according to Aruwa (2004). Simply put, it involves guarding against potential disasters, spotting opportunities, and taking advantage of them when they present themselves. In addition, Head (2009) defines risk management as the process of

planning, organizing, directing and controlling resources to achieve given objectives when good or bad events are possible.

2.1.2 Types of Risk

Risk borne by individuals and businesses are of many variants, these risks are broadly classified into two main classes, Head (2009)

Internal and External

Internal risks are dangers that an organization faces from within and develop during routine business operations. Given that internal business risk is under the organization's control and that it can be predicted with some degree of reliability, a company has a good chance of lowering it. On the other hand, external risks frequently include economic developments that take place outside of the corporate framework. A company cannot predict or control external events with a high degree of reliability that result in external risk. As a result, lowering the risks is challenging.

2.1.3 Risk Management Process

2.1.3.1 Risk identification

The first step in the risk management process is risk identification. When managers are unsuccessful in identifying all potential losses or gains that challenge the organization, these unidentified risks will become unmanageable. Risk identification ensures the effectiveness of risk management. 2017 (Lagat & Tenai)

The process of identifying risks must be ongoing, and it must be understood at both the transactional and portfolio levels. Risk identification identifies and reveals potential risks that are highly probable as well as other events that happen frequently. This can only be

accomplished by examining an organization's activity from all angles and making an effort to introduce new exposure that will come about in the future as a result of altering the internal and external environment. . (Akong'a , 2014) asserts that correct risk identification ensures risk management effectiveness he further opined that risk identification is divided into four (4) which includes internal risks reporting, external risks reporting, risk frequency and risk severity. Risk identification is further classified into three (3).

- **Risk Frequency:** Risk Frequency is a measurement of how frequently, on average, a risky event happens over the course of a given period of time. Its value spans 0 and infinite. Time can always be substituted with other "counters." "Per year" is a typical measurement of time for those in charge of conducting risk assessments. Frequency can be calculated using long-term observations.
- **Risk severity:** Risk event damage to the institution, its members, and its goals and objectives, measured in terms of risk event severity. Risks can range in severity, so the risk management strategy would change depending on the risk's level of importance.
- **Risk Ranking:** This step in the risk management process involves evaluating all identified risks quantitatively or qualitatively to determine which ones are most likely to occur and which ones will have the biggest impact if they do, in order to rank the risks in order of importance.

2.1.3.2 Risk Evaluation

The process of risk evaluation involves comparing the estimated risk to the specified risk criteria in order to assess the significance of the risk.

2.1.3.3 Risk monitoring

The risk positions and control measures develop during the monitoring stage. (2015) (Angote, Malenya, & Musiega) To make sure that risk management procedures are appropriate and in line, risk monitoring can be used. Additionally, risk management can help an organization spot errors early on. A lack of risk monitoring activities can result in failure and losses. (2016) Muriithi

Financial risk monitoring thoroughly examines the risk management process and flags any potential threats to a company. 2015's (Alshatti) argues that monitoring financial risk can help an organization improve its performance. (Wolfgang, 2005) Explains that monitoring enables businesses examine market risks and how to deal with it for profitability. Risk monitoring involves risk tracking and risk ranking.

- **Risk Tracking:** This activity involves regularly monitoring and assessing the effectiveness of risk mitigation measures against predetermined metrics throughout the acquisition process, and developing and carrying out additional risk mitigation options as necessary.
- **Risk Ranking:** This step in the risk management process involves evaluating all identified risks quantitatively or qualitatively to determine which ones are most likely to occur and which ones will have the biggest impact if they do, in order to rank the risks in order of importance.

2.3.1.4 Risk Mitigation

Taking action to lessen negative effects is referred to as risk mitigation. 2017 (Abeywardhana). For business continuity and disaster recovery, there are four distinct types of risk mitigation strategies. According to the four main risk reduction steps listed below (Sharifi, 2014).

- **Risk acceptance:** This is a popular risk management strategy when the cost of other risk reduction measures, like avoidance or limitation, may be greater than the cost of the risk itself. The strategy does, however, lessen the risk rather than completely eliminating it.
- **Risk Avoidance:** The antithesis of risk acceptance is risk avoidance. It is the action that completely eliminates all risk exposure. The most expensive method of risk mitigation is usually risk avoidance.
- **Risk Limitation:** Risk limitation is the most common risk management strategy used by businesses. This strategy limits a company's exposure by taking some action. It is a strategy employing a bit of risk acceptance along with a bit of risk avoidance or an average of both. An example of risk limitation would be a company accepting that a disk drive may fail and avoiding a long period of failure by having backup
- **Risk Transference:** Risk transference involves handing the risk off to a willing third party. Many companies outsource certain operations such as customer service, order fulfillment, or payroll services. They do this in many cases, so they can focus on their core competencies, but they can also do this as part of risk management.

2.2 Effects of Risk Management on Financial Performance

Risk can be broadly defined as any problem, whether financial, service-related, or commercial, that has the potential to affect the goals of a business entity. The likelihood that both anticipated and unanticipated events could negatively affect the capital and profits of a business entity. Therefore, effective risk management is crucial to help business owners avoid losses, take full advantage of opportunities, and get the results they want. Therefore, developing and maintaining core business value depends on an organization's proactive management of risks.

According to Anderson (2008), risk management also lowers a company's typical contract and capital costs because it makes it easier to access resources. These results appear to indicate that risk management can increase an organization's access to credit and, as a result, their financial performance. In addition, it has been demonstrated by arguments put forth by Stulz (1996, 2003), Nocco and Stulz (2006), Wang and Reuer (2006), and Andersen (2008) that risk management activities may add value to a company and its stakeholders when agency costs, market imperfections, and information asymmetries prevent the operation of perfect capital markets. According to Stulz (1996, 2003), risk management has the potential to add value if it can lower the likelihood of adverse earnings shocks, which would help the company avoid the direct and indirect costs typically associated with financial distress.

2.4 Investment and interest Rate.

The investment rate in business statistics is the ratio of gross tangible investment to value added Investment rate also means for each fund with a fixed rate of return, the annual interest rate applicable to such fund as determined by the committee time to time. For any fund that does not have a fixed rate of return, any appreciation or depreciation in the value of the investment in whisch the participants is deemed invested.

2.5 Insurance

Upon the occurrence of a specific loss, one party (the insurer) agrees to pay the other party (the policyholder or his designated beneficiary) a specified sum of money (the claim payment or benefit) in exchange for a predetermined sum of money, known as the premium. This specified claim payment amount may be a set sum or a reimbursement of all or a portion of the actual loss. In order to set premiums that, taken as a whole, will be adequate to cover all anticipated claim payments for the insurance pool, the insurer takes into account the losses anticipated for the insurance pool as well as the possibility of variation. Each pool member will be charged a premium equal to their portion of the pool's overall premium. Each premium may be changed to reflect any unique features of the given policy. The size of the policy pool affects how predictable the outcomes are, as will be evident in the following section.

Only a small portion of policyholders typically experience losses. The premiums collected from the group of policyholders are used to cover their losses. As a result, the entire pool makes up for the unfortunate few. Each policyholder trades a known premium for the payment of an unknowable loss.

The formal agreement names the insurance company or the insurer as the party agreeing to pay claim amounts. The policyholder is a part of the pool. The premiums are the sums that the policyholder pays to the insurer. The policy is the insurance contract. The insurer, who has the authority to establish the terms and conditions for joining the insurance pool, assumes the risk of any unforeseen losses from the policyholder.

The specific types of losses that are covered by the insurer may be limited. A risk, for instance, has the potential to result in loss. Fires, hurricanes, theft, and heart attacks are a few examples of hazards. The insurance contract may specify which perils are covered in detail or may cover

all perils with specific exclusions (for example, loss as a result of war or loss of life due to suicide).

Conditions known as hazards raise the likelihood or anticipated size of a loss. Examples include smoking when considering potential healthcare losses, poor wiring in a house when considering losses due to fires, or a California residence when considering earthquake damage.

2.5.1 Characteristics of an Insurable Risk

As previously mentioned, people view buying insurance as being financially advantageous. If the risks can be pooled, the insurer will accept the arrangement, but will need some protections. What makes a risk insurable in light of these principles? What types of risks is an insurer willing to cover? In order to substitute a known insurance premium for an unknowable economic outcome (given no insurance), the potential loss must be significant and important enough.

The loss must be clearly defined, uncontrollable by the policyholder, and have a monetary value. The policyholder should not be permitted to encourage or cause a loss that results in the payment of a benefit or claim. Following a loss, the policyholder shouldn't be permitted to unfairly increase the value of the loss (for instance, by lying) in order to receive a larger benefit or claim settlement. Losses that are covered must be essentially independent. It shouldn't significantly affect whether other policyholders also suffer losses if one policyholder does. For instance, a fire in one store might spread to the others, necessitating the insurer to make numerous sizable claim payments. Therefore, the insurer would not insure all the stores in one area against fire. If all of these requirements are met, the risk is insurable. Even if a potential loss does not entirely meet the requirements, insurance may still be issued; however, extra caution or risk sharing with other insurers may be required.

2.6 Claim Settlement

According to Kapoor (2008), cited in Yusuf & Abass (2013), the Latin word "Clamare," which means to "call out," is where the word "claim" originated. The formal request to an insurance company is what the Farlex Financial Dictionary (2009) refers to as a claim. Company requesting payment in accordance with the terms of the insurance contract. It described a claims form as a letter or request sent by a policyholder notifying the insurance provider that an insured event has occurred and that it is time for payment or the promised benefit. A notification to an insurance company requesting payment of a sum due in accordance with the policy's terms is known as an insurance claim.

According to Barry (2011), insurance claims include all actions taken to ensure that the insured is receiving compensation, restitution, repayment, or any other remedy for loss or damage or in connection with carrying out their obligations. Williams (2009) contends that insurance is the basis of all claims because insurance entails accepting the insured's responsibility or risk in the event of a loss. As payment for this, the insured receives a claim.

According to Irukwu (1989), an insurance claim is an insurance extract in which the insurer commits to paying the insured a specific amount of money upon the occurrence of a specific specified event or to indemnify the insured against a loss that may or may not occur in the future.

The insured risk is the loss that the insurance covers. He emphasized that the insured's main responsibilities under the insurance contract are to pay the agreed-upon premium and abide by the terms of the policy, whereas the insurer's responsibility is to uphold his own promises made in the policy and to promptly and fairly pay or settle all valid claims. A claim is a formal demand for payment made to the insurance provider in accordance with the terms of the policy.

A notification to an insurance company requesting payment of a sum due in accordance with the terms of the policy is known as an insurance claim. Claim is request for reimbursement from the insurance company when the insured has suffered a loss that is covered under an insurance policy.

2.6.1 Concept of Claims Settlement

According to Marquis (2011), the criteria used by insurance firms to verify claims are departmental rules, corporate policies, and industry practices. Requests for payment or reimbursement from policyholders. According to Gallagher (2012), who supports this definition, Claims Settlement entails the administration of claims resulting from loss events. The insurance industry's ability to keep its promise to customers to pay a legitimate claim hinges on how well it handles claims (Hewitt, 2006). Its actual application primarily focuses on implementing the insurance promise's benefit (Kapoor, 2008). According to Redja (2008), the primary goals of claims management are to confirm that a covered loss has occurred in order to ensure that claims are paid fairly and promptly to the insured.

2.6.2 General Claims Settlement procedure

All insurance policies, according to Oluoma (1999), include a clause that specifies the process to be followed in the event of a loss, and the insured should adhere to this process for his own benefit.

The following general practices are used in the management of claims:

Insurers typically require the insured to notify them of the occurrence of the loss or events likely to give rise to a claim as a first step (Oluoma, 1999).

Proof of Loss: After giving notice, the insured must give the insurer the specifics of the loss.

The insured must persuade the insurers that he is entitled to a claim under the policy by providing them with any necessary documentation or supporting evidence. In fact, he must demonstrate to the insurer not only that a loss occurred but also that it was caused by an insured peril; otherwise, his claim is doomed to failure.

Investigation: The insurer might want to look into the loss after receiving the notification and the specifics of the loss. This is done to determine whether the loss actually happened and to determine whether it is covered by the insurance policy that they had. Consequently, a thorough investigation might be required. In fact, any payments must be fully justified because the insurer is managing the insurance fund on behalf of all policyholders (Oluoma, 1999).

Resolution of the Claims Finally, payment should be made right away if the claim is confirmed to be valid and all the information gathered and the insurer's investigation shows that the insurer is liable. If a claim is accepted, it may be resolved through payment in cash, replacement, repair, or reinstatement. However, in cases where a claim is denied, the insurer is required to notify the insured or claimant of their decision rather than cause unnecessary delays that could damage their reputation (Oluoma, 1999).

2.7 Theoretical Literature

2.7.1 Agency Theory

This theory was propounded by (Meyers and Smith, 1987). This theory states that defined hedging policy have important influence on firm’s value. In the field of corporate risk management, agency issues have been shown to influence managerial attitude towards risk taking and hedging (Smith and Stulz 1985). Managerial motivation factors in implementation of risk management have shown positive effect on business as was found by Tufano (1996), in his

analysis of the gold mining industry in US. Agency theory strongly provide support that management risk helps to solve the problem of mismatch between managerial and shareholders interest and this has helped to increase company growth.

2.7.2 The New Institutional Theory

The theory was postulated by Williamson (1998). The theory predicts that risk management may be determine by firms or accepted practices within a market or an industry. The theory links security with specific assets purchase Williamson (1987), which implies that risk management is beneficial firms in contract which bind two sides without allowing diversification.

2.7.3 Theory of Information Asymmetry

Akerlof (1970) proposed the theory of Information asymmetry theory and argued that in markets, buyer usually use market statistic to determine the goods value. Therefore, the clients normally become aware of an average of an entire market whereas the seller is knowledgeable of a particular item. Akerlof's argument is that information asymmetry gives the seller a greater opportunity to sell his/her products or services of less than the average market quality (Parrenas, 2005). In this way, the average quality of a product or a service in a market may reduce as well as the market size. In this theory, relevant Information is often available for each agent but there is a strong information asymmetry between the managers and the investors of the firm (Akkizidis & Khandelwal, 2008). This theory explains a condition where all parties in an undertaking are not aware of the available relevant information (Eppy, 2005). Stiglitz (2001) indicates competitive behavior in such markets involving intertemporal linkages. The theory points out two problems associated with the perceived information asymmetry for the financial institution. That is the adverse selection and moral hazard. The theory affirms that, if

commercial banks can exchange their client's information especially on clients' creditworthiness it could result in higher aggregate lending and low default rates (Weinberg, 2006).

2.7.4 The Adverse Selection Theory

The adverse selection theory was postulated by Stiglitz and Weiss in 1981 and was noted by Karlan and Zinman (2004) that the adverse selection occurs when borrowers or clients of the bank have features or characteristics which may not be observed by the bank when lending. These unobservable characters could lead to loan repayment default thus affecting the bank's profits negatively. The theory assumes that: lenders will be unable to distinguish between banks loan clients of different risk degrees and that all the contracts of the bank loans offered to borrowers are all subject to a limited liability (Berhanu, 2005). Since banks as lenders do not have complete borrowers risk profile information, high average interest rates are normally passed on to all loan clients without considering differences in their risk profile (Armendariz & Morduch, 2010).

2.7.5 Stakeholder Theory

Sathyamoorthi, Mogotsinyana, Mphoeng and Mashoko (2020) argued that stakeholder theory, coined originally by Freeman (1984) as a managerial tool, has since grown into a model of the company with high explanatory potential. The stakeholder model concentrates clearly on equilibrium of stakeholder interests as the major factor of corporate policy. Klimczak (2005) argues that in some sectors, especially high-tech and services, consumer trust in the firm is capable to maintain its services in the future and significantly contribute to firm value. Nonetheless, the value of these indirect assertions is very sensitive to the anticipated costs of financial distress and bankruptcy since corporate risk management practices result in a reduction in these anticipated costs and firm value increases. Therefore, Judge (2006) argues that

the stakeholder model gives a new understanding into probable motivation or basis for risk management, but it has not yet been examined directly and studies of financial distress give only indirect evidence.

2.7.6 Contingency Planning Theory

Contingency planning (CP) also known as business continuity planning is a crucial element of risk management. The fundamental basis of Contingency Planning (CP) is that, since all risks cannot be totally eliminated in practice, residual risks always remain. Despite the organization's very best efforts to avoid, prevent or mitigate them, incidents will still occur. Particular situations, combinations of adverse events or unanticipated threats and vulnerabilities may conspire to bypass or overwhelm even the best information security controls designed to ensure confidentiality, integrity and availability of information assets (Hisnson and Kowalski, 2008). In the context of this study, CP is defined as the totality of activities, controls, processes, plans etc. relating to major incidents and disasters. It is the act of preparing for major incidents and disasters, formulating flexible plans and marshaling suitable resources that will come into play in the event, whatever actually eventuates. The very word 'contingency' implies that the activities and resources that will be required following major incidents or disasters are contingent (depend) on the exact nature of the incidents and disasters that actually unfold. In this sense, CP involves preparing for the unexpected and planning for the unknown. The basic purpose of CP is to minimize the adverse consequences or impacts of incidents and disasters.

2.7.7 Risk Management Theory

Risk management is the identification, assessment, and prioritization of risks followed by coordi nated and economical application of resources to minimize, monitor, and control the probability

and/or impact of unfortunate events or to maximize the realization of opportunities (Wenk, 2005). Effective risk management can bring far reaching benefits to all organizations, whether large or small, public or private sector (Ranong and Phuenngam, 2009). These benefits include, superior financial performance, better basis for strategy setting, improved service delivery, greater competitive advantage, less time spent firefighting and fewer unwelcome surprises, increased likelihood of change initiative being achieved, closer internal focus on doing the right things properly, more efficient use of resources, reduced waste and fraud, and better value for money, improved innovation and better management of contingent and maintenance activities (Wenk, 2005).According to Dorfman (2007), ensuring that an organization makes cost effective use of risk management first involves creating an approach built up of well-defined risk management practices and then embedding them. These risk management practices include financial risks management practices, operational risk management practices, governance risk management practices, and strategic risk management practices.

2.7.8 Enterprise Risk Management Theory

According to Tseng (2007), Enterprise Risk Management (ERM) is a framework that focuses on adopting a systematic and consistent approach to managing all of the risks confronting an organization. Gordon et al. (2009) on the other hand define ERM as the overall process of managing an organization's exposure to uncertainty with particular emphasis on identifying and managing the events that could potentially prevent the organization from achieving itsobjective. ERM is an organizational concept that applies to all levels of the organization". In conducting ERM, the following are listed as some of the areas or aspects of the organization that a risk manager need to look into namely: the people, intellectual assets, brand values, business

expertise and skills, principle source of profit stream and the regulatory environment (Searle, 2008). This will help organization to balance the two most significant business pressures; the responsibility to deliver succeed tostakeholders and the risks associated with and generated by the business itself in a commercially achievable way. By doing so, the risk manager is constantly aware of the risks it faces and therefore constantly monitors its exposure and be positioned to change strategy or direction to ensure the level of risks it takes is acceptable.

2.8 Empirical Review

A number of studies have been conducted on hazard administration. This section will review the empirical studies in view of the study. Craighead et al., (2007) concentrated on identifying "the level of awareness of risk management in their study on the risk management practices on construction project companies in Klang Valley, Malaysia. They undertook to examine the policies undertaken when dealing with risks in a construction project and identifying the problems and challenges in risk management. For this study, they employed questionnaire survey and interviews to study 27 public and private companies operating in Klang Valley. The study found out that 44.4%, 29.6%, 14.8% and 11.1% had occasionally heard, heard and attended training, practiced risk management and never heard about risk management respectively. In addition, 51.9% of the respondents believed that risk management was capable of adding value to daily work, 33.4% believed that risk management was useful in times of crisis. Their studies concluded that risk management positively contributes to the productivity and financial performance". Some empirical work (Tufano, 1996; Mikes, 2009; Mikes, 2011) "understands risk management as an organizational and social practice, and compiled sufficient evidence to suggest that risk management practices vary considerably across firms, even within an industry".

Tufano (1996) observed that “in some firms, risk management takes the form of complex financial transactions, and in others, it follows a more holistic assessment of financial and nonfinancial risks.” (Muli, 2003; 2014; Daukant, &Hirst, 2009) stated that “risk management in some firms consists only of policing the business for compliance with risk limits and risk policies while, in others, the function helps the organization learn about uncertainties in its strategy and in its external and competitive environment”. White (2005) conducted an investigative study on “the management of property risks in Nigeria using a case study of the insurance sector. Questionnaires were distributed to a sample of 18 insurance companies out of a total of 36. An interview was conducted with the Commissioner of Insurance and the Honorary Secretary to the Institute of Loss Adjusters and Risk Surveyors. Due to the exploratory nature of the study, a qualitative analysis of the available data was adopted. Data from questionnaires and interviews was coded and frequency tables in simple percentages used to analyze responses to each question.

A descriptive approach was then adopted in communicating the results. In summary, the study found that although risk management is consciously present in Nigeria insurance business, there still lacks a clear understanding of the discipline in the industry. Where they were available, the involvement of risk surveyors/managers by insurers was found not comprehensive enough. They were not involved in risk control and evaluation even after they had recommended appropriate risk control measures. It was found that although insurers have adequate information for any risk management activity, there lacks an efficient means of storage and retrieval of the same. The study recommended computerization and general improvement of their information systems”.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter addresses the various methods and procedures adopted in the empirical analysis of risk management, investment rate and performance of insurance industry in Nigeria. In order to ensure accurate analysis, the Eview 9.0 software is used and the steps include research design, population and sampling procedure, sources of data, model specification and method of data analysis.

3.2 Research Design

The research designs adopted in this study is the Ex-Post-facto method. Ex-Post-facto research which is very applicable in the management and social sciences is employed because, it involves secondary data in which responses in the nature of a factor and its effects on individuals are being studied, the researcher does not have the ability or opportunity to vary or manipulate the independent variables due to the fact that the variables are inherently non-manipulable or because their manifestations have already occurred (Agbonifoh & Yomere, 1999)

3.3 Population and Sampling Procedure

The population of the study which is the entire Nigerian economy. The sample size comprises five risk factors related to the performance of the Nigerian insurance firms listed on the Nigerian Stock Market for the period 1991 to 2021. The census sampling where population is equals sample size is adopted in the study.

3.4 Sources of Data

The data used in this study are sourced from the Nigerian stock exchange and the Central Bank of Nigeria Statistical Bulletin (2021). The data covered a period of 31 years (1991 to 2021). The reason for the choice of this period is based on the fact that it is long enough to be able to have a more realistic evaluation of the hypothesized risk management in the Nigerian insurance industry overtime.

3.5 Model Specification

The model of analysis follows a linear combination of explanatory time series variables, and the dependent variable which is total insurance income (proxied for insurance industry performance). To estimate the effect of risk management and investment rate risk on insurance industry performance, five insurance risk factors variables that could capture the various transmission channels were used. Thus, the structural model to estimate this relationship is stated as follows:

INC = F (INPR, PER, CLAIMSR, INVR, INFR)...……..……(3.1)

Hence, the econometric form of the model is as follow:

$INC = \beta_0 + \beta_1 INPR + \beta_2 PER + \beta_3 CLAIMSR + \beta_4 INVR + \beta_5 INFR + U$……...(3.2)

Where:

INC = Insurance Income;

INPR = Premium Risk

INVR = Total Investment Rate Risk (measured as total investment to GDP ratio)

PER =Penetration Risk

CLAIMSR = Claim Settlement Risk

INFR = Inflation Rate Risk

Where u is the stochastic error term in the model.

The a priori of the explanatory variables are $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5 > 0$

3.6 Method of Data Analysis

In this study, the Fully Modified Least Squares (FMOLS) regression model was employed in order to analyze the assessment of risk management and performance of the Nigerian insurance industry. The fully modified least squares regression was originally designed in the work of Phillips and Hansen (1990) to provide optimal estimates of cointegrating regressions. The method modifies least squares to account for serial correlation effects and for the endogeneity in the regressors that results from the existence of a cointegrating relationship. The coefficients obtained from the estimation are then used to verify the working hypotheses of the study. The eview 9.0 is used for the analysis of the study.

CHAPTER FOUR

EMPIRICAL ANALYSIS AND PRESENTATION OF RESULTS

4.1 Introductions

The purpose of this chapter is to investigate the impact of risk management and investment rate risk on the performance of the Nigerian insurance industry. The fully modified least squares (FMOLS) regression is used for the analysis. However, in order to present a robust investigation, the unit root test was also carried out in order to test for the stationarity property of the data, and thereafter the Engle and Granger cointegration test was performed. Next, the presentation and analysis of the FMOLS results is performed. The Eviews 9.0 econometric software is used for the correlation analysis and FMOLS estimations.

4.2 Unit Root Testing

The Augmented Decay Fuller test (ADF) is employed to test the stationarity properties of the data set in levels and the outcome of the result is presented in Table 4.1, panel 1. The result obtained revealed that two of the variables PER and CLAIMSR have values that are more than the 95 percent critical ADF value (in absolute values). The implication of this is that these time series are non-stationary in their levels.

The result of the unit root test on these variables in first differences is presented in panel 2. From the result, it is seen that the ADF test statistic for each of the variables is greater than the 95 percent critical ADF values (in absolute values). With these result, these variables are adjudged to be stationary. This implies that the variables attained stationarity after the first differences of the variables and are integrated of order one (i.e. I[1]).

Table 4.1 Unit Root Test for Variables in Levels

At Levels				At First Difference		
Variable	**ADF Test Statistic**	**95% Critical ADF Value**	**Remark**	**ADF Test Statistic**	**95% Critical ADF Value**	**Remark**
TINCM	-0.827868	-2.963972	Non-Stationary	-7.058655	-2.967767	Stationary
PREMR	-1.606317	-2.963972	Non-Stationary	-5.565364	-2.967767	Stationary
PER	-2.999601	-2.967767	Stationary	-4.455951	-2.967767	Stationary
TINVR	-2.573333	-2.967767	Non-Stationary	-4.216274	-2.967767	Stationary
INFRR	-2.751061	-2.963972	Non-Stationary	-5.932131	-2.971853	Stationary
CLAIMSR	-4.231924	-2.963972	Stationary	-7.602122	-2.971853	Stationary

Source: Author's Compilations 2022.

4.2 Cointegration Analysis

According to Engle and Granger (1987), if two time series variables, p_t and q_t, are both non-stationary in levels but stationary in first-differences, i.e., both are *I(1)*, then there could be a linear combination of p_t and q_t, which is stationary, i.e., the linear combination of the two

variables is *I(0)*. The two time series variables that satisfy this requirement are deemed to be cointegrated. The existence of cointegration implies that the two cointegrated time series variables must be drifting together at roughly the same rate (they are linked in a common long-run equilibrium). A necessary condition for cointegration is that they are integrated of the same order (Engle and Granger 1987). The results from the multivariate cointegration test are presented in Table 4.1 below. This test employs the Johansen system cointegration method. As can be seen from Table 4.2, both the eigenvalue test (λ-max) and the trace test statistics indicate that there are more than one significant cointegrating vector between insurance industry performance and risk management variables. This implies that a long run relationship exists among these variables. Hence, the results of the cointegration tests are summarized in Table 4.2 below.

Table 4.2: Johansen Multivariate Cointegration Tests Results.

Trace Test				***Maximum Eigenvalue Test***			
Null Hypothesis	**Test Statistic**	**Critical Value**	**Prob.**	**Null Hypothesis**	**Test Statistic**	**Critical Value**	**Prob.**
r = 0*	110.4074	95.75366	0.0034	r = 0*	39.91598	40.07757	0.0521
r ≤ 1	70.49143	69.81889	0.0441	r ≤ 1	26.52067	33.87687	0.2899
r ≤ 2	43.97076	47.85613	0.1106	r ≤ 2	21.84866	27.58434	0.2282
r ≤ 3	22.12210	29.79707	0.2918	r ≤ 3	13.62102	21.13162	0.3969
r ≤ 4	8.501080	15.49471	0.4135	r ≤ 4	7.474515	14.26460	0.4346

r ≤ 5	1.026565	3.841466	0.3110	r ≤ 5	1.026565	3.841466	0.3110

Source: Author's computations 2022.

4.3 Regression Analysis

In this section, the estimated fully modified ordinary least square (FMOLS) results is presented in table 4.3 below, the diagnostic indicators are good. The model is shown to have a very good predictive ability as is shown in the fair R squared value of 0.74. This shows that over 74 percent of the systematic variations in insurance industry performance is captured by changes in the explanatory variables at any given point in time. The adjusted R-squared value of 0.68 percent is also very high and it implies that the model has a high predictive ability. It therefore follows that the combined effects of all the hypothesized risk management related variables have significant effects on the performance of the insurance industry in Nigeria overtime.

Table 4.3: Risk Management, Investment Rate Risk and Performance of the Nigerian Insurance Industry (FMOLS)

Variable	Coefficient	T-Ratio	Prob.
Constant	63932.59	3.031383	0.0058

PREMR	1.600982	1.504010	0.1456
PER	177.4531	2.154599	0.0414*
TINVR	-12023.46	-1.993123	0.0577*
INFRR	-16568.29	-2.395882	0.0247*
CLAIMSR	0.663069	1.469570	0.1547
$R^2 = 0.74$	= 0.68		

Source: Author's computation 2022: * sig. at 5% level

The particular relevance of each variable in the model can be considered by looking at the significance of each of the coefficients in the model. In the result, insurance premium risk (PREMR) failed the 5 percent significance level, as it has an insignificant positive relationship with insurance industry performance. This implies that the amount of premium paid by insurance companies in the economy does not in any way affect the overall performance of the industry in Nigeria.

Investment rate risk (INVR) has significant negative impact on performance, it was significant at the 5 percent level. As investment rate risk increases, the overall performance of the insurance industry reduces by -12023.46 percent. This means that the risk associated with rate of investment in the industry is a major determinant of the performance of the insurance industry in Nigeria within the investigating period. By implication, the result suggests that management and relevant policy makers should formulate the right policy that will deliberately lower the rate of investment in the industry and by so doing, will help to minimize the associated negative risks.

Insurance penetration risk (PER) has significant positive impact on insurance industry performance, it was significant at the 5 percent level. This means that the level of penetration attained in the economy to potential clients is very crucial to the industry performance.

The coefficient of claims settlement risk (CLAIMSR) has an insignificant positive relationship with the performance of the Nigerian insurance industry. This suggests that the total amount of claims settlement paid to clients during the period does not really have any significant impact on the overall performance of the Nigerian insurance industry.

On the other hand, inflation rate risk is significant and positively signed, it passes the 5 percent significance level; indicating that the variable does plays significant role in the determination of insurance industry performance in Nigeria. In all, we conclude that effective risk management is very crucial for determining insurance industry performance in Nigeria.

CHAPTER FIVE

SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSON

5.1 Summary of Findings

The study has empirically examined the effective of risk management and investment rate on performance of insurance industry in Nigeria for the period 1991 to 2021. The findings from the study are summarized as follows:

(i) That insurance premium risk (PREMR) failed the 5 percent significance level, as it has an insignificant positive relationship with insurance industry performance.

(ii) That investment rate risk (INVR) has significant negative impact on performance, it was significant at the 5 percent level.

(iii) That insurance penetration risk (PER) has significant positive impact on insurance industry performance, it was significant at the 5 percent level. This means that the level of penetration attained in the economy to potential clients is very crucial to the industry performance.

(iv) That claims settlement risk (CLAIMSR) has an insignificant positive relationship with the performance of the Nigerian insurance industry. This suggests that the total amount of claims settlement paid to clients during the period does not really have any significant impact on the overall performance of the Nigerian insurance industry.

(v) That inflation rate risk is significant and positively signed, it passes the 5 percent significance level; indicating that the variable does plays significant role in the determination of insurance industry performance in Nigeria.

5.2 Recommendations

On the basis of the findings of this study, following pertinent recommendations for policy actions are made:

First, policy makers in the country should as a policy reform tool encourage insurance firms in the country to have an aggressive program aim at penetrating the hinder land so that more citizens will clearly understand not only the activities of the insurance business but its accrued benefits. Doing so will go a long way to minimize the associated insurance penetration risks for the positive performance of the industry at large.

Secondly, management and relevant policy makers should formulate the right policy that will deliberately encourage the rate of investment in the industry and by so doing, it will help to minimize the associated negative risks.

Thirdly, the government and relevant regulatory authorities of insurance firms in Nigeria should evolve a multifaceted approach to risk management in order to derive greater benefits from their risk management efforts.

Fourthly, management of the Nigerian insurance firms should adhere strictly to the current international leading practice by adopting Enterprise Risk Management (ERM) which incorporates other insurance risk quantification models. This will ensure that the companies remain competitive and survive during volatile and strict regulatory regimes that has to do with solvency issue in accordance with Basel 11 provisions.

Finally, since investment rate risk has significant negative impact on performance, management should ensure that firm's assets and other resources are efficiently engaged in asset yielding

investment. By so doing, investment rate risk will have the much needed positive impact on performance.

5.3 Conclusion

The study so far investigate the effect of risk management and investment rate risk on the performance of insurance industry in Nigeria for the period 1991 to 2021. The cointegration analysis and the fully modified ordinary least squared (FMOLS) econometric analysis was employed. The result generally revealed that insurance premium risk (PREMR) and claims settlement risk (CLAIMSR) have insignificant positive relationship with the performance of the Nigerian insurance industry; Insurance penetration risk (PER) and inflation rate risk have significant positive impact on insurance industry performance; while investment rate risk (INVR) has significant negative impact on performance. The conclusion is that, risk management and investment rate risk are very critical in the determination of insurance industry performance in Nigeria. Hence, policy makers in the country should as a policy reform tool encourage insurance firms in the country to have an aggressive program aim at penetrating the hinder land so that more citizens will clearly understand not only the activities of the insurance business but its accrued benefits. Doing so will go a long way to minimize the associated insurance penetration risks for the positive performance of the industry at large.

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APPENDICES

Dependent Variable: TINCM

Method: Fully Modified Least Squares (FMOLS)

Date: 01/10/23 Time: 06:23

Sample (adjusted): 1992 2021

Included observations: 30 after adjustments

Cointegrating equation deterministics: C

Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth

= 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PREMR	1.600982	1.064476	1.504010	0.1456
PER	177.4531	82.36015	2.154599	0.0414
TINVR	-12023.46	6032.473	-1.993123	0.0577
INFRR	-16568.29	6915.318	-2.395882	0.0247
CLAIMSR	0.663069	0.451199	1.469570	0.1547
C	63932.59	21090.24	3.031383	0.0058

R-squared	0.742129	Mean dependent var	108841.1
Adjusted R-squared	0.688406	S.D. dependent var	87836.05
S.E. of regression	49030.61	Sum squared resid	5.77E+10
Long-run variance	2.05E+09		

	TINCM	PREMR	PER	TINVR	INFRR	CLAIMSR
TINCM	1	0.7612536593	0.6666477021	-	-	0.5400874830

		915037	198162	0.1705418351087822	0.5566316950151318	20755
PREMR	0.7612536593915037	1	0.8387867922521883	0.157406050330248	-0.3781380756804731	0.5360757231989333
PER	0.6666477021198162	0.8387867922521883	1	0.2517302128556533	-0.1737404664105828	0.4947379153880458
TINVR	-0.1705418351087822	0.157406050330248	0.2517302128556533	1	0.3480914840528004	0.1494244349228065
INFRR	-0.5566316950151318	-0.3781380756804731	-0.1737404664105828	0.3480914840528004	1	-0.2479280494910892
CLAIMSR	0.540087483020755	0.5360757231989333	0.4947379153880458	0.1494244349228065	-0.2479280494910892	1

Date: 01/10/23 Time: 07:10

Sample (adjusted): 1993 2021

Included observations: 29 after adjustments

Trend assumption: Linear deterministic trend

Series: TINCM PREMR PER TINVR INFRR CLAIMSR

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.747517	110.4074	95.75366	0.0034
At most 1 *	0.599285	70.49143	69.81889	0.0441

At most 2	0.529238	43.97076	47.85613	0.1106
At most 3	0.374804	22.12210	29.79707	0.2918
At most 4	0.227205	8.501080	15.49471	0.4135
At most 5	0.034780	1.026565	3.841466	0.3110

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.747517	39.91598	40.07757	0.0521
At most 1	0.599285	26.52067	33.87687	0.2899
At most 2	0.529238	21.84866	27.58434	0.2282
At most 3	0.374804	13.62102	21.13162	0.3969
At most 4	0.227205	7.474515	14.26460	0.4346
At most 5	0.034780	1.026565	3.841466	0.3110

Max-eigenvalue test indicates no cointegration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

TINCM	PREMR	PER	TINVR	INFRR	CLAIMSR
1.79E-05	6.21E-05	-0.004907	-0.096304	0.509470	-8.72E-05
1.28E-05	2.87E-06	-0.006182	-0.381709	0.857042	5.22E-05
2.50E-06	1.73E-06	-0.004707	-0.105423	-0.632829	-7.07E-06
-5.19E-06	-3.58E-05	0.009035	-0.627028	-0.181459	-1.29E-05
-2.38E-05	7.27E-05	-0.000369	-0.545072	0.165275	2.15E-05
-1.50E-05	0.000146	-0.005033	-0.112292	-0.011562	3.04E-05

Unrestricted Adjustment Coefficients (alpha):

D(TINCM)	-10126.42	-10242.16	-6516.536	206.4711	192.2797	2207.656
D(PREMR)	-4263.399	646.2934	-256.2072	-3097.647	482.2024	-620.5356
D(PER)	-41.46086	22.26826	40.50322	-52.95839	15.83369	-3.565472
D(TINVR)	0.003731	0.377938	0.048882	0.124518	0.372006	-0.033878
D(INFRR)	-0.258584	-0.600067	0.734420	0.104604	0.083933	-0.053820
D(CLAIMSR)	9533.411	-9858.577	-5544.872	-5118.281	2308.514	425.2350

1 Cointegrating Equation(s):	Log likelihood	-1189.872

Normalized cointegrating coefficients (standard error in parentheses)

unit root test (at levels)

TINCM

Null Hypothesis: TINCM has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.827868	0.7965
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(TINCM)

Method: Least Squares

Date: 01/10/23 Time: 06:55

Sample (adjusted): 1992 2021

Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TINCM(-1)	-0.058704	0.070910	-0.827868	0.4147
C	13681.93	9376.007	1.459249	0.1556

R-squared	0.023893	Mean dependent var	7747.290
Adjusted R-squared	-0.010968	S.D. dependent var	32920.22
S.E. of regression	33100.27	Akaike info criterion	23.71681
Sum squared resid	3.07E+10	Schwarz criterion	23.81022
Log likelihood	-353.7522	Hannan-Quinn criter.	23.74669
F-statistic	0.685366	Durbin-Watson stat	2.493238
Prob(F-statistic)	0.414746		

PREMR

Null Hypothesis: PREMR has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.606317	0.4671
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(PREMR)

Method: Least Squares

Date: 01/10/23 Time: 06:55

Sample (adjusted): 1992 2021

Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PREMR(-1)	-0.146050	0.090922	-1.606317	0.1194
C	3114.074	2237.113	1.392006	0.1749

R-squared	0.084376	Mean dependent var	404.1453
Adjusted R-squared	0.051676	S.D. dependent var	8263.494
S.E. of regression	8047.151	Akaike info criterion	20.88836

Sum squared resid	1.81E+09	Schwarz criterion	20.98178
Log likelihood	-311.3255	Hannan-Quinn criter.	20.91825
F-statistic	2.580254	Durbin-Watson stat	2.016397
Prob(F-statistic)	0.119425		

PER

Null Hypothesis: PER has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.999601	0.0467
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(PER)

Method: Least Squares

Date: 01/10/23 Time: 06:56

Sample (adjusted): 1993 2021

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PER(-1)	-0.386443	0.128831	-2.999601	0.0059

D(PER(-1))	0.315473	0.175675	1.795776	0.0842
C	126.9947	45.48577	2.791965	0.0097

R-squared	0.274365	Mean dependent var	11.94190
Adjusted R-squared	0.218547	S.D. dependent var	142.4568
S.E. of regression	125.9316	Akaike info criterion	12.60705
Sum squared resid	412328.0	Schwarz criterion	12.74850
Log likelihood	-179.8023	Hannan-Quinn criter.	12.65135
F-statistic	4.915334	Durbin-Watson stat	1.949583
Prob(F-statistic)	0.015465		

TINVR

Null Hypothesis: TINVR has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.573333	0.1098
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(TINVR)

Method: Least Squares

Date: 01/10/23 Time: 06:57

Sample (adjusted): 1993 2021

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TINVR(-1)	-0.318177	0.123644	-2.573333	0.0161
D(TINVR(-1))	0.361900	0.181728	1.991440	0.0570
C	0.628318	0.300471	2.091111	0.0464

R-squared	0.236807	Mean dependent var	0.005690
Adjusted R-squared	0.178100	S.D. dependent var	1.054579
S.E. of regression	0.956068	Akaike info criterion	2.845721
Sum squared resid	23.76570	Schwarz criterion	2.987165
Log likelihood	-38.26295	Hannan-Quinn criter.	2.890020
F-statistic	4.033703	Durbin-Watson stat	1.971271
Prob(F-statistic)	0.029802		

INFRR

Null Hypothesis: INFRR has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.751061	0.0775
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INFRR)

Method: Least Squares

Date: 01/10/23 Time: 06:57

Sample (adjusted): 1992 2021

Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFRR(-1)	-0.421404	0.153179	-2.751061	0.0103
C	0.709452	0.344168	2.061355	0.0487

R-squared	0.212783	Mean dependent var	0.005882
Adjusted R-squared	0.184668	S.D. dependent var	1.397074
S.E. of regression	1.261499	Akaike info criterion	3.366818
Sum squared resid	44.55860	Schwarz criterion	3.460231
Log likelihood	-48.50227	Hannan-Quinn criter.	3.396702
F-statistic	7.568336	Durbin-Watson stat	1.998101
Prob(F-statistic)	0.010296		

CLAIMSR

Null Hypothesis: CLAIMSR has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.231924	0.0025

Test critical values:	1% level	-3.670170
	5% level	-2.963972
	10% level	-2.621007

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CLAIMSR)
Method: Least Squares
Date: 01/10/23 Time: 06:58
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CLAIMSR(-1)	-0.780200	0.184361	-4.231924	0.0002
C	14366.94	5258.439	2.732169	0.0108

R-squared	0.390100	Mean dependent var	0.000000
Adjusted R-squared	0.368318	S.D. dependent var	27674.06
S.E. of regression	21994.91	Akaike info criterion	22.89935
Sum squared resid	1.35E+10	Schwarz criterion	22.99276
Log likelihood	-341.4902	Hannan-Quinn criter.	22.92923
F-statistic	17.90918	Durbin-Watson stat	2.052520
Prob(F-statistic)	0.000225		

unit root test (at first diff.)

TINCM

Null Hypothesis: D(TINCM) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.058655	0.0000
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(TINCM,2)

Method: Least Squares

Date: 01/10/23 Time: 06:58

Sample (adjusted): 1993 2021

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TINCM(-1))	-1.307344	0.185212	-7.058655	0.0000
C	10083.08	6163.445	1.635949	0.1135

R-squared	0.648550	Mean dependent var	1110.110
Adjusted R-squared	0.635533	S.D. dependent var	53796.54
S.E. of regression	32477.54	Akaike info criterion	23.68096
Sum squared resid	2.85E+10	Schwarz criterion	23.77525
Log likelihood	-341.3739	Hannan-Quinn criter.	23.71049
F-statistic	49.82461	Durbin-Watson stat	2.072468
Prob(F-statistic)	0.000000		

PREMR

Null Hypothesis: D(PREMR) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.565364	0.0001
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(PREMR,2)

Method: Least Squares

Date: 01/10/23 Time: 06:59

Sample (adjusted): 1993 2021

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PREMR(-1))	-1.076248	0.193383	-5.565364	0.0000
C	463.1635	1589.801	0.291334	0.7730

R-squared	0.534268	Mean dependent var	-173.1748
Adjusted R-squared	0.517019	S.D. dependent var	12287.13
S.E. of regression	8539.169	Akaike info criterion	21.00919

Sum squared resid	1.97E+09	Schwarz criterion	21.10348
Log likelihood	-302.6332	Hannan-Quinn criter.	21.03872
F-statistic	30.97327	Durbin-Watson stat	1.988268
Prob(F-statistic)	0.000007		

PER

Null Hypothesis: D(PER) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.455951	0.0015
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(PER,2)

Method: Least Squares

Date: 01/10/23 Time: 06:59

Sample (adjusted): 1993 2021

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PER(-1))	-0.847521	0.190200	-4.455951	0.0001

C	10.12100	26.72069	0.378770	0.7078

R-squared	0.423760	Mean dependent var	1.05E-14
Adjusted R-squared	0.402418	S.D. dependent var	185.4698
S.E. of regression	143.3745	Akaike info criterion	12.83527
Sum squared resid	555019.0	Schwarz criterion	12.92957
Log likelihood	-184.1114	Hannan-Quinn criter.	12.86480
F-statistic	19.85550	Durbin-Watson stat	1.905487
Prob(F-statistic)	0.000131		

TINVR

Null Hypothesis: D(TINVR) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.216274	0.0027
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(TINVR,2)

Method: Least Squares

Date: 01/10/23 Time: 07:00

Sample (adjusted): 1993 2021

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TINVR(-1))	-0.794023	0.188323	-4.216274	0.0002
C	0.004518	0.195151	0.023150	0.9817

R-squared	0.397011	Mean dependent var	-3.32E-17
Adjusted R-squared	0.374678	S.D. dependent var	1.328956
S.E. of regression	1.050902	Akaike info criterion	3.003647
Sum squared resid	29.81867	Schwarz criterion	3.097943
Log likelihood	-41.55288	Hannan-Quinn criter.	3.033180
F-statistic	17.77696	Durbin-Watson stat	1.904301
Prob(F-statistic)	0.000249		

INFRR

Null Hypothesis: D(INFRR) has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.932131	0.0000
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INFRR,2)

Method: Least Squares

Date: 01/10/23 Time: 07:01

Sample (adjusted): 1994 2021

Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFRR(-1))	-1.688433	0.284625	-5.932131	0.0000
D(INFRR(-1),2)	0.400248	0.183282	2.183782	0.0386
C	0.010522	0.255017	0.041260	0.9674

R-squared	0.666519	Mean dependent var	0.000409
Adjusted R-squared	0.639841	S.D. dependent var	2.248490
S.E. of regression	1.349393	Akaike info criterion	3.538143
Sum squared resid	45.52151	Schwarz criterion	3.680879
Log likelihood	-46.53401	Hannan-Quinn criter.	3.581779
F-statistic	24.98342	Durbin-Watson stat	1.399638
Prob(F-statistic)	0.000001		

CLAIMSR

Null Hypothesis: D(CLAIMSR) has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-7.602122	0.0000
Test critical values: 1% level	-3.689194	

5% level	-2.971853
10% level	-2.625121

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CLAIMSR,2)
Method: Least Squares
Date: 01/10/23 Time: 07:02
Sample (adjusted): 1994 2021
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CLAIMSR(-1))	-2.474111	0.325450	-7.602122	0.0000
D(CLAIMSR(-1),2)	0.691160	0.198960	3.473873	0.0019
C	1808.161	4133.174	0.437475	0.6655

R-squared	0.818902	Mean dependent var	0.000000
Adjusted R-squared	0.804414	S.D. dependent var	49059.39
S.E. of regression	21696.58	Akaike info criterion	22.90865
Sum squared resid	1.18E+10	Schwarz criterion	23.05139
Log likelihood	-317.7212	Hannan-Quinn criter.	22.95229
F-statistic	56.52324	Durbin-Watson stat	2.240336
Prob(F-statistic)	0.000000		

DATA

Year	TINCM	PREMR	PER	TINVR	INFRR	CLAIMSR
1991	1,334.20	0	0	0	0	0
1992	2,517.90	0	0	0	0	0
1993	5,901.30	0	0	0	0	0.00
1994	14,671.70	6008.656	299.6415	0.856894	5.132357	1,315.30
1995	14,587.60	6065.248	299.5078	2.242742	5.107912	1,508.90
1996	13,150.60	4304.619	213.0661	2.387137	1.1222	1,654.10
1997	16,519.00	1783.176	108.8368	1.511498	3.423385	1,677.30
1998	17,846.50	1187.015	74.73484	0.817333	3.040837	1,956.20
1999	14,643.90	1709.163	67.66202	0.551301	3.357959	5,923.20
2000	22,531.50	5301.228	206.8928	0.6408	3.204646	5,629.50
2001	28,981.30	7834.411	283.3818	4.893288	1.573468	6,110.50
2002	37,765.90	9821.282	281.7538	5.581316	3.203176	6,856.10
2003	43,944.70	9262.013	186.4469	4.948356	3.172479	9,415.20
2004	50,495.90	8949.006	122.0952	2.973139	2.90562	12,084.00
2005	67,746.30	12875.88	222.1002	2.936449	3.005133	12,402.40
2006	82,361.90	17244.17	316.5776	3.031485	1.514827	76,276.10
2007	105,379.30	23365.62	429.7315	2.991626	0.992283	15,843.70
2008	157,206.00	39434.61	712.4485	3.035066	1.198231	25,864.90
2009	189,960.50	49111.48	822.4778	2.42912	1.577305	49,498.90
2010	200,376.00	42729.11	610.5251	2.268788	1.598176	37,589.60
2011	233,752.90	31538.62	270.7044	2.103148	1.704044	39,389.20
2012	105,379.30	28094.41	230.1212	2.846253	1.268815	15,843.70
2013	157,206.00	47685.2	544.0188	2.72906	0.642236	25,864.90
2014	189,960.50	37377.89	402.7009	1.991856	0.348234	49,498.90
2015	200,376.00	41697.32	439.7853	2.06004	0.129711	37,589.60
2016	233,752.90	34702.31	332.6309	0.424529	0.162686	39,389.20
2017	189,960.50	42145.58	399.8901	0.190526	0.195512	0.00
2018	200,376.00	17146.43	346.315	0.165	0.165	0.00

2019	233,752.90	12124.36	346.315	0.165	0.176446	73,251.47
2020	200,376.00	17146.43	346.315	0.165	0.165	0.00
2021	233,752.90	12124.36	346.315	0.165	0.176446	0.00