Introduction

Financial institutions play a critical role in a nation's socio-economic growth and development. In particular, insurance firms facilitate countless economic transactions within a nation through effective and efficient savings mobilization, risk transfer and compensation, and financial intermediation processes.

In fact, by virtue of risks and uncertainty in society, insurance, like many financial services, has recently attracted considerable attention. Insurance firms provide specialized financial services for the economic advancement. By mitigating risk, they provide financial stability and soundness in financial markets. Thus, without cover, the corporate climate is unpredictable and they have little capacity to bear risk in this global setting.

Besides, these firms provide financial protection to a nation's households by mobilizing long-term savings. In addition, they improve the government's accumulation of productive capital, which is invested mainly in long-term investment instruments that can be used to build infrastructure.

The survival of the non-life insurance industry as the dominant segment of the insurance market is critical for developing nations. They play an active role in protecting and repairing device.

This goes to show the importance of a financially sound and strong insurance market in the development of a nation.

Hence, Favorable financial performance is a prerequisite for effective, fair, secure, and sustainable insurance markets for policyholder's benefit and protection. In addition, as Burca and Batrînca (2014) have noted, profitability attracts investors and increases the solvency level, thus increasing the confidence of consumers. In fact, profitability plays a key role in persuading policyholders and shareholders to supply insurance firms with funds. Therefore, one of the aims of insurance company management is to gain profit as an underlying prerequisite for carrying out any insurance business.

In the last decade, the Tunisian financial sector has faced numerous hurdles that influenced its performance one way or another. As a matter of fact, the Tunisian insurance sector as an active participant in the financial market had its fair share of difficulties coming out of the subprime crisis and going through the Jasmin revolution in 2011. The year 2011, had known a massive crowd demonstrations that have attacked public as well as private property that were very costly to Tunisian insurers.

Today, with the world health crisis and the propagation of the Covid-19 virus, the Tunisian economy have suffered enormously. The industrial sector will know the hardest hindrance, with production at 52.7%, followed closely by the services at -49.0% and finally agriculture at -16.2%, according to a Project Paper entitled "the impact of COVID-19 on Tunisia's economy" carried out by the Tunisian Institute of Competitiveness and Quantitative Studies (ITCEQ). This crisis can only hinder the insurers' returns, from the collapse of the stock market to the decrease in the households' financial capacities. Thus, it is vital for insurers to have an idea on the key elements including firm specific, industry specific as well as macroeconomic variables that drive their profitability and try to use it in the most optimal way.

The literature based on the relationship between the different micro and macro-economic factors and insurance financial performance is quite ambiguous. Some studies have shown positive impacts of factors on insurance profitability, while others have argued the opposite. In addition, some researchers argue that the nature of the relationship between these factors and profitability varies depending on the insurance market studied.

In this context, our thesis opts to test and empirically verify the impact of the different determinants on insurance profitability and to reach this objective we tend to use a panel estimation to test the significance of these factors on insurance firms. We used in this framework a static and a dynamic specification model by incorporating in the first regression the lagged dependent variable among the explanatory variables.

Hence, our thesis is therefore articulated around the following question:

Which are the factors affecting the profitability of the insurance market in Tunisia is the main question of this thesis. Factors, which might affect the profitability of insurance firms, can be internal or external. This thesis will focus on the influence of both internal and external factors in the profitability of the insurance market, in order to try to determinate how factors depending upon insurance companies' decision affect their own profitability as well as managing various economic resources and their efficient use from a macroeconomic viewpoint, to optimize economic results.

Our research question will be handled in 3 chapters:

The first one will be devoted to the presentation of the different characteristics and concepts of insurance financial performance as well as its different indicators and measures.

The second chapter will be presenting previous studies related to our research problem and the different approaches used to address it as well as presenting the previous empirical reviews laid down by researchers.

The Third and final chapter will be devoted, in a first stage, to give an overview of the Tunisian insurance sector. Then, we devote the rest of the chapter to the test of the relationship between, on the one hand, firm specific and macroeconomic factors, on the other hand, insurance profitability of the 9 major Tunisian insurance firms, using GMM and GLS models. This chapter also includes the use of Data Envelopment Analysis in order to determine the cost efficiency of insurance firms proxied by both Scale and technical efficiency variables.

Chapter I: Profitability of insurance companies

Introduction

Financial performance is the main concern of every firm, and hence enhancing the wealth of its stakeholders Gitman (2007). A non-profitable insurance firm cannot exist whereas only a profitable business has the ability to reward its owner for a large return on investment

To that end, insurance companies, as with any for-profit business, are making significant efforts to achieve sustainability, which is becoming increasingly threatened by a number of factors including a cutthroat competition, globalization, technological development especially with the emergence of fintechs etc.

When analyzing insurance companies, it is essential to measure their performance compared to other companies in the industry. Conventionally, this has been done using traditional means with financial performance ratios, which is how we intend to proceed in our thesis. However, in our paper we propose to explain the financial performance through conventional determinants (Reinsurance dependency, solvency, loss ratio, etc.) and an unconventional mean, which is efficiency.

Accordingly, since the insurance industry is developed and immensely competitive, we would like to study the cost efficiency effect on earnings. Bearing in mind that companies who are efficient should have mastered their cost management. Thence, we intend to examine the association between annual profitability and efficiency through a series of regressions where efficiency is an explanatory variable.

This chapter fills the gap in understanding the concept of insurance financial performance as well as it showcases the different factors that are affecting profitability and their measures. Bearing in mind that in this chapter that we are intending to display different tools of measuring profitability such as the traditional financial ratios (ROE, ROA..) defining the different determinants we are aiming to evaluate as well as introducing a new concept which is efficiency.

Section 1: Insurance profitability: Measures and Determinants

I. The concept of profitability

The word profitability subtext depends highly on who evaluates it and to what intent. Profitability keeps investors and insurers specifically on the tip of their toes. It sounds like profit margin to a stock insurer's policyholders, while those insured by a mutual enterprise are impartial to it. Insurance regulatory authorities either favor profitability when it comes to solvency or try to cut it down when it comes to regulating rates.

The oxford dictionary of banking and finance defines profitability as the ability to make a profit. Another definition would be the amount of profit made as a percentage of costs.

Profitability is generally measured by the ratio between a result and the means used to achieve it which is the capital employed. Profitability conveys the ability of a business to generate income from the resources it employs. It is its ability to generate a monetary surplus after paying the capital employed to ensure its survival and develop its activity.

The general insurance committee, as a regulatory body, set out multiple guidelines whose aim is to protect the interests of the insured and insured beneficiary through obligating all the insurers to disclose clearly profits, terms and conditions under the insurance policy and requiring a minimum solvency margin in a position to carry out their undertaking towards their clients when it comes to paying claims.

Regulators have the authority to step in if the insurers are in financial distress or are unable to comply with the regulatory guidelines and take action that can include capitalization, reserves reassessment and even deter and sanction an insurer if an abusive practice is observed.

The turnover of insurance companies is different from that of other sectors of the economy in that it does not mark the end of a production cycle, but rather is accompanied by a commitment to produce a service. The collection of a premium goes hand-in-hand with a commitment by the insurer to transform the individual risk into a collective risk, and, most of the time, to guarantee an indemnity or benefit in the event of a claim.

This characteristic only makes the concept of insurer’s profitability even harder to define and, in another step, measure.

In general terms, profitability can be defined as: "the ability of the firm to generate a result expressed in monetary units" Colaisse, B (1993). Profitability is therefore a criterion of what is profitable, i.e. either it produces a return and by means gives a sufficient profit, or it produces good results.

In another point of view and under Ramage Pierre (2001), Profitability can be defined as "an efficiency indicator that compares the results obtained with the means used to obtain this result. In other words, it is the ability of a capital to generate a profit". This definition is nothing but the definition of return on investment that we aim to outline in this chapter.

Profitability according to Gérard Naulleau and Michel Rouach, amounts to "the most synthetic performance indicator there is and it is of course through the implementation of analytical accounting that this element can be apprehended". This description incorporates the company's performance dimension as an objective in the evaluation of profitability.

The net balance of the total operating account of insurance undertakings, results from two activities:

- A technical activity whose profitability can be expressed as the difference between the premiums collected and financial operating expenses and the reinsurance balance.
- A financial activity whose profitability can be written as income excluding capital gains or losses on investments, net of financial expenses on investments.

The multiplicity of the streams of incomes when it comes to the insurance activity makes measuring insurer’s profitability a very important and intriguing question for different researchers.

In the light of what has been discussed above, it only seems legitimate to investigate the profitability and the different measures that has been utilized in past academic and professional researches. Thus, in the next section, we are going to turn the spotlight on profitability scales.

II. Measures of profitability

There’s no doubt that profitability is a paramount objective of financial management as the main goal of a financial organization is to maximize the owner` s wealth. Thus, profitability is a key determinant of performance as portrayed by Malik (2011). In this section, we will go through different measures of profitability.

Firstly, profitability can be expressed as the amount of earnings that the company cash in during a period of time based on its level of sales, assets, capital employed, net worth and earnings per share. These amounts are measured by profitability ratios which are considered as an indicator for its growth, prosperity and overall efficiency as Kabajeh et al. (2012) stated in their paper. Accordingly, the term 'profitability' is a relative measure expressed as a ratio or as a percentage.

The fundamental difference between the insurance industry and other industries and what makes it distinctive is the accessibility of funds, due to the reversal of the operating cycle, which will be used at a further date for an investment plan Foong and Idrees (2012). Thus, both the investment income and underwriting income are key elements of measuring the financial profitability of insurance firms Srivastava and Ray (2011).

Keeping that in mind, Greene and Segal (2004) stated that the performance of insurance companies could be classified as profit performance measures and investment performance measures that can be consolidated in order to obtain the markup derived by the insurance firm.

In financial terms, the profitability is normally expressed in net premium earned, profitability from underwriting activities, annual turnover, return on investment, return on equity. The financial analysis, in general terms, can focus on measuring the company's absolute or relative operating performance, i.e. in relation to a technical or financial context in order to place it within a sector context.

In this study, we choose to mention different apparatuses that were used in previous studies, define each one of them and explicit its formula in order to give out a broad range of solutions that can be used to measure insurance firms' financial performance.

1. Return on Assets

The return on total assets ROA ratio is used to assess the firm's financial statements and its financial condition. It merges the income statement and balance sheet into summary measures of profitability. It is as net profit after tax divided by the total assets. This quotient measures a company's operating efficiency based on its generated profits from the total assets.

Return on Assets (ROA) = Operating Income t (1 - tax rate)/ Book Value of Total Assets t-1

2. Return on equity

The return on equity ROE is used to measure the return earned on the common stockholders' investment in the firm. Generally, the higher this return, the better off is the owners. Consequently, ROE reflects the impact of financial leverage on owners' return.

ROE ratio is calculated as shown: net profit after tax / total shareholders' equity.

3. Return on investment

Among the activity ratios group, return on investment (ROI) ratio is usually used to measure the ability to optimize the use of the available resources. This ratio is a measure of operational efficiency and performance.

ROI ratio is calculated as net profit after tax divided by the total paid in capital. It measures the firm's efficiency in utilizing invested capital. In other words, this ratio expresses company's ability to generate the required return (expected return) based in using and managing the invested resources by the shareholders.

ROI is calculated as shown:

ROI= Operating Income t (1 - tax rate) + Depreciation & Amortization/Gross Fixed Assets + Non-cash Working Capital

Most researchers in the field of insurance and their profitability stated that the key indicator of a firm's profitability is ROA defined as the before tax profits divided by total assets. Hardwick et al. (1999), Malik (2011) are among others, who have suggested that although there are different ways to measure profitability it is better to use ROA.

Respectively, Al-Shami (2008) argued that ROA, return on equity (ROE) and return on invested (ROI) are measurement of profitability.

Accordingly, Kabajeh et al. (2012) stated among the different ways of measuring profitability: Return on assets (ROA) ratio, Return on owner's equity (ROE) ratio and return on investment (ROI) may be the most important. They also stated that ROA and ROE are the most used profitability ratios in the analysis.

Several authors have defined different measures for financial performance indicators, however, most consistently, researchers have stated that the main indicator of an insurance firm's profitability is ROA.

4. Tobin's Q

Tobin's Q: This ratio is based on the investment choice theory developed in 1969 by economist James Tobin. The interpretation of this ratio is dependent on the value of Q that is found. If a Q is greater than 1 means that the firm in question needs to increase its fixed capital stock because the increase in stock market value will be greater than the amount invested. Subsequently, this ratio was re-developed by Brainard and Tobin (1977).

Q is a measuring tool of profitability that multiple researchers used in their papers. This ratio has the advantage of providing researchers with an estimate of the firm's intangible assets like goodwill growth opportunities etc.

For instance, Lang et al. (1993) focused on Tobin's Q as a performance measure observed at a point in time in order to figure out the link between corporate diversification and performance. On another note, Bharawaj et al. (2014) used Q's ratio to figure out the effect of information technology on firm's performance.

Moreover, investment performance revealed the efficiency and effectiveness of investment decisions. Thus, it is the critical factor for measuring the financial strength of an insurer. Among these factors, the one that is mostly used in the vast majority of the literature publications is Tobin's Q that measures the financial performance. Ali et al. (2011) are among the academicians who used Tobin's Q to measure insurance profitability.

Tobin's Q is calculated as shown:

$$Tobin's\ Q = Equity\ Book\ Value / Equity\ Market\ Value$$

5. Economic Added Value

In 1991 Stern and Stewart put forward the concept of EVA, that is the economic added value in order to faithfully and fairly show the true economic profit of the enterprise. Compared with traditional methods, its significant advantage is that the company's economic performance is combined with the degree of risk necessary to achieve that performance. EVA is the most advanced business' performance measurement tool based on the principles of value management argued Kollar et al. (2014). Compared with other evaluation criteria, the reason for this methods' popularity is its relatively simple application.

To cut short, the economic value added equals the wealth generated by the company after deducting the costs of financial related to the company's operational cycle.

EVA is calculated as shown by the following formula:

$$EVA = NOPAT - (WACC * capital\ invested)$$

With:

NOPAT: Net Operating Profits After Tax

WACC: weighted Average Cost of Capital

Capital invested: Equity + long-term debt at the beginning of the period

In a research conducted by Sharma and Kumar (2010), it has been pointed out that EVA researchers have completely different standpoints. As a matter of fact, many support EVA, but many prove that EVA is superior to regular performance-measuring methods.

In an academic work carried out in South Africa in the last decade, De Wet (2005) produced arguments to prove that the advantages of EVA are less than those of accounting measures. In the insurance industry.

Three years after, Acharyya (2008) found that economic value added is insufficient to measure enterprise risk management (ERM). The latter pointed out that shareholder value is one of the main benefits of enterprise risk management. Therefore, this indicates that EVA is considered insufficient to measure shareholder value and thus the firm's financial performance in general.

In another frame of reference, EVA or Economic Value Added, represents an approach to measure the value a company generates from funds invested into it and it is also used in numerous papers in assessing financial performance of an insurer's company.

6. Stock market Ratios

A corollary to the development of financial markets especially stock markets, other indicators have emerged to provide new measures of financial performance, namely:

- Total Shareholder Return (TSR) which is defined as the amount of dividends paid to shareholders and the potential capital gain in the event of the sale of their holdings.
- The Price Earnings Ratio (P/E Ratio) as defined by the corporate finance institute is the relationship between a company's stock price and earnings per share. This is a popular ratio that allows investors to better understand the value of the company. The price-earnings ratio shows the market's expectations, which is the price you must pay in units of current earnings (or future earnings, as the case may be). This criterion is necessary

in order to assess the company's stock market performance. The level of the PER indicates whether the company's stock is over- or undervalued.

- MVA or Market value added is the value of the wealth that the company can create for its shareholders since its inception. In short, the difference between the current market value of the company's stock and the initial capital invested by the bondholders and shareholders in the company.

III. The determinants of profitability:

Amidst an industry that remains very competitive and the uncertainties relating to its environment, assessing the different factors that insurance companies are affected by is of utmost importance.

These factors, focus of our discussion, could be further classified as internal and macroeconomic factors. Nonetheless, before we progress in our chapter's discussion, we'd like to point out that in different literatures related to insurance, profitability is expressed in different manners. In some cases, researchers focus on the insurance industry in general, others focus only on one line of business like Health/Life or Non-life insurance. In other cases, researchers convey their papers in way that they investigate different factors while others focus solely on one factor and its impact on the firm's outcome. In our case, we divide the determinants into three different components. We start by exhibiting internal factors that influence profitability, we focus on external factors in a second step and we finish by introducing the concept of efficiency as a determinant of profitability.

1. Internal factors:

The internal business environment includes factors that affect the success and sustainability of the operations within the company. Internal factors may be conveyed as the firm's strengths and weaknesses. If one element has a positive effect on the firm, it is perceived as a strength. Which brings us to examine these inner factors and their relationship with financial performance.

1.1. Firm size

This aspect can be conveyed in a number of different ways. Becker-Blease et al. (2010) stated that measures of firm size could be weighed by the number of employees in the company's network, total firm's assets and sales i.e. the underwriting premium volume.

With that in mind and due to the particular features and activities of insurance firms in relation to other regular firms, Cummins and Rubio-Misas (2001) approach in measuring the size of an insurance company endorsed using gross written premium to gauge an insurance firm's size.

1.2. Age of the company

A significant determinant of financial performance is company age. When measuring firm's age, Anderson and Reeb (2003) mention in to their approach that the age of the insurance company's variable might be measured as the natural logarithm of the number of years since the company's inception.

1.3. Leverage

Leverage is usually defined as the amount of total debts compared to the owned equity. This ratio shows the degree to which a company in general or an insurance company specifically profit from borrowed money.

1.4. Liquidity

Liquidity is a financial concept that shows the company's ability to quickly convert assets into cash, and reflects its ability to manage working capital while remaining at a normal level. Having a high liquidity level can reduce management discipline in underwriting and investment operations.

1.5. Solvency

Solvency or capital adequacy is a key element in determining financial soundness. It represents the company's ability to meet its long-term fixed expenses and thus achieve financial growth. Sommer (1996).

1.6. Tangibility of assets

Tangibility of assets measures the proportion of fixed assets in total assets. These assets make it easy for companies to access loan channels as they are used as collateral to obtain sufficient funds.

1.7. Underwriting risk

Underwriting risk emerges when the premiums collected are not sufficient to cover the cost of coverage. Insurance prices are established based on estimates of expected claim costs and costs to issue and administer the policy.

1.8. Loss ratio (combined ratio)

One way to measure the performance of an insurance company is to consider it in its core business (underwriting risk). A simple measure that can be adopted is the loss rate of the insurance company. The loss rate is the ratio of the losses and loss adjustment costs incurred to the premiums earned.

The loss ratio for Insurance firms is computed or calculated as shown:

Loss ratio = (Incurred losses + Loss adjustment expenses)/Premiums earned

One can determine the loss rate of each insurance line and the overall loss rate of the company. The loss rate is usually between 65 per cent and 75 per cent, but at the beginning of the insurance period, the insurance company does not know what the final loss rate is.

The second important indicator of performance is the expense ratio. The expense ratio is equal to the underwriting costs of the company divided by the written premiums.

The expense ratio for an Insurance firm is:

Expense ratio = Underwriting expenses/Premiums written

Similarly, it is possible to determine the expense ratio for each insurance item, as is the total cost. Acquisition costs (commissions), general expenses and underwriting expenses are included in the underwriting costs. Some subscription scopes or coverages have lower cost of underwriting. The underwriting fees may be higher for big commercial accounts.

Of course, insurance companies tend to opt for low rates of expenses. The expenditure ratio is usually between 25% and 40%.

The consolidation ratio can be calculated for the general measurement of underwriting performance. The combined ratio is the sum of the loss ratio and expense ratio.

The relationship between the combined ratio and profitability will be further discussed in the following chapter.

1.9. Premium growth

In a study during the past decade, Mehari and Aermiro (2013) measured premium growth by using gross written premium. The premium growth parameter is used as a mean to measure the development in premiums generated by the company. A company that grows rapidly and

excessively may cause the company to fall into ruin, in which the company will prioritize growth over other objectives.

Total premium can be written as follows:

$$Total\ Premium = Average\ Rate \times Number\ of\ Exposures$$

Premium growth can be achieved by increasing the number of risk exposures for instance, selling more policies or by increasing the average price of each risk exposure like increasing underwriting rates or changing the combination of risk exposures. Nevertheless, the number of exposures and the price of each exposure are not independent of each other. Unless insurance products are completely inelastic, rising prices will reduce the amount of risk-taking. In fact, a company may significantly increase its risk exposure through demanding pricing, with little premium growth.

In spite of these concerns and challenges, property and casualty insurers can secure premium growth and greater profitability. However, these firms need to have a good strategy with striking balance between the risk they are taking and the price in which they are covering it. This aspect of the relationship between GWP growth and profitability will be discussed extensively in the following chapter.

1.10. Reinsurance

The reinsurance activity is highly regarded as a field in the finance sector because it makes it easier to transfer and disperse the risks of an insurer, while also playing an active role in capital markets through the funds it channels into securities. It also is considered as a risk management and a policy decision-making tool for the company's capital structure. Burca and Batrinca (2014).

Reinsurance is expensive to the insurer, when insurer transfer risks to a Reinsurance Company, they reduce the volatility the ratio of loss, reducing underwriting risk, reduces its cash-flows volatility and financial leverage, and increase the capital of the company. Thereby, it is of utmost importance to figure out a way to measure insurance dependency if we want to figure out its influence on profitability.

In order to measure the impact of reinsurance on the insurer's profitability, two major ratios are showcased namely RCR i.e. ratio of ceded reinsurance and RRPHS i.e. ratio of Reinsurance Recoverable to Policyholders' Surplus.

The RCR measures the extent to which reinsurance is used by an insurance company to meet its obligation toward its insured. It is measured as the ratio of gross written premiums ceded

through reinsurance to total assets. This ratio has been used in previous academic works, namely by Cole and McCullough (2006) Cummins et al. (2008), Iqbal and Rehman, (2014) and Burca and Batrinca (2014), to gauge reinsurance utilization rates among ceding firms.

The RRPHS gives out a clear assessment of the volume of the insurance company's reliance on its reinsurers to settle claims and the rate of the insurer's exposure to the reinsurer's failure to deliver.

2. Macroeconomic Factors

Considering those, the outside environment allows insurance firms to take suitable adjustments to their commercial plans to make it more adaptable to the external environment and to try to have a competitive advantage among other insurers.

There are numerous criteria considered as external factors. Among them, some of the most outstanding and important factors that need to be listed are GDP, interest rate and inflation rate.

2.1. Gross Domestic Product

GDP is the economic development indicator of a country. GDP accounts the total value of goods and services produced in one year.

2.2. Interest rates

Crowley (2007), defines interest rates as the price a borrower pays for the use of money borrowed from a lender. Economists uphold the premise that interest rate is the price that capital is paid over time and monetarists use the interest rate to attract more funds.

2.3. Inflation

Inflation is a general increase in the prices of goods and services in a particular country. In particular, it leads to a decline in the value of money. If a country’s inflation rate increases significantly, the country’s total goods and services also decrease significantly Suheyli (2015).

Section 2: Efficiency

In this section, we try, as a first step, to shed some light on the concept of efficiency as well as some important notions related to it and then showcase different methods of measuring efficiency that have been utilized in previous literature.

I. The concept of Efficiency

Originally, efficiency was an industrial engineering concept that came about at the beginning of the 20th century. Management theorists such as Frederick Taylor and Frank and Lillian Gilbreth conducted studies primarily to improve efficiency.

There are several definitions of efficiency. In consumption theory, Efficiency is where the consumer has the ability to maximize his utility or satisfaction. Whilst, in the production theory it is where a company can maximize its profit in the realized production. In conventional literature, the theory of production will describe the company's treatment of buying and using inputs for the production and output of produced products.

In his article, Ghimire (2016) affirms that efficiency is an organization's productive capacity. As it is the ability of the company to produce desired goods or services with minimal resources, expenses, and waste. Ghimire adds that efficiency is assumed to improve when more products of a given quality are produced with fewer or even less resources, or when the same number of outputs are made with less input.

Higher levels of efficiency is displayed when there are more outputs produced per input unit. Once efficiency reaches an optimal point, which is the highest possible performance per input unit, we then talk about a state of absolute or optimal efficiency. This state is only possible when changes in the production process or new technologies are put in place. Karim (2007) in his study asserted that efficiency will be optimal if the company can maximize output by using fixed input or by minimizing the use of input to achieve the same level of output.

In the light of this, the theory of production will see the company's ability to maximize profits and optimize its efficiency. From an economic point of view, there are two ways of understanding of efficiency: technical efficiency and economic efficiency. Economic efficiency has a macroeconomic viewpoint, while technical efficiency has a microeconomic standpoint Cummings (1998).

From a macroeconomic outlook, the premise of economic efficiency is maximizing profits by minimizing costs and maximizing revenues. Cost reduction involves minimizing input usage depending on the outputs produced, and maximizing revenue involves maximizing outputs subject to the inputs used. Complete technical efficiency is said to have been achieved by firms, which minimize inputs conditional on output.

J. Cummings (1998) also argued that the company that minimized the output-based input has achieved full technical efficiency. In minimizing the cost, it is also important to choose the best-input combination to achieve "allocative" efficiency.

Realizing technical efficiency and allocative efficiency is also important for maximizing revenue. Technical efficiency is achieved by maximizing the output of a given input, and allocative efficiency is achieved by selecting the optimal output combination. Profit efficiency involves the best choice of input and output, depending on the price of both output and input.

From what we discussed above, it is clear that here are three fundamental forms of efficiency: technical, allocative and the combination of technical and allocative efficiency which is referred to as cost efficiency, subject of our research.

Measurement of technical efficiency is limited to technological and operational relationships in the process of converting inputs into outputs. While in economic efficiency, price can not be considered given, because the price can be influenced by macro policy Ascarya (2009).

II. Measurement of Efficiency

Measuring efficiency is becoming a very important part of the business environment nowadays. Every company is becoming mindful when it comes to its productivity, therefore it is consciously focused on assessing its level of performance. If a company can make the best use of its resources (i.e., input to produce output), it is considered to be efficient and vice versa, it is deemed inefficient otherwise.

It's essential to measure Efficiency appropriately. Many companies that want to raise their competitiveness are investing a lot of money in methods to track their performance and their cost efficiency.

Besides, it is often important to measure firm's performance and compare it to other firms when analyzing insurance companies. Classically this has been done using classical financial ratios suchlike equity returns, asset returns, premium ratio expenses. These conventional methods are

rapidly becoming obsolete with the rapid evolution of frontier efficiency techniques. This sophisticated approach measure firm performance against the frontier of best practice consisting of other companies in the industry.

Testing economic hypotheses about insurers on matters such as organizational form, distribution systems, economies of scale and scope, and the effects of mergers and acquisitions will not be convincing in the future unless they involve the use of one or more performance measures based on frontiers.

In this chapter, we introduce the concept of Data Envelopment Analysis (DEA), Fontier analysis, Fuzzysets Theory and TOPSIS method.

1. Stochastic Frontier analysis and Data Envelopment Analysis

Among the methods of measuring efficiency, the main two widely used in the literature are stochastic frontier analysis (SFA) and data envelope analysis (DEA).

SFA, also known as the frontier method of econometrics, was developed by Aigner et al. (1977). This method specifies a functional form for the cost, profit, or production relationship between input, output, and environmental factors, and allows for random errors Berger et al. (1997). These mentioned functions are used to estimate the distance between the firm and the optimizing envelope, Seale (2000).

Charnes et al. (1978) Introduced data envelopment analysis (DEA) or mathematical programming methods in the late seventies and drew upon the concept of efficiency inaugurated by Farrell (1957) by the middle of the previous century. As stated by Charnes et al. (1978), DEA estimates efficiency under the assumption of constant returns to scale, while Banker et al. (1984) estimate efficiency under the premise of a variable returns to scale. This method constructs the frontier of the observed input-output ratio through linear programming. It is assumed that linear substitution can be performed between the input combinations observed on the isoline.

In other words, DEA is a model that combines all an enterprise's input and output information into a production efficiency measure between 0 (i.e. a completely invalid enterprise) and a unit (1) (i.e. a fully effective enterprise). Furthermore, DEA estimates the frontier effectively by finding a set of linear estimates that restrict (envelop) the observation data Leong et al. (2003).

Thereby, this approach is a benchmarking procedure in the sense that "best practice" firms are on the frontier and other inefficient firms are "enveloped" Neal (2004).

Multiple academic works were carried out to measure the efficiency of insurance industries using the DEA tool and tried to put forth an understanding of insurance financial performance in different countries all over the globe. Namely the one's in the United States that are undertaken by Berger et al. (1997), Cummins et al. (1999), Meador et al. (2000), aCummins and Weiss (2002) and Cummins et al. (2010), and the insurance sectors in other countries like in Japan, Italy, United Kingdom, Australia, Spain, and Germany have been studied by Fukuyama (1997), Cummins et al. (1996), Diacon (2001), Worthington and Hurley (2002), Cummins and Rubio-Misas (2001), and Mahlberg and Url (2010), respectively.

1.1. Stochastic frontier

The stochastic frontier (SF) method, as noted earlier, was first proposed by Aigner et al. (1977) and Meeusen and Van Den Broeck (1977) and it's a method that helps estimating cost efficiency.

As mentioned in the first section, cost efficiency can be composed of two parts: technical efficiency, reflecting the ability of an enterprise to obtain the maximum output from a given set of inputs and allocative efficiency, which reflects the ability of an enterprise to use these inputs in optimal proportions, taking into account their respective prices.

The SF model includes estimating the cost frontier based on output and input prices, where the deviation from the frontier is considered to be linked to cost inefficiency and statistical noise.

Both DEA and stochastic frontier analysis have established benchmarks for comparing the performance of firms or production units. The benchmark is determined by available technology. By comparing the actual output produced with the maximum possible output, a measure of technical efficiency and related scale efficiency can be derived.

1.2. DEA

As outlined above, DEA is a non-parametric technique of selecting a benchmark, then measuring efficiency with numerous inputs, numerous outputs and no market prices. The classic references are Charnes et al. (1978, 1981) but Farrell (1957), Debreu (1951), and Shepard (1953) laid down the roots of the method.

DEA uses linear programming as an alternative to market prices, to calculate 'weights' or 'shadow prices.' Linear programming calculates the shadow prices which maximize an objective function subject to the identified constraints. The data used for the DEA are the actual observed procured inputs and the actual output generated by the units of expenditure.

This method of optimizing mathematical programs measures the technical efficiency of a Decision Maker Unit (DMU) and compares it with other DMUs Charnes et al. (1978) and Banker et al. (1984). Assuming maximization of the efficiency ratio makes this DEA research use output orientation in the calculation of technical efficiency. Another orientation is minimization of inputs, but the two assumptions still get the result Sutawijaya dan Lestari (2009). There are three benefits arising from DEA Insukindro and al. (2000) efficiency measurement, first as a benchmark for obtaining relative efficiency that is useful in facilitating comparison among the same economic units. Second, measure the different efficiencies between economic units to pinpoint contributing factors, and third, determine policy implications to enhance their efficiency.

DEA was initially used to overcome shortcomings of the ratio and multiple regression analysis. Ratio analysis can only provide information that certain DMUs have the special ability to transform one type of input into one particular type of output, while multiple regression analysis infuses multiple outputs into one. DEA is intended to measure the relative effectiveness of a DMU which uses more than one input and output, in which it is impossible to incorporate. A DMU's relative efficiency is the efficiency of a DMU when compared to other DMUs in a sample using the same input and output type. DEA formulates the DMU as a linear fractional program for finding a solution if the model is converted into a linear program with a weighted input and output value. In the case of varying inputs and outputs, the efficiency of a DMU is calculated by transforming inputs and outputs into one. This transformation is effected by determining the weights that are appropriate.

- Limitations of DEA

As is generally the case with numerical methods, the main limitations of DEA arise from an assumptions failure. Random noise, measuring error or outliers are normal in data. It's not advisable to presume an outlier is also a best practice. The data used to portray inputs and outputs are not always well understood and the efficiency measurement is particularly sensitive to the number of variables.

The primary problem here is that the approach does not need to specify a relationship between the inputs and the outputs of the decision-making units. It requires only that the combinations of input and output are known for each unit. Anything beyond the simple logic of aggregated labor and capital begins to add measure and interpretation inconsistencies.

Despite these inherent limitations, DEA is the principal approach used to measure DMU efficiency.

1.3. Stochastic Frontier Analysis

Stochastic frontier analysis provides a way to address two of DEA's limitations which are the presence of random noise, measurement error, and outliers, on the one hand, and the input-output relationship, on the other. Nevertheless, it does so without resolving the key problem of needing price weights to aggregate public institutions' multiple inputs and multiple outputs.

Stochastic frontier analysis is a statistical method based primarily not on mathematical programming but rather on regression to estimate a production function it uses regression and the input and output outlined. Then, for measuring efficiency, it uses the random errors generated by the estimation process.

This method, in particular, uses the estimated production function to clearly define a technical, cost, or profit frontier against whom analytical units are compared and their degree of efficiency is assessed.

2. The concept of fuzzysets

By using classical logic, you can only work with the information that is either totally true or completely false. It is not possible to control the inaccurate or insufficient information, though this information may provide a more practical solution.

In general, human evaluations are characterized by imprecise language such as terms like equal, weak, fairly strong, very strong, and absolute. Hence the implementation by decision-makers of fuzzy theory allows them to deal with uncertainties effectively.

Zadeh (1965) conveyed the theory of fuzzy sets as an effective method for mathematical representation of human-made uncertain and imprecise assessments. The word “fuzzy” originates in English and means a vague, imprecise concept. By virtue of the incorporation of the fuzzy concept, it is possible to allocate a value to a statement that varies between totally false and entirely true.

Fuzzy set premise is based on fuzzy sets that represent a class of belonging objects Negoita (1985). This kind of sets is characterized by a membership function that is assigned to each class object with a rank moving inside the interval [0,1]. The mathematical operations allowed

on the sets include: addition, subtraction, multiplication, and division as noted by Dubois and Prade (1979), Kaufmann and Gupta (1991).

Bellman and Zadeh (1970) were the first to introduce the theory of fuzzy sets in decision-making, in situations where vague, imprecise and unclear data were used to generate decisions. Yager and Basson (1975) also proposed the adoption of the theory of fuzzy sets in the decision-making process.

3. TOPSIS method (Technique for Order Performance by Similarity to Ideal Solution)

The Technique for Order Performance by Similarity to Ideal Solution as presented by Hwang and Yoon (1981) identifies solutions from a finite set of alternatives. TOPSIS ranks alternatives according to their distance from the Positive Ideal Solution (PIS) and Negative Optimal Solution (NIS). PIS denotes an alternative which maximizes the benefit metrics and minimizes the cost metrics while NIS has the opposite logic, which means that it maximizes the cost metrics and minimizes the benefit metrics Benítez, Martín and Román (2007).

In their paper, Seçme, Bayrakdaroğlu and Kahraman (2009) noted that this method takes into consideration PIS and NIS distances, with the optimal alternative being the one closest to PIS in geometric order, and the one farthest from NIS. The ranking of alternatives is built on the relative similarity with the optimal or ideal solution, which prevents the alternative situation from having the same similarity to both PIS and NIS. PIS is specified using the best rating of the alternatives values for each individual criterion. Vice versa, the NIS denotes the worst ratings of the alternatives.

For each criterion, the terms 'best' and 'worst' are interpreted separately, depending on whether the criteria are in question for maximization or minimization.

The TOPSIS methodology presented by Hwang and Yoon (1981) consists of these following steps:

- Step 1: The decision matrix is normalized;
- Step 2: A weighted normalized decision matrix is obtained by multiplying the normalized matrix with the weights of the criteria;
- Step 3: PIS (maximum value) and NIS (minimum value) are determined;
- Step 4: The distance of each alternative from PIS and NIS is calculated;
- Step 5: The closeness coefficient for each alternative (CCi) is calculated;

- Step 6: At the end of the analysis, the ranking of alternatives is made possible by comparing the CCi values.

❖ Application of FAHP and TOPSIS method for evaluating the parameters in the insurance sector FAHP (Fuzzy Analytic Hierarchy Process)

A study conducted in Serbia where authors who have measured the efficiency of insurance companies have analysed different criteria, Backovic and Babic (2013) used AHP to identify the best life insurance policies.

They analyzed the following criteria in their paper: premium and sum ratios insured, life insurance premiums, mathematical reserves, offer diversity, number of insurance contracts, length of business, agent ability.

Stepic and Stosic (2012) proposed the DEA method of calculating the efficiency of insurers. They analyzed efficiency of business through the following parameters (inputs: insurance costs, capital and reserves, number of employees, number of types of insurance, number of branches and output: total income) and profitability through (inputs: insurance costs, capital and reserves, employee and output costs: insurance income, other income).

The FAHP approach was first applied to allow the estimation of the weight vectors for each financial parameter separately. The FAHP method can be illustrated on the underlying of two stages:

- Stage I: the definition of basic criteria in relation to the target. The objective is Assessing financial parameters in the insurance sector.

  In this stage five basic criteria are analyzed: equity and reserves, business assets, supply and liabilities, financial income, insurance costs.

  Equity and business assets were considered to be the two metrics with utmost importance. Equity and reserves reveal the actual overall state of insurance companies. The structure of insurance provisions and the structure of investment are, in fact, indicators of the characteristics of insurance companies' operations.

  In addition to these two criteria, and on his researcher, Mandić (2017) have considered the following parameters: provisions and liabilities, financial returns and insurance costs on the basis of which we can provide a complete discernment into the efficiency of insurance companies' activity.
- Stage II: The ponderosity of each criterion are calculated using the Fuzzy AHP method. Once the weight vectors of the criteria using fuzzy sets analysis are determined, the TOPSIS method is used to allow insurance companies to be ranked on the basis of

financial criteria. The standardized matrix is then multiplied by the criteria's FAHP weight vectors resulting in a weighted standard matrix, after using TOPSIS method in the normalization of the decision matrix as a first step.

Through the TOPSIS system, the next step is to decide the shortest distance from the PIS and the farthest distance from the NIS. After the PIS measurement and the nearness coefficient can be obtained for each alternative, in other words insurance activity.

At this point, PIS, NIS, CCi parameters are defined and we have an overview on insurance firms rankings. At the same time, the TOPSIS approach considers PIS and NIS distances, which will lead us to an optimal solution that is the nearest to PIS and the farthest from NIS.

Conclusion

Insurance firms' financial performance has always been the subject of interest among scholars. Previous studies have tried to shed light on the link between different variables insurers' profitability.

We tried in this first chapter to define insurer's profitability, its indicators, its primary measurements as well as its major determinants. And with previous studies as a background, we analyzed profitability as a concept and then we shifted our focus to better understand insurance companies' internal and external factors as well as the concept of efficiency and the different ways to measure it.

In the following chapter, we will focus our interested in analyzing the researchers' findings regarding the relationship between profitability with the level of reinsurance, premium growth, loss ratios, and efficiency in order to better explain their impact on insurance financial performance.

Chapter II: Review of Literature

Introduction

Previous studies that examined the determinants of insurers' performance were interested in different variables, and the majority of these variables were examined in order to assess their influence on returns. Similarly, in the first section, we intend to focus on the influence of insurers' specific characteristics and external factors that concern industry features.

The choice of the variables used in this thesis is based on our judgement that internal factors as well as the insurer's primary functions are controllable by the management. These latter are subscribing new policies, claim management and settlement and portfolio monitoring, statistics and prevention with the emergence of other activities like reinsurance ceding which gives the insurer the possibility of further enhancing his turnover without necessarily being binded by capital restrictions and the same goes for claims payment as reinsurers proportionately or non-proportionately settle claims with the direct insurer.

However, the relevant literature that we display also shows the effects of macroeconomics factors on profitability. The financial performance of insurance companies is also important in the macroeconomic environment because insurance companies have important functions and contribute to the development of the economic and financial system.

Moreover, as we go further in this chapter, we introduce another concept that we also deem as a strategic choice of the management, which is the concept of efficiency, its link to profitability and its determinants.

Several empirical studies have been interested in the impact macroeconomic factors in addition to the internal ones on banking performance however very few on that of insurance. In this chapter, we present in detail studies on the nature of the relationship between these determinants and insurers' financial performance.

Further, we call into question the correlation between efficiency and profitability of an insurer through the second section.

Then in a final step, we outline the main findings concerning the determinants of profitability as well as the empirical framework used to obtain those findings.

Section 1: Profitability determinants review

A company's financial performance is either positively or negatively affected by multiple factors, some of which are internally linked to the company's success and can be regulated theoretically, while others are external, resulting from the company's ability to compete successfully in the market.

I. Internal factors

Value creation within a business is the product of a complex alchemy of technical, financial, organizational and, of course, human factors, which must be measured, compared and explained.

In insurance, the uncertainties inherent in the profession (risk taking, reverse cycle, therefore cost price known a posteriori...) make measuring insurer's profitability even more difficult.

When we take a closer look towards the concept of value creation from an insurer's viewpoint, monitoring performance will consist of striking the balance between different components. These components are the core basis of an insurer's activity. Thus looking into their effect on performance is pivotal.

In order for insurance companies to maintain sustainable development in a highly competitive global environment, yielding profits is essential. Without profits, insurance companies cannot attract external capital to carry out their objectives Teklit & Jasmindeep (2017). The performance of an insurance company depends on the validity of the designed policy, and its performance can be estimated by measuring its profitability, while the performance of an insurance company is related to specific determinants other than external factors Malik (2011).

As we mentioned, factors that may affect the profitability of an insurance company can be internal or external.

Primarily, aside from the factors that characterize an insurance firm (age, size, solvency, liquidity, ownership structure…), our focus will be on the change in written premiums reflects the company's commercial effort and, ultimately, the financial outcome of the line of business, which is obtained by the difference between investment income and expenses allocated to insurance operations. These two factors, i.e. premiums and costs and expenditures, intertwine in order to hit a certain level that makes the insurers business profitable. Needless to say, the

reinsurance companies intervene to help insurers, not only when underwriting new policies as it gives them a little nudge (capital requirement), but also when settling claims. These factors represent nothing but decisions made by the insurer on day-to-day basis, which conveys commercial strategies adopted by the latter. The following are the findings, which various researchers investigate.

1. Firm size:

Firm size measurement plays a crucial role in microeconomics and financial analysis.

In regards to the link between this factor and profitability, an important claim is that the firm's important size enables it to draw off cost advantages due to scale economies and the pressure made by pricing control as stated by Robins and Wiersema (1995) which would lead to higher output.

Furthermore, Cummins and Weiss (2004) argue that if they populate the market, the relatively small firms are more likely to linger on and lose their competitiveness.

Moreover, while examining the relationship between this factor and financial performance, Cummins and Nini (2002), argued that this parameter is expected to be positively associated with efficiency if larger firms have lower insolvency risk and/or are able to earn higher proceeds because size expresses the firm's weight on the market. This assumption is also supported Lee, (2009) and Doğan (2013), who stated in their research that there is a positive relation between firm size and performance.

According to all the previously listed researchers, there is a positive relationship expected between firm size and profitability. However, Yuki Li (2007) in his analysis of banks profitability, drew attention to the possibility of the existence of a negative relation between the two elements if the firm becomes extremely large and bureaucracy becomes a handicap.

2. Age of the company

The age of a company is a cornerstone when it comes to organizational studies. Athanasoglou et al. (2005) in his study argue that newly established insurance are not likely to be profitable in their first years of undertakings, as they focus primarily on expanding and developing their market share, rather than on improving profitability.

A growing body of literature has examined the link between age and financial outcomes, and the results are two different trends of researches. The first line supports the statement that age

helps firms becoming more efficient through experience which gives them an advantage when exploiting their experience on the market making them more profitable that is also argued by Vijaykumar and Kadirvelu (2004) and Bates and al (2008). Likewise, Yuqi li (2007) stated that older insurance are expected to be more profitable due to their reputation that they built throughout the years.

The second line of research indicates that older and more bureaucratic firms are more resistant to change and new trend and might be overtaken by newer and more flexible companies.

Consequently, the expected effect of this variable on results is unclear due to the equivocal findings of the past researches.

3. Leverage

Firm's leverage is a fundamental principal in corporate finance because it gives us an idea about the firm's capital structure. Multiple studies have focused on the concept of leverage and its relationship with other financial determinants and components. For instance, Ferreira and Vilela (2004) stated in their study that leverage reflects the firm's capacity to issue debt as well as reflecting its ability to manage its exposure to unexpected losses.

The influence that leverage has or should have on profitability has been put under the scope by academicians. A positive relationship is to be expected between profitability and ROE and a negative one is expected between profitability and ROA as companies with lower levels of leverage ratio reported higher levels of return on assets.

Chen et al. (2009) used structural equation modeling that includes factor analysis and path analysis to analyze the relationship between leverage and profitability and as stated by their findings there exists a significant and negative relationship between leverage and profitability.

This finding is also supported by Malik (2011) who conducted his studies on insurance companies in Pakistan and Wabita (2013) who conducted his research in kenya. Although, Malik (2011) make a point of entertains the idea that as leverage reaches a desirable point (optimal capital structure) the debt increases the firm's profitability.

However, Boadi et al (2013) while studying Guinean insurance market had found an insignificant correlation between the two.

In short, the relationship between profitability and leverage is essentially unclear. Certain papers prove that the link is positive while others prove quite the contrary.

4. Liquidity

According to the agency cost theory, and according to a study by Adams and Buckle (2000) high liquidity of assets may increase the agency costs of owners, because managers may use the benefits of liquid assets.

Moreover, liquid assets mean a higher reinvestment risk, because the return on liquid assets will have to be reinvested after a relatively short period of time. Consequently, reinvestment risk will put pressure on the company's performance. Therefore, in this case, an insurance company with less liquid assets may outperform an insurance company with more liquid assets.

On this ground, studies carried out by Andres and Stephen (2013), Abate and Yuveraj (2013), Meaza (2014), Suheyli (2015), Edlira et al. (2016), came to the conclusion that there is a negative and significant relationship between the profitability and the liquidity of insurance companies.

The opposite of this finding is presented by Eric et al. (2011), Charumathi (2012), and Behaylu (2017) who pointed out that the liquidity ratio is positively correlated with profitability, which means that when the company's liquidity is improved, profitability will also increase.

On the other hand, Mirie and Jane (2015) conducted research in Kenya, and Nikhel (2015) conducted research in India and demonstrated that there is no statistically significant relationship between the liquidity ratio and the company's profitability.

In short and in regards to this ratio, different studies put forth different findings when investigating the relationship between leverage and profitability. This could be owing to being conducted in different markets with different behaviors.

5. Solvency

Insurance companies with higher solvency ratios are considered to be financially sound. In fact, financially sound Insurance companies find themselves in a better position to attract potential policyholders and to better comply with the specified underwriting standards and guidelines. Therefore, these insurance firms can expect better underwriting results. Nevertheless, Asrat et al. (2016) have found a negative and significant relationship between solvency and profitability.

However, in a prior study that have been conducted to determine the impact of solvency on the performance of insurance companies by Bawa and Chattha (2013) found, in this context, a non-significant relationship between solvency and financial performance.

Solvency of insurance is generally expressed through the solvency margin and in consequence it provides us with a description of the volume and condition of the capital adequacy of insurers. This margin is the amount of capital that an insurer must retain to cover expenses that may occur in a chance of unforeseen episode.

6. Tangibility of assets

Yuqi Li (2007), and through a study conducted in the United Kingdom found that there is no significant relationship between the tangibility of assets and the profitability of insurance companies.

Whereas, Asnakew (2011) in his study argued that tangible assets may affect the company's borrowing decision, because they are less affected by inherent information asymmetry, and for the most part have greater value than intangible assets in case of bankruptcy. Therefore, it is believed that the availability of such lending capacity will positively affect the profitability of insurance companies.

Within this framework, Naveed et al (2011) investigated the effect of firms' characteristics on financial performance of life insurance companies in Pakistan and their findings showed an insignificant relationship between tangibility of assets and ROA.

Discordantly, Malik (2011) finds a positive and significant correlation between tangibility of assets and profitability of insurance companies and the larger and older the insurance firm is the more tangible assets it has.

In brief, tangibility of assets is also a parameter where scholars have a dissimilarity when it comes to its linkage to profitability. Some argue that the association is positive, some argue that it is negative while others proclaim that there is no significant relationship between the two.

7. Underwriting risk

Insurers undertaking risky businesses and diversifying underwriting risks help mitigate exposure to underwriting losses and improve operating profit. This criterion reflects the adequacy and efficiency of the insurers' underwriting conduct.

Charumathi (2012) finds no evidence of a link between insurance risk and profitability for the Indian life insurance sector. However, lower expected losses can lead to better performance because monitoring and damage settlement costs are low. Chen-Ying Lee (2014) stated that insurance risk has a significant impact on a company's profitability.

This parameter highly depends on the insurers' risk appetite. Literature shows us different findings from having no link to profitability to having a positive one.

As for measuring Underwriting Risk, Adams and Buckle (2000) determined this variable through the claim incurred divided by annual premium earned.

8. Reinsurance

8.1. The use of reinsurance

Since some of the risks that insurers underwrite are too large for them to retain, in order to reduce loss exposures, insurance companies transfer part of the risks to reinsurers. Reinsurance helps insurers to manage their risks by absorbing some of their losses. Reinsurance also stabilizes insurance company results and enables growth and innovation to continue. Freeing up capital allows insurers to write more business, thus enabling economic growth and helping to create stability Swiss Re (2013).

The primary motivation behind acquiring insurance or reinsurance is risk sharing. However, Doherty and Tinic (1981), as well as Plantin (2006) have proven that it is not the only purpose of purchasing it. As a matter of fact, an insurance company reinsurances several of its business lines in order to diversify the risk of its portfolio, to reduce the possibility of bankruptcy, to use the expertise and skills of the reinsurance company, and to stabilize the reinsurance company's stakeholder returns.

Besides, in their paper, Mayers and Smith (1990) considered the similarity between the motive of the company to buy insurance and the motive of the insurer to buy reinsurance, and provided the logical basis for the positive aspects of reinsurance.

Purchasing reinsurance can reduce pre-tax income volatility and thus minimize the expected tax strain on the firm. The costs and the risk of bankruptcy are high for companies with large cash flow fluctuations. Because the essence of the business of insurance companies is based on risk management and coverage, insurance companies are generally very likely to have increased cash flow volatility and thence reinsurance buying can reduce the risk of going bankrupt and the expected costs of bankruptcy Mayers and Smith (1990).

Reinsurance helps the insurance companies increase their level of investment. Companies sporadically withhold valuable investment incentives due to fear of abnormal losses. Major losses will lower the value of the outstanding policies of both the companies and the equity. Therefore, if the firm purchases reinsurance, the probable losses would be settled and the firm can take on value increasing projects as stated by Mayers and Smith (1990).

Moreover, researchers such as Derrig and Ostaszewski (1997) and Petroni et al. (2000) have proven that in insurance industries that it is essential to correctly manage corporate tax and meet the minimum requirements solvency restrictions imposed by regulators, asset and liability management and proper reservations. However, Hoerger et al. (1990) found in their paper that in order to respect these requirements, reinsurance emerge to be used by insurance companies to transfer unforeseen underwriting risks to another company.

In relation to reinsurance, we propose taking into consideration two key factors one that are Ratio of Ceded Reinsurance (RCR) and Ratio of Reinsurance Recoverable to Policyholders' Surplus (RRPHS).

Both of the concepts differ not only in their definition but also in the way they are calculated and interpreted. In this section, we are going to study both of the concepts and mention their linkage to the notion of profitability following previous researches and schools of thinking.

8.2. Theoretical framework

Some preliminary work was carried out reviewing reinsurance, showing the positive and negative effects. Through those studies of different aspects of reinsurance, it has been demonstrated that they have a considerable impact on insurance companies' profitability and financial health.

Culp and O'Donnell (2009) claimed that reinsurance helps insurers in avoiding significant opportunity costs due to the catastrophic loss that they may have to face if they choose writing the business without the reinsurer's intervention. Charumathi (2012) defined reinsurance retention ratio as the percentage of the underwritten business which is not transferred to reinsurers. An insurance firm that is more efficient in its underwriting activity would have greater profitability if it has higher retention, the researcher added.

The same conclusion was drawn by Chen et al. (2001), Swiss (2003), Arndt et al. (2004), Zeng (2005), Powell and Sommer (2007), Cummins et al. (2008) and AMF (2010), who argued that reinsurance causes a reduction in the needless or unnecessary volatility or instability of the

results of the financial statements, in particular the profits and losses declarations. It helps stabilize direct insurer's income by reducing its insolvency risk. Reducing the risk of insolvency is due to the benefits inherent in the reinsurance for the direct insurer, such as stability of loss experiences, enhanced underwriting capacity, specialized services and protection against catastrophic risks.

However, companies with high likelihood of bankruptcy tend to seek more reinsurance. Chen et al. (2001), Arndt et al. (2004), Powell and Sommer (2007), and Cummins et al. (2008) stated that reinsurance helps stabilize direct insurers revenues by enhancing their underwriting capability and mitigating their risk of bankruptcy and ruin.

Claiming that direct insurers acquire reinsurance contractual agreements for two main reasons, to diversify their risk and enhance their financial stability. But reinsurance's widespread use can also be due to its financial distress. Financially challenged firms with higher chances of insolvency appear to use more reinsurance practices because of their failure to raise the capital required from financial markets. Reinsurance practice availability encourages direct insurers to engage in highly risky business resulting in greater probability of insolvency. The increase in ceded reinsurance leads to a further reduction in the risk of insolvency due to a reduction in the company's leverage level. But again the increasing trend in ceded reinsurance without continuing to increase the capital simultaneously could also increase the risk of insolvency. This occurs due to the obvious insurance business' unique credit nature or because of the obligations a direct insurer has towards its policyholders. The reinsurance procedure does not diminish the liability of the direct insurer towards their policyholders. The primary insurer is completely responsible for paying its insureds whether or not the reinsurer makes payment Chen et al. (2001).

In Addition, in a paper published by AMF (2010) states that there are certain risks in the reinsurance business such as legal risks (when the law cannot enforce the contract and the contract terms do not fully reflect the direct insurer’s intentions), counterparty risk (which occurs because the reinsurer cannot pay the direct insurer) liquidity risk (due to the direct insurer’s payment of claims and reinsurance occurs at the time interval between the person receiving the payment) and residual insurance risk (which occurs due to the difference between the reinsurance demand and the actual coverage it provides). All these listed risk can get in the way of an insurer’s profitability.

Accordingly, the same outcome was also obtained with Austrian insurance firm where insurance firms that ceded more of their premiums to reinsurance reported higher levels of returns. This conclusion comes hand in hand with the assumption that in developed insurance markets where insurance companies that are expanding throughout other countries, use reinsurance as a tool for better risk diversification extenuating through this mean potential losses. Kramaric and Galetic (2013).

However, they also state that in Croatia, were the researchers also conducted their study that they found the relationship between the level of ceded premiums and the level of income of insurers is significant and negative contrarily to their own findings mentioned in the previous paragraph. This is consistent with the presumption that a small or undeveloped insurance market, whose scope of activities is limited to its national borders, is not susceptible to severe losses, which leads to a decline in the share of reinsurance premiums ceded.

Thus, we find ourselves in front of a new stream of reinsurance studies who may have tended to focus on the negative or unconstructive impacts of reinsurance and addresses issues such as why and how direct insurance becomes economically unviable.

In the event of large claims, insurance firms reinsure a certain portion of the underwriting liability to reduce the possibility of bankruptcy. Although reinsurance improves the insurance provider's stability by dispersing risk, honoring solvency criteria, managing the risk profile, and increasing underwriting efficiency, there is a cost associated.

It is crucial for insurance firms to assess an acceptable degree of retention, and they must seek to strike a balance between lowering insolvency risk and reducing future returns. While it improves operating efficiency, increasing reliance on reinsurance decreases retention rates and decreases future profitability. Therefore, the relationship between output and retention ratio may be hypothesized to be negative.

To be more precise, the insurer may win in the short term because the reinsurer covers one year of poor or mediocre subscriptions; with long-term insurance, profitability is diminished, otherwise there will be no viable reinsurers. Reinsurance dependence can therefore have a negative relation to success Shiu (2004).

Typically, general insurers provide reinsurance coverage to boost earnings, improve underwriting efficiency and provide protection against catastrophic losses. Reinsurance purchases will substitute capital and allow an insurance firm to have less capital without raising

the risk of insolvency. It is worth noting that the type of insurer makes reinsurance units more complicated. Thereby, they rely heavily on reinsurance to stabilize their results and take greater risks that cannot be justified either by their capital base alone or by arbitration. Shiu (2004).

The outward reinsurance is costly since reinsurance consists primarily on transferring risk via the transfer of capital. Accordingly, a negative impact on profitability may be expected Burca and Batrînca (2014) and Chen-Yin Lee (2014). This reinsurance cost for a direct insurer can be much higher than the actuarial price of risk transferred. It may become a reason for the direct insurer to generate insurances that are more expensive.

Chen-Yin Lee (2014) had put forward the idea that with an important reinsurance dependency comes lower profitability rates. It is known in the financial domain that higher risk is associated with greater probability of higher return and conversely lower risk is associated with lower probability of high returns. Thence, if an insurance firm tends to cede an important level of its premiums and keeps lower retention, it operates as if it's an insurance broker rather than a firm and consequently it is likely to report less profit for it only cashes in returns from cuts given by reinsurers instead of those from its regular risk management activity.

The effect reinsurance has on direct insurers can be measured by analyzing the impact of reinsurance utilization and exposure on firm's profitability ratios. RCR i.e. Ratio of Ceded Reinsurance shows the reinsurance utilization and Ratio of Reinsurance Recoverable to Policyholders' Surplus (RRPHS) shows the reinsurance exposure or the risk associated with reinsurance.

In a study conducted by Iqbal and al. (2014b) the results of the pooled regression model used in their analysis show that RCR has a significant and positive correlation with ROA. While RRPHS, was found to be insignificant and thus had an insignificant negative relationship with ROA. This result i.e. the one with RRPHS shows that it does not have any significant impact on the profitability insurers in Pakistan.

On another note, Dansu and al. (2018) have found results that confirm Iqbal and al. (2014b). In fact, they found that in the context of the Nigerian industry, by measuring profitability through the loss ratio, this latter increases by 15% if RRPHS increases by 1% and thus a decrease in RRPHS by 1% means a decrease of 15% in loss ratio thence general profitability.

Taking into considerations all the results and arguments put forward by different scholars, we can see clearly that the reinsurance variable impacts different industries diversely. It can both

influence direct insurers returns positively or negatively, depending on the context of the companies i.e. their size and level of capital and the industry itself, in other words, whether it's a closed border industry or not.

9. Loss ratio

Risk analysis has been a proven method for insurance firms for many years. Under theory, they balance the projected costs and income from the sold policies with the revenue. Solvang, E. (2001). In this context, the loss ratio has been the thermometer for a company's performance operating in a risky environment. In this paper, the ratio that depicts losses that we will monitor is the combined ratio.

When the combined ratio is less than 1 or under 100%, underwriting results are considered profitable and the insurance firm is considered to be making profits from its operation business. However, when the combined ratio is more than 1 or over 100%, underwriting results are considered unprofitable and the company is losing money from its primary business line. Be that as it may, the combined ratio underestimate real underwriting profitability by measuring losses undiscounted. In other words, this ratio does not take into account profits generated from the investments made by the firm.

Loss ratios or combined ratio to be specific is a key element in the world of insurance. This index is a measure of profitability used by an insurance company to measure how well it is performing in its day-to-day operations. The combined ratio is calculated by dividing the sum of the losses and expenses incurred by the premium earned.

Insurance companies are called by law to honor their liabilities once the insured comes forth with an insurance claim. Therefore, Claims are the recourse issued by the insured to insurance company for the compensation of loss that has incurred.

Organizations that engage in risky activities are likely to have more volatile cash flows than entities whose management is more risk-averse Fama and Jensen (1983). Insurers set premium rates based on the predicted loss ratio that supports claim payments, administrative costs, profit requirements and an appropriate risk margin in the event of adverse experiences Ahmed (2008). Therefore, insurers who take on risky ventures will have to ensure that good management standards are applied to reduce exposure to insurance losses and maximize return on invested assets. For this reason, it is likely that managers in insurance and reinsurance undertakings that deal with risky insurance lines will be given more freedom in responding to market events than

their counterparts in companies that run less risky businesses Oppenheimer and Schlarbaum (1983). Such freedom of decision-making could improve annual financial results by encouraging managers to increase cash flow by taking risks.

However, Nahusenay study (2016) proved that there is a negative relationship and not statistically significant between the loss indicator and the financial results of insurance companies in Ethiopia. He added that excessive risk taking may have a negative impact on the annual results of insurers and reinsurance companies. For example, unforeseen market forces, such as increased competition and a sharp fall in share prices, may limit management's ability to increase annual premiums and investment income to offset losses arising from incorrectly priced risk.

In addition, high annual insurance losses will tend to increase the level of company management costs, which could further worsen the decline in reported financial results. In contrast, insurers and reinsurance undertakings with lower-than-expected annual losses are likely to show better financial results because they do not incur such high monitoring and loss settlement costs Adams and Buckle (2003).

Through their research, Srivastava and Ray (2011) stated that claims significantly affected the performance of the insurance industry in India. He also finds that commission and expenses of management have a very weak and negative effect on insurers.

This result is backed by other researchers like Malik (2011) when studying the Indian insurance sector and Pervan and al. (2012) when conducting their research upon the Croatian insurance industry who argued that Loss ratio and depict negative but considerable relationship with profitability.

The primary objective of each insurer is to raise the premiums while reducing costs and losses simultaneously. Greater value of operating expenses and claims incurred have a direct impact on the earnings of insurers, therefore this variable is expected to have a negative influence. Őner Kaya (2015). However, as we have seen in this review of literature, some scholars find a negative and significant relationship between profitability and the claim ratio while others do not.

10.Premium growth

For most insurers, premium income is the main source of profits, which is usually more stable than other revenue sources. Premium growth would therefore help to forecast future sales and

earnings growth. Premium growth also informs about earnings quality as positive growth implies potential earnings understatement due to the overstatement of recognized expenses (particularly PC insurers' undiscounted losses and loss expenses), and negative growth implies earnings overstatement Nissim (2010). On the other hand, premium growth is often considered a risk factor, as explained in next two paragraphs.

Premium growth is driven by growth in exposure (an increasing number of the insured) and growth at the rate level (an increase in the average price per exposition). Those two factors have different consequences on persistence and risk. Exposure growth is valuable if the insurance products are priced correctly, but significant exposure growth in a competitive market can be an indication of undercutting prices. This is the primary reason to use premium growth as a potential early warning indicator of financial deterioration.

Conversely, premium growth due to rate increases can help reduce the risk if the same policyholders pay more for the same risk exposure. Nevertheless, if the rate is increased, or reflects a change in the customers themselves, the new business volume can create unexpected losses if it is mispriced.

The premium is the amount paid to the insured, based on the loss or risk anticipated. Sambasivam and al. (2013) while conducting an analysis of insurance companies' profitability in Ethiopia, who argued that firms with higher growth rates in terms of their total assets reported higher returns. In the same context, Tadesse's (2013) research tried to generalize that the rise in Ethiopian insurance companies' premiums had a positive and heavy effect on their earnings. Knowing that the clear positive shift from one year to the next in premium collection boosts earnings growth at insurance firms. However, Tadesse (2013) emphasizes that it is necessary to be very cautious about risk control strategies, because as premium demand increases, insurance firms' loss likelihood often increases in the same direction. A greater amount of premiums does not automatically mean that there will always be higher returns with the implementation of sound risk management strategies.

This finding was backed by Akotey et al. (2013), who stated that gross premiums have a significant accordance with the profitability of insurance companies. They added that an increase in premium income usually reflects the development of insurance companies, thus increasing overall profitability.

Smith and Chamberlain (2010) reported in their paper that although it has a positive contribution to profitability, the correlation coefficient is very low. This may be because, the

amount of premium collected i.e. the insurance penetration rate, is very small in the Ethiopian insurance industry.

Premium growth rate is the main ingredient to measuring the rate of market penetration. Financially healthy insurance companies tend to have a fast growth of premium, which also indicates that the firm is somewhat solvent. However, focusing on premium growth alone can lead the company to the brink of self-destructing especially during an economic depression Chen & Wong (2004). These latter, also stated that Gross written premium has an insignificant relationship with financial performance.

Businesses growing too fast can lead themselves to self-ruin, as argued Chen & Wong (2004), because they have ignored other important goals. Research results found there is no influence between premium growth and financial performance. This might be by virtue of other elements that affect the relationship between the financial performance of a company and its premium growth suchlike the addition of investment assets of the company.

Provided the use of premium growth as a risk measure in risk assessment models, a critical question arises which is the impact of growth on the underwriting profitability. Barth and Eckles (2009) find a negative linkage between premium growth and loss-ratio changes, implying that the growth of premium indicator alone does not automatically lead to higher risk of underwriting. Furthermore, they also find a positive association between the increase in claim counts and changes in loss ratios, suggesting that growth in claim counts may be a preferred measure of risk.

Charumathi (2012) states that the new premium consists of single-premium and first-year premium schemes purchased in a given year as opposed to the previous year's new premium. She deduced that insurance companies with a higher premium growth would have lower profitability due to higher risk of underwriting and the associated solvency margin provision. This further concluded that premium growth has a negative and important effect on insurers' profitability.

Batrina and Burca (2014) also found a negative and significant association between the two elements. More, Batrinca and Burca argue that, in some cases, an excessive growth of premium underwriting leads to a high underwriting risk and thus it would be very necessary to raise the amount of technical reserves.

After a thorough set of examinations on the subject of premium growth, it is evident as of this point. Multiple studies confirmed the existence of diverse conclusions to the matter of the relationship between premium growth and profitability. Growing and expanding is undoubtedly crucial for the sustainability of insurance firms. However, researches indicate that how fast the firm grows and how it achieves that growth is what makes all the difference.

Due to its complexity in comparison with traditional variables which explain profitability and due to the use of different tools and software while measuring efficiency, the following section will be dedicated to presenting previous theoretical and empirical studies that focused on the link between efficiency and insurance financial performance as well as its determinants.

II. Macroeconomic Factors

Among the aims of our thesis is to study the significance of the relationship between the insurer's profitability and macroeconomic factors chosen on the basis of relevant theory and literature.

In the following subsection, we display previous literature and empirical finding regarding this relationship.

1. Gross Domestic Product

Oshinloye et al. (2009) made a point in his study that without a strong insurance industry, no country can achieve meaningful development. Therefore, regardless of its GDP quota, insurance business in any country is essential. Similarly, Ezirim (2002) argued that the insurance industry is regarded as an indispensable tool for economic progress, growth and development.

GDP is an indicator to measure economic recession and recovery, and it is also an indicator to measure the general monetary ability of the economy to solve externalities. Therefore, an increase in GDP generally indicates the disposition of individuals and households of greater income streams and an increase in the standard of living. Thereby, the increase in the profitability of firms, confirm the existence of a positive correlation between the growth of GDP and the increase in the earnings of the firm.

Plus, GDP growth rate reflects the level of economic activity and economic development, and therefore affects various factors related to the supply and demand of insurance products and services. If the gross domestic product grows, the possibility of selling insurance policies

increases accordingly and insurance companies may profit. Thence a positive impact is expected.

This orientation is backed by multiple researchers like Kozak (2011), Batrnia and Burca (2014), Kazimierz (2016) and Asrat et al. (2016) who proved that in their context, there's a positive correlation between GDP and the profitability of the firm, which means as GDP levels get higher, profitability of insurance firms also get higher.

However, a plenitude of academicians argued against the late findings. While conducting a study analyzing the determinants of profitability of insurance sector within macroeconomic perspective, Kalkidan (2016), Behaylu (2017) and Andrés and Stephen (2013) concluded that while GDP increases the profitability of insurance companies decrease. Which carries out the statement that GDP has a negative significant influence on the financial performance of insurance companies.

Another wave of researchers state that as far as this macroeconomic parameter is concerned, and while measuring its impact on profitability, Lee (2014), Meaza (2014), Teklit and Jasmindeep (2016) came out with the conclusion that GDP does not have a significant relationship with profitability.

On these grounds, GDP's effect on insurer's profitability is quite unclear. It varies from scholar to another, which can be due to different data in different insurance markets. This influence vary from being positive to negative to insignificant between different researchers.

2. Interest rates

Crowley (2007) stated that since higher interest rates are more likely to attract more savings, lower interest rates will encourage investors to seek other investments. Insurance companies themselves earn more income on their investments when interest rates rise, but if interest rates are too high it can negatively affect the level of premiums.

The ever-changing nature of interest rates is one of the major risks that are posing serious threats to insurance sectors all around the world.

Interest rate volatility seriously disturb insurance firms in multiple ways as it affects, simultaneously, the value of assets and the cost of claims. Thus, the effect on profitability is indeterminate according to the literature mentioned above.

3. Inflation

Price increases tend to steep household spending, which in turn leads to lower GDP and reduced wealth available to households. For instance, in the insurance domain inflation may reduce insurance income by reducing the number of insurance policies taken out.

When actuaries set the company's premiums, they take into account inflation rates. It is untoward for inflation to seriously affect the financial performance of insurance firms. However, if the inflation rate is much higher than expected, it may lead to financial difficulties for insurance companies. For illustrative purposes, if unexpected inflation has lowered the actual return on fixed-rate bonds. On this account, the profit margins of insurance firms are compressed and financial performance is damaged (Browne, Carson & Hoyt, 1999).

The idea behind inflation rates, just like interest rates, is that they can influence insurance companies' profitability affecting both their liabilities and assets.

On the attempt of finding out the link between inflation rate and profitability, scholars have conducted plentiful of researches. Pervan (2014) investigated the factors that affect the profitability of insurance companies. His research results demonstrate that inflation also has a negative and significant effect on profitability so does the research conducted by Redwan K. (2016). However, multiple studies carried out on the subject of banks' performance, have shown that there is a direct link between return on assets and inflation, suggesting that an increase in inflation will be contributory to higher bank profits, which can be implicated to insurance firms.

On the other hand, other academicians like Meaza (2014), Teklit and Jasmindeep (2016) and Asrat et al. (2016), Andrés and Stephen (2017) and Behaylu (2017), argued that inflation does not have an effect on the profitability of insurance companies. Thus, its influence on both their assets and their liabilities is not significant.

Section 2: Literature review on efficiency

Efficiency is a tool of measuring the performance of a business, in reference to the first chapter. However, a question arises on the nature of the relationship between how the firms use their resources (efficiency) and what their shareholders get (profitability). The objective of this section is to analyze the link between profitability and efficiency and the factors that define and influence it.

I. Efficiency and profitability

Cost efficiency is when the firm saves money through a product or performing its activity in a better way. It is a strategic choice for many insurance companies. When policyholders are well aware of what they want, and when there are many rules and regulations guiding the two parties, competition on price prevails.

Measuring firm performance is of major importance to the business research. Chen et al (2015) affirm that a firm's competitive advantage is embedded in its efficiency in transforming resources. Thus, by using frontier efficiency, we measure this productive dimension, which constitutes an important aspect of overall firm financial performance.

For their research on cost efficiency and profitability in the United States' life insurance company, Greene and Segal (2004) used the SF approach to investigate the link between the two parameters. This study puts forth that cost inefficiency is considerably relative to earnings in the insurance industry, and that inefficiency is negatively associated with profitability, and that privately owned companies are as efficient and profitable as mutual companies.

In the same study, it has been shown that cost inefficiency influence profits and growth through the negative influence of wasted resources on earnings and cash flows. Potential reasons for inefficiency are the suboptimal use of the company's resources by overpaying inputs and using an inefficient operating system or process. Realizable earnings and cash flow rates that come shorter than theoretical optimum activities are the consequence of inefficiency. Contrarily, if the company distributes lower dividends or have lower levels of investment that slow the growth of the firm and in consequence have lesser firm value the adverse effect takes place on earnings and cash flows.

After analyzing the inefficiency, Greene and Segal (2004) disclose the absence of a significant linkage between inefficiency and organizational form. The first nevertheless, is positively

aligned with the investment output, and negatively associated with the annuity output, suggesting that the business line of investments is the most inefficient. Which provides proof that profitability is crucial and that the cost of inefficiency is major.

This work argue the bottom line is that inefficiency is negatively associated with both the return on equity (ROE) and the return on assets (ROA) ratios, thus efficient companies typically have higher return on equity and on assets. Besides, the effect of inefficiency on ROE calculated as mean inefficiency contributes to the deduction suggesting that such inefficiency has a direct economic impact on the profitability of life insurers.

Luhnen (2009) used data-envelopment analysis in another research to evaluate the efficiency and productivity of the German property liability insurance industry. The study indicated that the main predictors for the efficiency of P-L insurance companies are company size, distribution channels, formal ownership, product specialization, financial leverage and premium growth.

Efficiency gains are likely to be achieved by small and medium-sized businesses by mergers and acquisitions, but not by big firms. However, the overall scope for productivity improvements by fusions is limited due to the high levels of scale productivity in the industry, even for small insurers. The empirical analysis shows a positive development of TFP (total productivity factor) in the German insurance sector over time. This is consistent with what was observed, for instance, on the Spanish insurance industry, studied by Cummins and Rubio-Misas (2006), for other markets.

The primary contribution of luhnen's research is that he has found a positive relationship between size and efficiency, meaning large insurers are more efficient than medium and small ones. Luhnen (2009) also found a negative relationship between premium growth and efficiency: strong growth insurers are less efficient, due to a lack of discipline for growth ambition.

In the light of this literary review, and through Greene and Segal (2004) and Luhnen (2009), we draw the conclusion that theoretically, cost inefficiency is expected to have a negative impact on profitability and that efficiency is more likely to be achieved by larger firms

II. Efficiency determinants:

In a study conducted by Rai (1996) where cost efficiency of insurance companies were examined in 11 different countries in the timespan of 1988- 1992, found that the difference between efficient behavior implied by economic theory and that observed in practice doesn't only differ from a country to another but also by size and specialization.

The difference between the behaviors noted as X-inefficiencies by Rai (1996) are the lowest in France and in Finland and those in the UK are the highest. It was also deduced through this study that smaller firms tend to be more efficient than larger firms, on average. Also, it states that firms with single or specialized services are more cost efficient than those who offer both life and non-life services.

Contrarily to the previous finding, Bernier and Sedzro (2002) carried out a study in which they inspected the efficiency of 69 Canadian insurance firms between 1996 and 1999 and found that the efficiency scores in the subject industry vary significantly by the size parameter. In other words, the larger the firms the more efficient they are and conversely smaller firms are less efficient.

Firm size has a significant impact on cost efficiency, whilst it does not have a weight on revenue efficiency. This academic work Bernier and Sedzro (2002) have conveyed that many insurance companies seem to have difficulty choosing the least costly input combination. The most efficient insurance companies are close to achieving optimal output choices, so the benefits are maximized, and there is evidence that the lack of "scale" is mainly in small insurance companies. Thus, smaller insurers are most likely to try to expand and invest in order to boost their cost efficiency through remodeling their allocative efficiency.

On the other hand, Saad and Idris (2011) used DEA to measure the efficiency of life insurance companies in Brunei and Malaysia in the timeframe from 2000 to 2005. Their research shows that the larger the company is, the more efficiently the company uses input to generate more output. Due to the positive impact of efficiency and technological change.

The study evoked above, found that there has been a significant increase in technological factors and efficiency changes, which indicates that the total factor productivity of the life insurance industry is due to the innovation of technological factors and the significant increase in efficiency. On average, it is found that insurance companies are experiencing technological progress. Even though the efficiency change has improved, the subcomponent of this efficiency

change (ie, pure efficiency) does show a slight deterioration. Due to the positive impact of efficiency and technological change.

The argument behind the study is that TFP of insurance firms in these two countries are positively correlated to the economic growth where it is mainly due to technical growth and an improvement in scale efficiency. This result indicates that their respective sectors have a great potential to give their total factor productivity an additional enhancement through the improvements in the technical component such as enhancing the use of information and communication technology in order to provide better services to the insured.

Mathur and Paul (2014) examined the efficiency of 20 nonlife insurance companies in India. The study concluded that only seven companies are completely efficient in terms of technical efficiency scores, seven insurers were employing their inputs effectively and judiciously in producing the existing level of output. While on the other side, 13 insurers were reported as inefficient as they were operating below the efficient frontier. The study further highlighted the issue of inappropriate management and control of the inputs by them.

It is found that the main reason for the inefficiency of the analyzed insurance companies is mainly due to the inefficiency of scale. The authors argued that the scale of production of most insurance companies is inappropriate. It is worth noting that 50% of insurance companies have increasing returns on their scale of operations, so for them, they need to expand their scale of operations to improve efficiency.

On the second phase of analysis, it was found that technical reserves and net income have a positive impact on overall technical efficiency. Therefore, for the insurance companies investigated in India, it is crucial to properly manage their technical reserves and closely check their net income (also known as the business bottom line).

Similarly, the results also show that administrative expenses have a negative impact on the overall technical efficiency of insurance companies. Therefore, it requires insurance companies to restrain themselves, avoid any unnecessary expenditures, and prudently spend money on their business activities.

Finally, it can be traced from the study that only one insurance company's Liquid asset and Liability ratio exceeds the expected limit of sufficient margin. Unless there is sufficient margin, the ratio of the remaining insurance companies would be low.

Therefore, it reveals the working capital management problem of each insurance company in the sample that the researchers worked on, which has probably been completely ignored by the insurance company. The author adds that in order to overcome the mentioned obstacle, insurance companies need to carefully underwrite the risks and avoid the risks that are most likely to occur and suffer losses.

Mathur and Paul (2014) added that the inputs and outputs selected to assess each insurance company's performance have issued some key and relevant information on its operational performance. Nevertheless, their research has some limitations, but it may show and give insurance companies warning signs, especially in managing their working capital, so they can redesign their management strategies and begin to improve their efficiency levels. Which is our whole purpose from conducting our research.

In this section, we introduced the relationship between cost efficiency and profitability, in a first step, and in a second, we highlighted the main determinants of efficiency as mentioned in previous literature reviews. It is clear that the relationship between cost efficiency and profitability is positive, as businesses that optimize their resources tend to be more efficient. Besides, the main determinants of profitability, as highlighted in the literature reviews, are the company's size, technological progress and process as well as technical reserves and administrative expenses.

Section 3: Empirical review

Due to the growing interest of researchers regarding the insurers' profitability and their determinants in the insurance industry, the number of such papers is increasing.

In fact, a vast analytical and empirical literature has been devoted to study this problem. Its objective is not only to examine the effect but also to find the best way to measure profitability and to analyze its evolution over time.

In this empirical revue, we will divide the papers into three way major fashion. There are authors who used efficiency as a proxy for profitability and performance, some who used traditional measures, i.e. ROA and ROE and other who used different methods and thus this section is divided accordingly.

I. Efficiency

There is also a rich body of literature, which deals with determinants of the profitability of insurance companies in developed countries. However, many of the papers on developed markets analyzed efficiency performance. For instance, Cummins, Weiss and Zi (1999) used frontier analysis to analyze the efficiency of US mutual and stock property-liability insurers, with a sample of US Life insurers from 1988 to 1995. The authors of the study found that efficiency scores are low in comparison to Property liability insurers, cost and technical efficiency scores have risen in the past years prior to the study period and that top efficiency is obtained regardless of the distribution channel.

Whereas, Cummins and Rubio-Misas (2001) used frontier efficiency analysis on a sample of Spanish firms between 1989 and 1998 to estimate cost, technical and allocative efficiency, also it uses Malmquist analysis to measure total productivity factor (TFP) change. The results of the study suggested that cost efficiency is low in the Spanish insurance industry, the primary source of inefficiency of insurers is allocative efficiency (42.2%) while technical efficiency is at (60%) thus insurers are more successful using technology than choosing iputs and outputs. Besides, this study imply that larger companies are more cost efficient because they have higher pure technical efficiency and that growth in total productivity factor is due to technical efficiency.

The Author Fecher et al. (1993) assessed the relative productive performance of French insurance companies i.e. their technical efficiency. The study applies to the 1984–1989 era and is carried out using parametric and non-parametric methods. Various primary features of insurance firms such as the reinsurance ratio, the delivery ratio, the legal status, the size of activities and the compensation ratio were used as explanatory variables. The results of this research suggest that non-life insurers are more efficient than life insurers with a score of 50% vs 30% for the latter. Fecher et al. (1993) also noted that public companies are more efficient than foreign mutual and stock companies. Efficiency scores also appear to be higher the bigger the scale of operation and the lower the retention ratio.

The idea behind measuring efficiency in this research was drawn from previous studies carried out by numerous researchers like the ones mentioned in the previous paragraphs and many others like Berger (1997), Cummins, Weiss and Berger, (1997), Diacon et al. (2002), Feroz et al. (2003) etc. In fact, several of these studies analyzed the firms using the Data Envelopment Approach (DEA) and some supplemented the findings in conjunction with the financial ratios of the company. A summary of the previous studies is exhibited in the following table(1).

Table 1: Summary of previous literature on Efficiency

Authors	Method	Units	Inputs	Outputs
Gardner and Grace ,1993	Cobb-Douglas Frontier	561 life insurance companies in USA, 1985-1990	Labor, Capital and Miscellaneous items.	Ordinary life insurance premium, group, life insurance premiums, ordinary annuity, group annuity, group accident and health premium
Cummins et al., 1996	DEA and Malmquist index	17 Italian life, 58 non-life and 19 mixed insurance companies, 1985-1993	Wages, administrative wages, fixed capital, equity capital and other ratios	Life insurance benefits and changes in reserves, non-life incurred losses in auto, auto liability and invested assets.
Fukuyama, 1997	DEA and Malmquist index	25 Japanese life insurance companies, 1988-1993	Asset value, number of workers and tied agents or sales representatives	Insurance reserves, loans.
Cummins and Zi, 1998	DEA and Malmquist index	USA insurance companies, 1988-1992	Loan, financial capital and materials	Incurred benefits desegregated into ordinary life insurance, group life insurance and individual annuities, and reserves.
Cummins et al., 1999	DEA-input oriented and Malmquist index	USA insurers, 1981-1990	Labor cost, material, policy holders supplied debt capital and equity capital and real invested assets	Short tail personal lines, short tail commercial lines, long tail personal lines, long tail commercial lines and return on assets.
Diacon et al., 2002	DEA-CRS and DEA-VRS	Standard's and Poor's Eurothesys data base, 1996-1999	Total operating expenses, net reinsurance commissions, total capital, total technical reserves and total borrowings	General Insurance net earned premiums, long term insurance net earned premium, total investment income.
Mahlberg and Url, 2003	DEA and Malmquist index	Austrian insurance companies, 1992-1999	Administration and distribution cost and costs of capital investments	Aggregate value of: expenditure on claims incurred, net change in technical provisions and the amount of returned premiums desegregated on health insurance, life insurance, property-liability insurance.

II. Profitability Measures

1. Unconventional measures

During the period from 1986 to 1999, Shiu (2004) conducted an analysis on the sample of UK general insurance companies. The researcher used an ordinary least squares regression model to assess each of the performance measures (investment yield, percentage change in shareholders' funds and return on shareholders' funds). The explanatory variables used are unexpected inflation, interest rate change, interest rate level, equity returns, underwriting cycle (immature soft, mature soft, immature hard), company size, leverage, reinsurance dependence, affiliated investments, solvency margin, stability of underwriting operation, liquidity, stability of asset structure, underwriting profit and insurer type (multiline, composite or reinsurer) IT1 IT2 IT3. This paper finds that liquidity, unexpected inflation, interest rate levels and underwriting profits are statistically significant determinants of the performance of UK general insurance companies.

In the timeframe between 2005 and 2009, Doumpos, Gaganis and Pasiouras (2012) evaluated insurance firms' output from 91 countries. Using the preference ranking organization method for enrichment assessments (PROMETHEE) II method, The authors employ seven variables of financial performance, such as equity to asset ratio, solvency ratio, technical reserves ratio, liquidity, ROA, Loss Ratio, operating expense ratio. Whereas, performance determinants include size, share of reinsurance, real GDP growth, inflation rate, inequality of income (GINI), gross national income per capita (GNICAP), nonlife insurance premium to GDP (PREM), bank domestic credit to GDP (CREDIT), stock market capitalization to GDP (MCAP), insurance and financial services as a percentage of service imports (FINSERV), overall institutional development index (INSTDEV), enforcement index (ENFIND), the financial freedom index (FINFR), Heritage economic freedom index (ECONFR).

The results of this research suggest that macroeconomic indicators such as real GDP growth, has a positive linkage to profitability while inflation, and income inequality negatively influence the overall performance of firms. Stock market development also has a positive effect on performance. On the contrary, other indicators such like the insurance premium to GDP, bank credit to GDP, and insurance and financial services as percentage of import services are not significant. likewise, the institutional development and the overall freedom in the financial services industry do not have a statistically significant impact on insurers' performance.

Unlike Shiu (2004), by using PROMETHEE II, Doumpos et al. (2012) did not measure the effect of firm specific and microeconomic factors on each dependent variable separately. They however use of this multicriteria method to assess the profitability of insurers while considering simultaneously a set of conflicting financial criteria combined depending on their weights specified by the decision maker.

2. Traditional measures

Charumathi (2012) studied the impact of firm-specific factors on life insurance companies' profitability in India. All 23 India life insurers subject of the researchers study (1 public and 22 private) were taken as a sample. The period of research covers 3 financial years 2008-09, 2009-10 and 2010-11. The model used by the researcher is linear multiple regression. Towards that end, the latter used leverage, size, premium growth, liquidity, underwriting risk and equity capital as explanatory variables to be regressed against the dependent variable ROA.

In this paper, the dependent variable is as mentioned the Return on Assets (ROA), a proxy for profitability. Plus, six explanatory variables were considered, such like LEV, LnNP, PG, LQ, UWR and LnEC. This research also evaluated the linear multiple regression model assumptions, namely, multicollinearity and homoscedasticity.

This study led to the conclusion that life insurers' profitability is positively and significantly affected by both size and liquidity. The leverage, premium growth, and equity capital have a negative and significant impact on Indian life insurers' profitability. This study finds no evidence of a link between underwriting risk and profitability.

Another study conducted in this area by Pervan (2012), reviewed how Bosnia and Herzegovina insurance companies performed. Return on Equity was used as the dependent variable as a proxy for insurers' profitability during the period from 2005 to 2010. In order to solve the problem of profitability the authors used generalized methods of moments (GMM) panel estimator developed for dynamic panel models. The results of the empirical analysis have shown a negative and significant impact of claims ratio on profitability and significant positive influence of age, market share and past performance on current profitability. Moreover, diversification had no significant role in determining the profitability, while foreign owned firms have drawn better results than domestically owned ones.

On the sample of 21 insurance companies during the period 2008-2012, Burca and Batrînca (2014) analyzed the determinants of financial performance in the Romanian insurance market. Return on Assets was used as the dependent variable in the model while the multiple regression

approach employing panel data with fixed and random effects, used to evaluate 13 explanatory variables (including firm-specific, industry-specific and macroeconomic variables). The explanatory factors used in this study are financial leverage in insurance, size, number of years since the company operates in the Romanian insurance market, growth of gross written premiums, equity, total market share, diversification, underwriting risk, investment ratio, reinsurance dependence, retained risk ratio, solvency margin and growth of real GDP/capita.

The conclusion drawn by the authors is that determinants of the financial performance on the Romanian insurance market are size (positive), leverage (negative), risk underwriting (negative), gross written premium growth (negative), risk retention ratio (positive) and solvency margin (positive), according to the findings.

Lee (2014) analyzed the impact of firm-specific and macroeconomic factors on Taiwan's nonlife insurance companies' profitability. Two dependent variables were included in the model, namely the operating ratio and return on assets to calculate the profitability of insurers, using the panel data of 15 insurers covering the period from 1999 to 2009. For the study, the analyst used Ordinary Least Square (OLS) regression model, Fixed Effect Model (FEM) and Random Effect Model (REM), whereas the findings indicate that underwriting risk, reinsurance usage (negative), input cost(negative), Return on Investment (ROI) (positive) and Financial Holding Group (negative) have a substantial influence on both operating ratio and ROA model profitability. However, the explanatory variables used in this study are mainly Firm size (FS), Financial leverage (FL), Undeærwriting risk (UR), Firm growth (FG) Reinsurance (RE), ROI, Market share (MS), Diversification (PD), Input cost (IC), Economic growth rate (EGR), Inflation Rates (IR), Financial holdings (FH).

In 2016, Asrat and Tesfahun (2016) attempted to determine the basic variables that influenced the profitability of the Ethiopian insurers using non-probability judgmental sampling with a sample of 8 insurance companies over the period from 2005 to 2015. The study attempted to test the effects of both firm - specific factors and macro-economic factors. In the study, the authors used fixed Effect Panel Data Model Regression Analysis that showed that the profitability of private insurers is statistically and significantly affected by a number of firm specific factor. For instance, Ethiopian insurers' profitability is affected by underwriting risk negatively, the size of the company positively, the premium growth positively, and the solvency ratio negatively, and the reinsurance dependency has no effect on profitability and is statistically insignificant. As for macroeconomic variables, the authors found that economic growth rate has

a significant impact on profitability and inflation has an insignificant impact, while the interest rate measured by the time deposit weighted average was insignificant.

Another Study conducted in Albania by Edlira Luçi et al, (2016) "Evaluation of Insurance Companies Profitability: case of Albania". The aim of this paper was to analyze the effects of internal factors such as growth rate, liquidity, liability, fixed assets, company size and capital volume on the profitability of insurance companies in Albania represented by Return on Assets. The carried out research examine the problem of profitability of insurance companies during the time span between 2008-13. The methodology used to attain the objective of the paper is based on multiple regression tools with panel data. The results of this multiple regression concluded that there was a statistically significant relationship between the rate of growth (positive), liquidity (negative), liabilities (negative) and fixed assets (negative) to the profitability of the Romanian insurers, while the impacts of the size of the company and the volume of capital were not statistically significant.

In an analysis conducted by Tadesse (2019), the researcher picked nine insurance firms with six consecutive years of financial statement data. The main aim of this analysis is to determine the financial performance factors, applying the annual balanced panel data, where all the variables are examined for each cross-section and timeframe. This panel data comprises both cross-sectional elements and time-series elements. The cross-sectional element is expressed by the various insurance companies, and the time-series element is expressed by the study period which goes from 2010 to 2015.

Two multiple regression models are specified on the basis of the general regression equation to analyze the relationship between the two dependent variables namely, ROA and ROE, each with eight explanatory variables viz., scale, capital adequacy, leverage, loss, liquidity, age, GDP and inflation.

The results drawn by the study conclude that capital adequacy has a positive impact on ROA while it also has a negative impact on ROE. Liquidity and size both have a positive linkage to both ROA and ROE while loss ratio and age have a negative influence on the two dependent variables. However, Leverage has a negative relationship with ROA whereas its relationship with ROE is statistically insignificant.

As for macroeconomic factors, both inflation and GDP have a statistically insignificant linkage to both ROA and ROE. The Following table(2) is a summary that showcases the different empirical tests and results.

Table 2 Recapitulative Table

Authors	***Dependent Variables (measures)***	***Explanatory Variables***	***Period***	***Model***	***Results***
Fecher et al. (1993)	Technical efficiency	• the reinsurance ratio • the delivery ratio • the legal status • the size of activities • the compensation ratio	1984–1989	Frontier Analysis	• Average efficiency score 50% for P-L and 30% for Life insurers • Efficiency are higher in public companies • Efficiency are higher the higher the scale of operations • Efficiency is lower the higher the reinsurance ratio
Cummins, Weiss and Zi (1999)	Pure technical scale allocative cost revenue	Inputs: Administrative labor, agent labor, business services, and financial capital Outputs: Risk pooling; "Real" financial services relating to insured losses; Intermediation	US Life firms 1988 - 1995	frontier analysis	Low Efficiency scores compared to P-L insurance A Rise in Cost and technical efficiency Efficiency is obtained regardless of the distribution channel
Cummins and Rubio-Misas (2001)	Cost efficiency technical efficiency allocative efficiency	Outputs: Risk pooling; "Real" financial services relating to insured losses; Intermediation Inputs:	Spanish market 1889 - 1998	Frontier analysis	• Low Cost efficiency • Primary source of inefficiency is allocative (41,2%) vs technical (60%) suggesting firms are

		Labor Business services Financial debt capital Equity capital			more successful using technology than choosing inputs and outputs • Larger firms are more cost efficient because they have higher pure technical efficiency • Yearly growth in TFP due to technical efficiency
Shiu (2004)	• investment yield • percentage change in shareholder s' funds • return on shareholder s' funds	• unexpected inflation, • interest rate change, • interest rate level, • equity returns, • underwriting cycle • company size, • leverage, • reinsurance dependence, • affiliated investments, • solvency margin, • stability of underwriting operation, • liquidity, • stability of asset structure,	UK 1986 - 1999	OLS Regression Model	• - • n/s • +(IY&RSF)–(PCSF) • n/s • n/s • n/s • n/s • n/s • n/s • n/s • n/s • - • n/s

		• underwriting profit • insurer type (multiline, composite or reinsurer) IT1 IT2 IT3			• +(PCSF&RSF) – (IY) • n/s
Doumpos, Gaganis and Pasiouras (2012)	• equity to asset ratio • solvency ratio • technical reserve ratio • liquidity • Operating expense ratio • ROA	• size • share of reinsurance • real GDP growth • inflation rate • (GINI) • (GNICAP) • (PREM) • (CREDIT) • (MCAP) • (FINSERV) • (INSTDEV) • (ENFIND) • (FINFR) • (ECONFR)	2005 – 2009 91 countries		+ n/s + - - n/s n/s n/s + n/s n/s n/s n/s n/s
Charumathi (2012)	ROA	• Leverage • size • premium growth • liquidity • underwriting risk • equity capital	2008 – 2011	linear multiple regression	- + - + n/s -
Burca and Batrînca (2014)	ROA	• Leverage • size, • GWP growth • retained risk ratio	2008- 2012	multiple regression	- + - +

		• solvency margin			+
Lee (2014)	Operating ratio ROA	Leverage Underwriting Risk Reinsurance dependency ROI Input Cost Inflation	1999 - 2009	Ordinary Least Square (OLS) regression model, Fixed Effect Model (FEM) and Random Effect Model (REM)	- - - + - -
Pervan (2012)	ROE	• claims ratio • age • market share • past performance • Diversification • Organizational (Foreign)	Bosnia and Herzegovina 2005 - 2010	GMM	- + + + n/s +
Asrat and Tesfahun (2016)	ROA	• Underwriting risk • Size • Premium growth • Solvency ratio • Reinsurance dependency • Economic growth rate • Inflation • Interest Rates	Ethiopia 2005 - 2015	Fixed Effect Panel Data Model Regression	- + + - n/s + n/s n/s
Edlira Luçi et al , (2016)	ROA	• Growth rate • Liquidity • Liability • Fixed assets • Size • Capital volume	Albania 2008 – 2013	Multiple Regression Tools with Panel Data	+ - - - n/s n/s

Tadesse (2019)	ROA ROE	• scale • capital adequacy • leverage • loss • liquidity • age • GDP • inflation	Ethiopia 2010 - 2015	Multiple Regression Models	+ (ROA & ROE) + (ROA) – (ROE) -(ROA) n/s (ROE) - (ROA & ROE) + (ROA & ROE) - (ROA & ROE) n/s (ROA & ROE) n/s (ROA & ROE)

Conclusion

The purpose behind this chapter is to better understand both the different determinants linked with strategic choices that can be made by the management of an insurance company i.e. the internal factors and those the company should overcome i.e. the external factors as well as the concept of efficiency in order to examine their influence on its profitability.

In the light of that, we presented a revue of literature on the nature of the relationship between these determinants and the financial performance of an insurance company. In fact, we found three study categories. The first ones argue that there is a positive link between these variables and insurer's profitability, the second ones support the existence of a negative impact, and finally the latter argue that the impact is not significant and that profitability depends on variables specific to the insurance sector on the one hand, and on each firm on the other.

We then, introduced the concept of efficiency and studied the relationship between cost efficiency and profitability as laid down previous literature as well as the different determinants of efficiency.

In this chapter, we also laid out different empirical frameworks conducted by researchers in the subject at hand. In fact, we exhibited different measures of profitability from conventional methods like Return on Assets or Return on Equity to unconventional methods like efficiency and PROMTHEE II method. We also displayed the different models and results found by these researchers.

Following the disparity in the earlier literature, we devote the next chapter to study the relationship between profitability and the determinants in the Tunisian context as well as to measure the efficiency of insurers with a sample of Tunisian insurance companies.

CHAPTER III: Empirical Framework

Introduction

In this chapter, we give an overview of the Tunisian insurance market, its key figures and the main challenges it faces in a first stage.

Further, this chapter presents the study's selected research methodology. As shall be seen, the methodology is influenced by the purpose of this study and is based on an assessment of the optimal strategy for responding to the research questions. As such, the current chapter discusses the statistical and econometric tools used to analyze data for the purpose of answering the research questions. It includes the approach adopted to examine data for the chosen variables and the construction of empirical models.

Section 1: Overview of the Tunisian insurance market

In the prevailing difficult economic climate, marked by an ongoing increase of the interest rate and a simultaneous increase of inflation rates, Tunisian insurance firms have undergone a substantial evolution in 2018. This evolution translates into a favorable rise in insurers' turnover i.e. gross premiums written (7.9% in 2018 against 12.5% in 2017). However, despite this growth dynamic and the ability of insurance to mitigate some key challenges for the sustainable development of the Tunisian economy, its potential remains largely untapped. In fact, insurance penetration rate is constantly low around 2.1% in 2018 nearly a quarter of the average rate 7.8% in advanced markets. Plus, average per capita spending on insurance (density) in the Tunisian market is around 195TND, around 74.4 US Dollars compared to an eminent 3737 USD in advanced markets and 682 USD as a global average in 2018. This can be partly explained by cultural and religious reasons but mostly because for large segments of the population, insurance is often unaffordable.

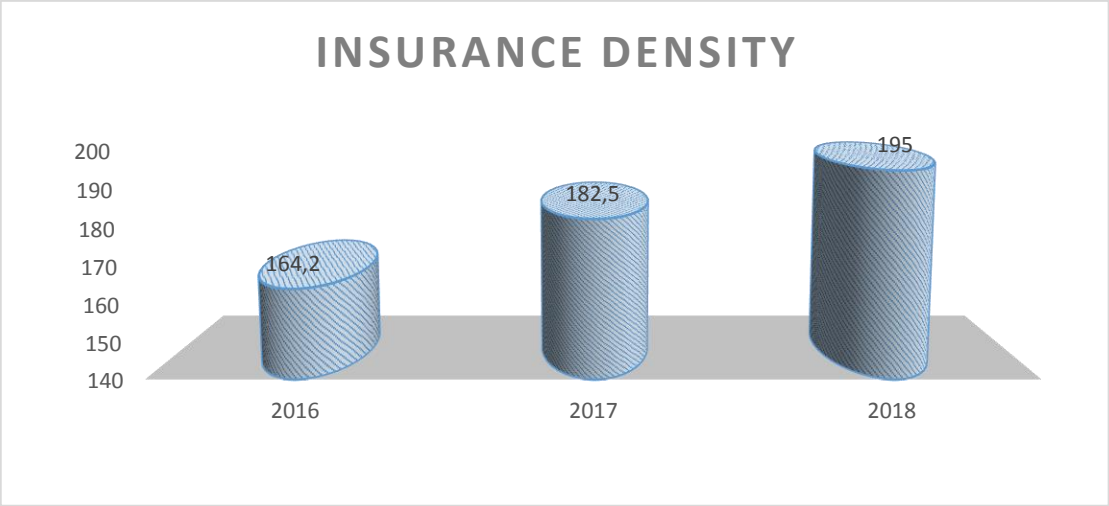

Figure 1: Insurance Density in TND

However, despite having a limited importance in the Tunisian economy as a whole, the insurance sector continues to develop and enhance by the day in order to achieve a strong and viable insurance industry. Thereby, a special stress should be placed on establishing an adequate infrastructure with decisive policymakers and regulators who know how to influence the key elements of development and performance of an insurance company and the sector as a whole in order to these barriers.

Throughout this section, our aim is to analyze the insurance activity in Tunisia as well as the main challenges that it is confronted by.

I. Activity analysis

The assessment of the data in the recent years prior to 2018 brings to light a steady growth in the insurers' turnover averaging 9.8% in the last 5 years (prior to 2018). However, this growth does not translate into a diversified market portfolio. In fact, auto insurance remain the main bread-and-butter of Tunisian insurers with a massive 43.5% of total gross written premiums in 2018 and a 14.3% share goes to health insurance.

Life insurance can play an important part in developing the Tunisian insurance market, as the potential lays in the possibility of funding retirement solutions especially if the regulatory bodies offer tax incentives to attract capital. Life insurance is only 22.5% of the Tunisian insurance portfolio while it occupies 54.3% globally. However, in the time span between 2014 and 2018 life insurance growth has averaged a tremendous 18% annually, giving a big boost

for insurers to establish themselves especially with the emerging of different coverages under different packaging and the development of bancassurance.

On the flip side, other insurance specialties are still lacking in development, as fire and special perils, marine, credit insurance and others amount to 19.7% of the total portfolio, thing that needs to be developed.

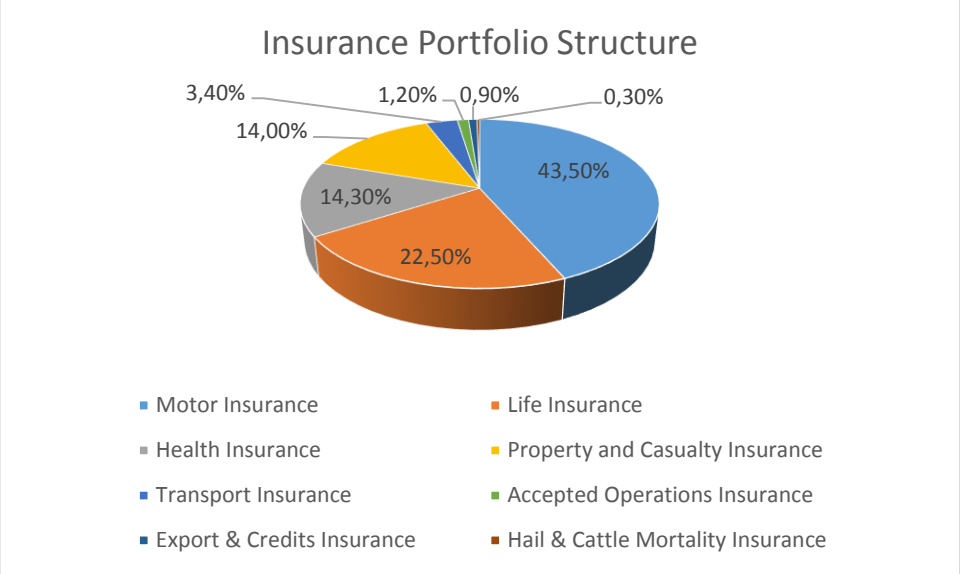

Figure 2: Insurance Portfolio Structure In 2018

As for the market structure, we find that it is specially diverse consistent of 22 local companies that include 20 'limited' companies and 2 'mutual form' companies.

Further, there are also seven offshore companies located in Tunisia two of which are representative offices of non-resident insurance and reinsurance companies and the other five are branches.

For the most part, Tunisian insurers operate in multi-branches, which provide the insured with a plethora of insurance products that may include marine, fire, auto insurance etc. However, there is a few specialized companies. For instance, 5 companies are specialized in life and capital redemption, one company is specialized in export and credit insurance 'COTUNACE' and one specialized reinsurer 'Tunis-Ré'.

II. Key figures analysis

Table 3: Resources Key Figures

Resources/ year		2016	2017	2018
Written Premiums	Sum	**1 968,70**	**2 087,9**	**2 252,4**
	Δ		6,05%	7,9%
Underwriting Results	Sum	**122,1**	**66,7**	**115,9**
	Δ		-45%	74%
Equity	Sum	**1 187,30**	**1 243,8**	**1 329,3**
	Δ		4,8%	6,9%
net accounting result	Sum	**130,952**	**79,599**	**138,2**
	Δ		-40%	74%

In terms of resources, as shown in the previous table(3), the gross written premiums have increased year-over-year reaching 2.252M Dinars in 2018 against 2.088M Dinars in 2017 gaining almost 8% in annual progress. Likewise, shareholders' equity has also increased in the previous years, amounting 1.329M Dinars in 2018 against 1.243M Dinars in 2017. Both gross written premium and shareholders' equity have increased in a steady pace over the years, yet the underwriting and the accounting net results have decreased between 2016 and 2017. This downturn can be explained by the rise in claims incurred, technical expenses and technical provisions as presented in the following table(4). For instance, in the year 2017, the rise in expenditures reached 16,5% and technical provisions also increased tremendously by 14,1% this is due to an increase in the incurred claims in the said year. Whereas in 2018 figures seem to be improved as although the paid claims have increased by almost 20% the growing pace of expenditures and technical provisions have slowed down respectively.

As for cumulated investment, it seems to increase every year reaching a total of 5.443M Dinars in 2018.

Table 4: Uses Key Figures

USES/ year		2016	2017	2018
Claims incurred	Sum	**1.017,6**	**1053,8**	**1262,8**
	Δ		3,6%	19,8%
Expenditures	Sum	**513,8**	**598,4**	**640,5**
	Δ		16,5%	7%
Technical Provisions	Sum	**3949,8**	**4 506,6**	**5 026,8**
	Δ		14,1%	11,5%

Cumulated Investments	Sum	**4537,7**	**4 913,8**	**5 443,3**
	Δ		8,3%	10,8%

III. Profitability Figures

The year 2018 has been a fruitful year for the Tunisian insurance market as a whole. With a 7,9% increase in gross written premiums and a 10,8% in cumulated investment as shown in the previous two tables, Tunisian insurers secured themselves a total of 115,9M Dinars of underwriting results and a net accounting result of 138,2M dinars with an increase of 74% in both results respectively. This progression amounts to the commercial efforts made by the different players in the industry, decrease in technical expenses with good management processes and an increase in remunerative investment.

The volatile behavior i.e. the fluctuant nature of the results leads to an equivalently fluctuant profitability indicators. For instance, the result drop in 2017 in the technical and net accounting results has led to a similar drop in both ROA and ROE reaching 0,99% and 6,4% respectively against 2,03% and 11,03% in 2016. However, in the following year and due to the improvement of both technical and accounting results, such improvement has led to a consistent enhancement of profitability measures in the insurance sector. In fact, in the midst of this growing profitability the Return on Assets ROA indicator has reached 1,6% in 2018 and ROE reached 10,4%.

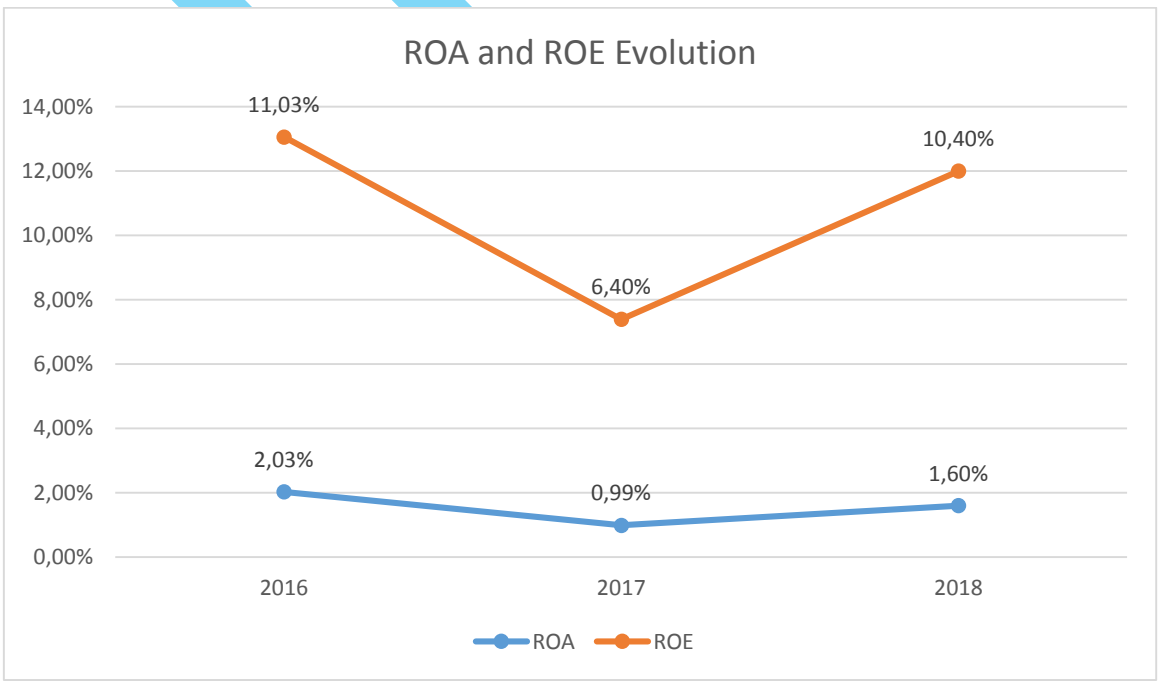

Figure 3: ROA and ROE Evolution

IV. Challenges facing the Tunisian insurance sector

A mature and developed insurance market has a positive influence on further financial sector development and capital formation in the real economy. However, the penetration rate of the Tunisian sector barely exceeds 2,1% against 10% in the USA, 14% in South Africa and 4% in our neighbors Morocco.

This hurdle amounts to a widespread lack of financial literacy and a low awareness regarding insurance products and their benefits. It is important to raise awareness of the existence of insurance products and to promote understanding of the concept of insurance and the benefits it can provide. Thus, insurance education is of utmost importance to overcome this challenge.

It should also be mentioned that there are 22 insurance companies operating on the market, most of which are medium or small and lack the financial capacity to install efficient information systems capable of ensuring effective risk assessment.

On another note, at least three out of the 22 insurance companies suffered losses due to the increase in claims amounts in regards to gross premiums written.

The insurance market is definitely suffering from several structural problems related to the increase in the value of compensation, particularly in the field of motor insurance. In fact, Motor or rather Auto insurance accounts for 50% of the overall collected premiums (1 Billion dinars) when the claim compensation totals 800 million Dinars.

Finally, the Tunisian insurance market is yet to become mature. As 50% of insurance coverage is related to motor insurance, risk pooling becomes much more difficult for the other risks. Therefore, the use of the mean of reinsurance becomes crucial which leads to an important outflow of funds to foreign reinsurers.

Section2: Determinants of profitability: an econometric study on panel data

The main aim of the study is to investigate the determinants of insurers' profitability in Tunisia and this study adopted an explanatory design by using panel research technique to realize a stated objective. As cited from (Baltagi 2005) the advantage of using panel data is that it controls for individual heterogeneity, less collinearity variables and tracks trends in the data

something which simple time-series and cross-sectional data cannot provide. The study also employs the input-oriented data envelopment analysis (DEA) with variable returns to scales (VRS) to approximate "best practice" cost, and allocative frontiers and then computes efficiency score of Tunisian insurance firms. For our empirical study, we use DEAP 2.1 as our primary software.

I. Data Description and Preliminary Tests

1. Sources of Data and Sampling

In order to carry out our research activity and to increase the dependability of the data, the study uses secondary data. This type of data is based on the audited annual financial statements of the insurances companies which are readily available on their website and the regulatory body's website (CGA) as well as the macroeconomic data was collected from Tunisian Central Bank annual reports, and other published documents.

The target populations of the study are all insurance companies under operation in Tunisia. Currently, twenty-three insurance companies are operational in Tunisia.

However, among those companies we choose to study the effect of internal and external factors on the profitability on a sample of 9 insurance companies. Our choice was founded upon two basis. First, the firms of our choice are the major 9 insurance companies on the market. In fact, in 2018 these nine companies' turnover amounted to 74.7% of that of the market*. However and most importantly, we chose the companies that regularly publish their annual statements from which we derived our data that go from 2006 to 2018.

1.1. Variables Description

By referring to the empirical literature, we have selected each of the following variables to include in our study:

1.1.1. The Dependent Variable

From what we have seen in the empirical review, there are numerous ways to measure profitability of insurance companies. Some authors used conventional ratios like ROA and ROE and other used unconventional ways like PROMETHEE II method; Doumpos, Gaganis and Pasiouras (2012) or the technical and cost efficiency like Cummins, Weiss and Zi (1999); Cummins and Rubio-Misas (2001) etc. as proxy for profitability.

However, there seems to be a consensus by a plethora of researchers that ROA, though are a simple way to represent financial performance, are also the best way to measure it. Thus, we translate this conclusion into our thesis by using this ratio as proxy.

Our research sample sets between 2005 and 2018. In this timeframe, ROA varied continuously and significantly throughout. In 2005, both ROA started at very low grounds with a percentage of 0,6% which is justified by the low level of both technical and balance sheet returns that are the lowest during the time period. Concerning the year 2018, i.e. the last year in our sample, ROA is at 1.5%.

It is worth noting that, the insurance industry is investors' treasure trove with an outstanding average Return Assets of 2.06% which is on par with the global average of 2% indicating that Tunisian insurers are efficient when it comes to managing their assets. It also means that Tunisian insurers have mastered underwriting when it comes to computing exposure, i.e. coverage cost, compared to their total assets. This ratio reached in 2008 an all-time high of 4.6% following a similar growth in the national economy 15.29%.

In the year 2011, Tunisia has undergone a major event that has changed the socioeconomic climate in the country known as the Tunisian revolution. This latter, had serious effects on the national economy especially in the first years when in 2012 insurers recorded an increase in incurred claims represented by an increase in provisions by almost 9%.

However, although the revolution has negatively impacted the Tunisian economy that is yet to recover (GDP growth is negative until 2018), insurers knew how to turn the situation around and remain profitable average 1.5% ROA though little short compared to the whole time period average.

To better illustrate the variations of our dependent variable between 2005-2018, the following chart is inserted alongside that of Return on Equity.

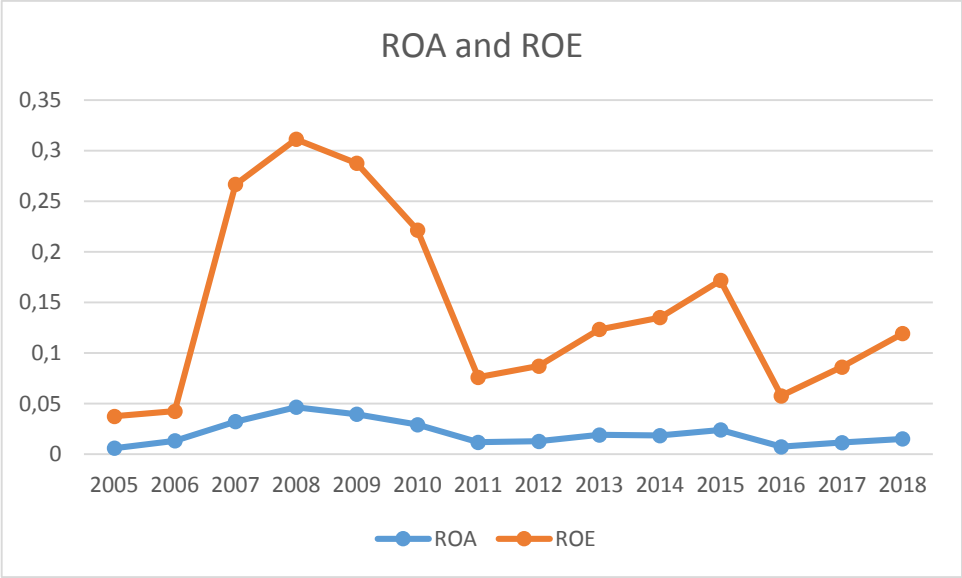

Figure 4: ROA and ROE Variation

1.1.2. The Independent Variables

Firms are impacted by a large number of factors that we have mentioned earlier in the literature review. Insurers generally have to strive to boost profitability through improved underwriting results. Thus, when choosing the key independent variables, we decided on those that can intrinsically affect insurers' returns while being manipulated by the management of the insurance firms. Those variables are Liquidity Ratio (LQ), Premium Growth (PWG), Underwriting Risk (UR), Combined Ratio (COMB), Reinsurance Dependence (RCR and RRPHS), Solvency Margin (SOLV) and both technical and scale efficiency.

In order to compute both technical and scale efficiency, we dedicate the following subsection to study efficiency in the Tunisian context.

i. Cost Efficiency

The study employed the input-oriented data envelopment analysis (DEA) with variable returns to scales (VRS) to approximate **«best practice»** cost, and allocative frontiers and then compute efficiency score of Tunisian insurance firms. For our empirical study, we use DEAP 2.1. as our primary software.

Two types of returns to scale exist, namely constant returns to scale (CRS) and variable returns to scale (VRS). Banker et al (1984) show that the DEA model specification with CRS, with substandard performance firms, generates valuations of technical efficiency scores that are similar to the efficiency of scale. However, modeling with VRS makes it possible to dissociate between these two elements. This justifies our choice of VRS.

Actually, the choice between input oriented or output oriented DEA does not influence the results if we choose constant return on scales. However, if we choose Variable Return on scales, the orientation should be mentioned. Thus, for our study, we decided on Input oriented DEA. This orientation means minimizing the quantities of inputs in order to minimize the overall costs while having same tier outputs.

❖ Outputs

Since the outputs are often intangible, the basic approach for measuring output is to identify the variables that are highly correlated with the services provided by companies in the industry and result in value-added creation. For this purpose, we choose risk pooling as our main Output for this study represented by Y1.

- Risk Pooling = Technical Results

❖ Inputs

We define four insurance inputs as administrative labor, agent labor, company size, and financial capital represented by Xi.

- X1 is Gross written premiums (Company size)
- X2 is Administrative Labor
- X3 Agent Labor
- X4 Shareholders Equity

In a later stage, we applied DEA method using DEAP 2.1 and we obtained results presented by efficiency scores following the Variable Return on Scale hypothesis.

In fact, both technical and scale efficiency scores will subsequently be used as a measure of the cost strategy of a given firm in the period between 2005 and 2018. For illustration purposes, we showcase and analyze through the following table(5) the efficiency results of the year 2018. The rest of the efficiency results will be inserted in the appendices. These efficiency scores alongside those of other years will take part in our database and be used in our estimation models.

Table 5: DEAP Output for the year 2018

Firm	CRSte	VRSte	Scale	
1	0.657	1.000	0.657	irs
2	1.000	1.000	1.000	-

3	0.580	0.695	0.834	irs
4	0.849	0.864	0.983	irs
5	1.000	1.000	1.000	-
6	1.000	1.000	1.000	-
7	0.909	0.910	0.999	drs
8	0.570	0.908	0.628	irs
9	1.000	1.000	1.000	-
Mean	**0.841**	**0.931**	**0.900**	

With a view to better understand the latter results we note the following:

- The first column indicates the 9 insurance firms subject of the thesis.
- The second column contains the efficiency scores under the constant return on scale. crste = technical efficiency from CRS DEA.
- The third column indicates pure technical efficiency under the variable return on scale efficiency hypothesis. vrste = technical efficiency from VRS DEA.
- The fourth column represents scale efficiency. scale = scale efficiency = crste/vrste.
- The last column tells us about the return on scale type (IRS, DRS or Hyphen). Insurance firms with IRS type evolve in conditions where return on scales are increasing. Conversely, the ones with DRS evolve in conditions where return on scales are decreasing and on a last note, the ones with hyphen means that the return on scale is constant i.e. they operate at their optimal size.

ii. Results Analysis:

For the year 2018 and on average, insurers got the following efficiency scores:

- **84.1% for CRSTE.** In total, insurance firms can reduce their inputs by 15.9% while producing the same level of outputs.
- **93.1% for VRSTE.** Insurance firms can enhance their management by reducing their input consumption by 6.9% while also producing the same level of outputs.
- **90% for SCALE.** If the insurance firms adjust their size they can reduce their inputs by 10% while having the same amounts of outputs produced.

Under the hypothesis of Variable Return on Scale VRS, a little more than half the firms (5 out of 9) are operating at an optimal level of technical efficiency whereas the other four are a little bit short. The first ones, having VRSTE score of 1, have the best practice when it comes to cost management and they are considered as benchmarks in the sample of firms analyzed and thus form the efficiency frontier.

In terms on efficiency of scale, only 4 insurers are cost efficient in 2018. A scale score of 1 means insurers operate at an optimal size and subsequently form the efficiency frontier.

We also noticed that firm number 7 is operating under a Decreasing Return on Scale, that is, «diseconomies of scale». Four insurers evolve in constant return on scale situation. The remaining insurers develop in an increasing return on scale.

Now that we have an overview over the independent variables we are using the next step is to present the hypothesis of the study.

1.1.3. Control Variables

As for the control variables, insurance size (SIZE), Company Age (AGE), Leverage (LEV), Tangibility Of Assets (TAN), Growth of gross domestic product (GDP), inflation rate (INF) and Interest Rates (INT) are presented in the literature as key determinants of insurance profitability and displayed in the following table(6).

Table6 : Variable definition and measurement

Variable	Definition	Measurement
ROA	Return on Assets	
LQ	Liquidity Ratio	Current Assets/ Current Liabilities
PwG	Premium Growth	(GWP (t) – GWP (t-1)) / GWP (t-1)
UR	Underwriting Risk	claim incurred / annual premium earned
COMB	Combined Ratio	(claims + adjustments+ expenditure) / Gross Written Premium
RCR	Ratio of Ceded Reinsurance	Reinsurance Ceded (RC)/Net Premium Written (NPW),
RRPHS	Ratio of Reinsurance Recoverable Policyholders' surplus	Reinsurance Inward / Total Assets
SOLV	Solvency Margin	Max (Min1;Min2)*
SIZE	Company Size	Natural logarithm of total gross written premium
AGE	Company Age	Number of years from date of establishment
LEV	Leverage	Total Debt / Total Stockholders' equity
TAN	Tangibility of Assets	Fixed Assets / Total Assets.
GDPgrowth	Growth of Gross Domestic Product	(GDP (t) – GDP (t - 1)) / GDP (t-1)
INF	Inflation Rates	I(t) Growth rate
INT	Interest Rates	MMR Growth Rate

PS:

*Min1= 20% x Gross written premiums net of tax and cancellations x (withheld premiums/ Gross written premiums net of tax and cancellations)

*Min2 = 25% x average annual claims expense for the past three years x (claims payable by the company / gross reinsurance claims).

The hereby collected panel data is analyzed using descriptive statistics, correlations, multiple linear regression analysis and inferential statistics. Mean values and standard deviations are used to examine the general trends of the data from 2006 to 2018 based on the sector sample of 9 insurance companies and a correlation matrix is also used to examine the relationship between the dependent variable and explanatory variables.

1.1.4. Hypothesis of the study:

Based on the review of relevant and related literatures, it is hypothesized that liquidity ratio, premium growth ratio, underwriter risk, Combined Ratio, reinsurance dependence and solvency are expected to influence firms' profitability as measured by Return on Assets (ROA). Accordingly, the following hypotheses were formulated in this study:

H1. Liquidity ratio is hypothesized to have a negative and significant impact on profitability of insurance companies in Tunisia.

H2. Premium growth is expected to have a positive and significant effect on profitability of Tunisian insurance companies.

H3. Underwriting risk is expected to have a negative and significant impact on profitability of insurance companies in Tunisia.

H4. Combined Ratio is expected to have a negative and significant influence on insurance profitability in Tunisia.

Two reinsurance proxies are used in our thesis namely RCR and RRPHS

H5. RCR is expected to have a positive impact on insurers' returns

H6. **RRPHS** is expected to have a positive impact on profitability of Tunisian insurers.

H7. Solvency is expected to have a positive impact on Tunisian insurers' profitability.

H8. Technical efficiency is expected to have a positive impact on Tunisian insurers' profits.

H9. Scale efficiency is expected to have a positive impact on Tunisian insurers' profits.

1.2. Descriptive Statistics

Starting with the dependent variable, we have already stated that we are using the ROA as a measure of each insurer's profitability. According to Table (7), this variable average is 1.7254% with a standard deviation of 2.8642%, a minimum of -16.7003% and a maximum of 9.1057 %. This means, the most profitable company may earned 9% (90 millimes) of net income from investing one Dinar on asset. On the other hand, the maximum losses incurred by the sample companies were -16.7003% (160 cent) on each of Dinar investment on asset. The statistical summary implies that there is no variation in ROA because the standard deviation statistics for ROA the proxy was 2.8642%, which is below the mean.

Table 7: Descriptive statistics of the different variables

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	117	0,017255	0,028642	-0,167004	0,091058
LQ	117	2,121201	0,459399	1,347740	3,825015
SOLV	117	0,075991	0,123857	-0,597131	0,316802
PWG	117	0,088027	0,105272	-0,371515	0,524587
UR	117	-0,608156	0,132381	-1,227438	-0,368886
COMB	117	-0,774282	0,105098	-1,176657	-0,578625
RCR	117	-0,280813	0,141442	-0,657405	-0,022977
RRPHS	117	0,031875	0,025120	0,003017	0,111283
TEFF	117	0,934462	0,134490	0,384000	1,000000
SEFF	117	0,528735	0,401530	0,000000	1,000000
SIZE	117	18,181630	0,712789	16,296170	19,686970
AGE	117	40,666670	18,457780	4,000000	73,000000
LEV	117	0,827470	1,070808	-2,930085	6,160350
TAN	117	0,661431	0,121307	0,265843	0,841866
REV	117	0,615385	0,488597	0,000000	1,000000
Interest	117	0,001304	0,006622	-0,009175	0,018392
GDP_Growth	117	0,018523	0,066632	-0,093600	0,152900
INF	117	0,004069	0,009747	-0,008100	0,020000

Regarding the independent variables, the Liquidity ratio's mean value is 2.12 and Solvency is 0.07599. Both These values indicate that, on average, insurance companies in Tunisia have the capacity to meet their liability. Their respective standard deviation are 46% and 12.385% respectively, indicating that variation within these variables is different due to the volatility of the current aspect of the liquidity ratio.

Underwriting Risk and Combined Ratio's mean values are 0.608 and 0.7742% respectively. Their respective Standard Deviation are 10.5% and 13.23% which is relatively low in the

Tunisian context compared to a liquidity Std. deviation of 165% Tadesse (2019) and Solvency ratio of 36% Asrat et al. (2016) both in Ethiopia.

As for RCR and RRPHS, their corresponding averages amount to -0.2808 and 0.0318 with standard deviations of 14.14% and 2.51% respectively which can be considered low in the Tunisian context.

Moreover, both the efficiency scores averaged 0.9344 for technical efficiency and 0.5287 for scale efficiency in a respective matter with corresponding standard deviations of 13.4490% and 40.1530%.

2. Diagnostic Tests

2.1. Panel Unit Root Test: Stationarity Test of Levin Lin & Chu (2002)

Levin, Lin and Chu assume that the model below produces the stochastic term y_{it}:

$$y_{it} = \rho_{it}\ y_{i,t-1} + \varepsilon_{i,t}$$

The null hypothesis supposes that the panel data contains a unit root, while the alternate one suggests that the panel is stationary.

Table 8: Stationarity test of Levin Lin & Chu (2002)

	H	Test statistic	P-value
ROA	1	-4.41895	0.0000***
LQ	1	-2.47651	0.0066*
SOLV	1	-1.54638	0.0610*
PWG	1	-.3.69475	0.0001***
UR	1	-5.15923	0.0000***
COMB	1	-2.13472	0.0164**
RCR	1	-1.89346	0.0291**
RRPHS	1	-4.21864	0.0000***
TEFF	1	-7.10402	0.0000***
SEFF	1	-2.17428	0.0148**
SIZE	1	-2.13869	0.0162**
LEV	1	-10.6804	0.0000***
TAN	1	-3.49270	0.0002***
INTERESTS	1	-3.00283	0.0013***
GDP_GROWTH	1	-4.88157	0.0000***

INF	1	-4.87340	0.0000***

*** Significant at 1 % ; ** Significant at 5% ; * Significant at 10 %

Table (8) reports the results of the Levin Lin & Chu (2002) test. We find that all the P-values corresponding to the variables included in our study are lower than 0.08. Hence, the variables are stationary and have no unit root.

2.2. Normality Test

Table 9: Jarque-Bera (JB) test

	Jarque-Bera	Probability
AGE	4.204270	0.122195
COMB	45.69101	0.000000
GDP_GROWTH	5.750456	0.056403
INTERETS	27.74815	0.000001
INF	12.58295	0.001852
LEV	283.9668	0.000000
LQ	107.4724	0.000000
RCR	12.16937	0.002277
PWG	128.5114	0.000000
ROA	1076.231	0.000000
REV	19.74680	0.000052
RRPHS	32.29768	0.000000
SEFF	13.95879	0.000931
SIZE	1.971203	0.373215
SOLV	293.3554	0.000000
TAN	17.97144	0.000125
TEFF	214.3082	0.000000
UR	128.0094	0.000000

For the most part, and although it is rare to find financial time series that are normally distributed, we will be testing the normality of the various time series included in our study. Hence, we used the Jarque-Bera test.

Apart from the variables GDP_Growth AGE and SIZE, the Jarque–Bera test indicates that all variables are non-normally distributed, this can be seen by examining the P-Values of each variable (P-value <0.05).

2.3. Test for Multicollinearity

Table 10 : Correlation matrix between variables

	ROA	LQ	PWG	UR	COMB	RCR	RRPHS	SOLV	SIZE	AGE	LEV	TAN	REV	TEFF	SEFF	INTEREST	GDP_Growth	INF
ROA	1																	
LQ	-0,1359	1																
PWG	0,0981	0,0578	1															
UR	0,2887	-0,1315	0,2855	1														
COMB	0,6631	-0,2105	0,2485	0,3599	1													
RCR	-0,0334	0,5145	0,0121	-0,3373	-0,2625	1												
RRPHS	-0,0135	-0,2353	0,0236	-0,2827	0,0725	-0,4447	1											
SOLV	0,1458	0,1047	0,7327	0,3734	0,2682	0,1532	-0,1463	1										
SIZE	0,3059	0,1489	-0,1588	-0,0283	0,1355	0,0993	0,0263	-0,0145	1									
AGE	0,1618	-0,1691	-0,2264	-0,3574	0,0465	-0,1499	0,2099	-0,1867	0,5189	1								
LEV	0,0456	-0,1212	0,032	0,207	0,0065	-0,1723	0,0726	0,1801	0,0562	-0,1701	1							
TAN	0,3876	0,1204	-0,1413	0,2212	0,1562	0,3632	-0,3678	0,0246	0,3235	-0,1758	0,0477	1						
REV	-0,1287	-0,0137	-0,1432	-0,0001	0,0793	-0,1126	0,0254	-0,0894	0,3451	0,1721	-0,0954	0,0406	1					
TEFF	0,117	-0,0456	0,0084	-0,0283	0,1205	0,0184	0,0179	0,0015	-0,3647	-0,0851	-0,05	-0,0375	-0,0302	1				
SEFF	0,0335	0,0625	-0,0167	-0,14	-0,0512	0,0831	-0,0681	-0,1258	0,0022	-0,0177	-0,1158	0,2566	-0,1178	0,1529	1			
INTEREST	-0,0496	-0,0049	0,0366	0,0069	0,0244	-0,0547	-0,1172	-0,0403	0,1839	0,0945	0,0132	0,091	0,2926	-0,0715	0,3566	1		
GDP_Growth	0,0327	-0,0504	0,197	-0,0062	-0,1878	0,0748	-0,0615	0,0554	-0,2743	-0,1379	0,0243	-0,0555	-0,5714	-0,0127	0,1696	0,0705	1	
INF	-0,111	-0,0313	0,1015	-0,0167	-0,1625	0,049	-0,0783	0	0,0627	0,0313	0,0588	0,0279	0,1164	-0,0074	0,4046	0,6146	0,1349	1

Our methodology and the idea behind our study is searching to detect the impact of different factors on insurers' performance. However, before presenting the principal results of our model estimation, it is necessary to examine the dependence between these different variables in our sample.

The result shows a positive association between the ROA and each of the following variables PWG, UR, COMB, SOLV, SIZE, AGE, LEV, TAN, TEFF, SEFF and GDP_Growth. This implies that these different variables move in the same direction as the financial performance of insurance firms, which is measured in terms of ROA.

Furthermore, there is a negative association between LQ, RCR, RRPHS, REV, INTEREST, INF and ROA ($r<0$), implying that they move oppositely to ROA, in other words, to the financial performance of insurance firms.

According to Kennedy (2008), the problem of multi-collinearity arises when the correlation is greater than 0.8. Yet, it can be seen from table (10) that the highest correlation, which is between the Solvency Margin and the premium growth ratio is 73.27%, still lower than 80%. Hence, we can say that there is no multicollinearity problem in the linear model.

II. Presentation of the model and Empirical findings

1. Empirical Model specification

The panel data approach is used in this section to empirically investigate the relationship between insurance profitability and the different factors that may influence it. Considering the scarcity of insurance companies' data, using a panel approach instead of several short time series seems to be the best way of estimating and testing the mentioned links. The silver lining of a panel data regression is that it enables the observation of differences across subjects and within them over time, while controlling for the effects of unobserved or missing variables.

Thus, as to achieve the objectives of this research study, the panel data regression model is used to explicitly show the relationship between the profitability of insurance companies and explanatory variables like company age, underwriting risk, leverage ratio, liquidity ratio, premium growth, tangibility of asset, interest rate, inflation and growth rate of GDP etc..

In fact, we referred to prior studies such like Malik (2011), Shiu (2004), and Charumathi (2012) in order to specify the regression equation subject of this estimation.

Through the following model, all independent variables enter the regression equation at once to examine the relationship between the whole set of predictor and dependent variables. The aim of this analysis is to determine which independent variables are highly significant to determine the company's profitability. The following regression equation is estimated as follow:

$$R_{it} = \beta o + \beta 1SZ_{i,t} + \beta 2AGE_{i,t} + \beta 3LEV_{i,t} + \beta 4LQ_{i,t} + + \beta 5SOLV_{i,t} + \beta 6TAN_{i,t} + \beta 7UR_{i,t} + \beta 8COMB_{i,t} + \beta 9PWG_{i,t} + \beta 10RCR_{i,t} + \beta 11RRPHS_{i,t} + \beta 12GDP_{i,t} + \beta 13INT_{i,t} + \beta 14INF_{i,t} + \beta 15Seff_{i,t} + \beta 16Teff_{i,t} + \beta 17REV_{i,t} + \epsilon_i$$ [1]

Although the static model provides us with insights into individual behavior in repeated scenarios, it does not consider the possibility that the dependent variable and the explanatory variable may affect each other at the same time. This is a desirable feature, especially when using low Frequency data. Therefore, the dynamic panel method is more suitable for our situation. It can adjust the model to eliminate long-term equilibrium deviations. It can also investigate the impact of lagging explanatory variables and deal with the deviations of missing or omitted variables.

For this context, the estimates of fixed effects (FE), random effects (RE), and general Least squares (GLS) are skewed and inconsistent due to endogeneity. Using Generalized Moments Approach as suggested by Arellano and Bond (1991) will result in clear and unbiased estimators. More precisely, we approach these problems according to the methods of Blundell and Bond (1998), in other words, the GMM estimator.

This estimator is developed for datasets with many of panels, but with few periods, which is the case of the data set available hereby. Compared to a differenced GMM estimator, a system GMM assumes that the observed and lagged levels of all variables are weakly correlated.

Blundell and Bond have shown that these biases could be minimized by introducing more informative moment conditions that are true in the initial conditions process under very reasonable stationarity conditions.

[1] ***R = Profitability proxy; βo = Constant; Size = Size of insurance company; AGE= Age of Company; LEV= Leverage; LQ = Liquidity; SOLV= Solvency Margin, TAN= Tangibility of assets; UR= Underwriting Risk; COMB= Combined Ratio PWG= Premium Growth RCR= Ratio of Ceded Reinsurance, RRPHS= Reinsurance Recoverable To Policyholders Surplus; GDP_Growth= GDP Growth; INT= Interest Rate INF= Inflation, Seff= Scale efficiency; REV = Revolution Dummy; Teff= Technical efficiency; Є= error term, ; i= Firms ; t= period covered by the researcher from 2005 to 2018 years.***

This approach essentially uses lagged first-differences as instruments for our equations, in addition to the usual lagged series levels that are only weakly associated with subsequent first differences. Because we cannot assume strict exogeneity, the independent variables may be declared predetermined if we assume that the error term has any input on its subsequent realizations.

Simply put, using past realizations that are not associated with current errors as instruments for our suspected endogenous variables is more feasible than searching for new variables.

The autocorrelation test of Arellano and Bond has a null hypothesis of no autocorrelation and is applied to the differenced residuals. That being said, we are more focused on the test for the autoregressive order 2 model, AR(2), because it detects level autocorrelation.

Therefore, if AR(1) yields a p-value lower than 0.05, this does not mean that the model is incorrectly defined, while this can not happen for AR(2). The validity of instrumental variables is confirmed using the Sargan post-estimation test of over-identifying constraints.

Subsequently, to be able to empirically test the impact of other performance factors that cannot be directly observed, we will adopt a dynamic specification of the regression model. Referring to the research of McDonald (1999), Goddard et al. (2005) and Odusanya et al. (2018), we add the lagged dependent variable to the other explanatory variables in the first regression equation. Following this, the regression model will be estimated as follows

$$R_{it} = \beta o + \mu\beta 1 R_{i,t-1} + \beta 2 SZ_{i,t} + \beta 3 AGE_{i,t} + \beta 4 LEV_{i,t} + \beta 5 LQ_{i,t} + + \beta 6 SOLV_{i,t} + \beta 7 TAN_{i,t} + \beta 8 UR_{i,t} + \beta 9 COMB_{i,t} + \beta 10 PWG_{i,t} + \beta 11 RCR_{i,t} + \beta 12 RRPHS_{i,t} + \beta 13 GDP_{i,t} + \beta 14 INT_{i,t} + \beta 15 INF_{i,t} + \beta 16 Seff_{i,t} + \beta 17 Teff_{i,t} + \beta 18 REV_{i,t} + \epsilon_i^2$$

Indeed, the second equation serves as an extension of previous studies examining the effect of different factors on insurance profitability.

For the first regression, we will first focalize on modelling the individual effects for the panel data by determining the appropriate model for our estimates, whether fixed or random effect, by reference to the Hausman specification test.

[2] Ri, t-1= is the lag value or past performance,

μ : Ajustement speed

Besides, in order to test the stability of the variance, it is necessary to investigate the heteroscedasticity through the Breusch-Pagan test. Then we need to proceed to the Wooldrige test to study the auto-correlations between these error terms. These test will enable us to know which method is more appropriate to use whether it's OLS (Ordinary Least Squared) or GLS (Generalized Least Squared).

2. Panel Estimation technique

Panel models combine two dimensions at once: the cross section of our sample, as well as the time series of each variable. This constitutes a major advantage, seeing that it increases the number of observations. In addition, the panel models allow us to study the evolution of relations over time while controlling the heterogeneity between the banks included in our study.

In fact, there are two types of panel models: fixed effect models and random effects models. Hereafter, we are going to present these models, as well as conduct some tests to choose the more adequate one.

- **Fixed effect model:**

The fixed effect model assumes that the relation between the dependent variable and each of the explanatory variables is identical for all the banks. This model is presented as follows:

$\mathbf{ROA_{it}} = \alpha_i + \sum_{k=1}^{K} \beta_k X_{it} + \varepsilon_{it}$ (i=1, 2…, n; t=1, 2…, T)

Where:

α_i : represents each bank's specificity

ROA_{it} : Return on assets ratio for each insurance firm

X_{it}: the different independent variables

ε_{it} : Idiosyncratic error term.

- **Random effect model**

The random effect model assumes that the individual specificities are actually random. The constant term breaks down into a fixed term and a random term which is specific to each individual, this actually helps controlling individual heterogeneity.

The random effect model is as follows:

$\mathbf{ROA_{it}} = \alpha_i + \sum_{k=1}^{K} \beta_k X_{kit} + \sum_p \lambda_i Z_{pi} + \varepsilon_{it}$ (i=1, 2…, n ; t=1, 2…, T)

Where:

α_i: individual random terms / $\alpha_i = \alpha + U_i$

X_{kit} : the different independent variables over time

Z_{pi} : the invariant factors over time

3. Detecting the effect of Different factors insurance financial performance

As a means to achieve the objective of this paper, we have used multiple regression tools. We will test multiple regressions models, so we can define which model best assess the impact of the different explanatory variables on the profitability of insurance companies represented by both ROA and ROE.

3.1. Testing for individual effects

Fisher type-tests that are recommended for unbalanced panels (Baltagi, 2005). To start with, we will test our data through the significance test of Fisher.

This test exhibited a Prob> F of 0.000 thus lower than 5%. Hence, confirms the heterogeneity of our data. This indicates the possibility of estimating our model using panel data.

3.2. Hausman Specification Test

The Hausman test statistic is a transformation of the difference between the parameter estimates from each of the fixed effects and random effects. That becomes asymptotically χ2chi- square distributed under the null hypothesis.

Table 11: The Results of the Hausman test

Test summary	**Chi-sq. statistic**	**Prob**
Cross-section random	66.20	0.0007

H_0: Random effect Model

H_1 : Fixed effect Model

Hausman test reported a chi-square of 66.20 with a P-value of 0.0000. This implies that, for return on equity, the random effect model is preferred to that of the fixed effect.

3.3. Regression analysis

The empirical results of the estimation, which are grouped in the table below, are obtained from Stata Software after several tests in order to avoid a biased regression and to get better results.

3.3.1. Heteroscedasticity Test

The second test to perform is Breusch-Pagen to examine heteroscedasticity. The purpose of this test is to verify whether or not the square of the residuals can be explained by the explanatory variables of the model. If it is the case, then there is heteroscedasticity.

For this test, the null hypothesis assumes that the coefficients of the regression of the squared residuals are equal to zero and homoscedasticity exist. If the p-value is below the confidence level, the null hypothesis is rejected, confirming the evidence of heteroscedasticity.

The result shows a probability lower than 5% (P=0.0000). Hence, we accept the hypothesis that suggests the heteroscedasticity of the residues for the ROA model.

3.3.2. Test for Autocorrelation

To establish whether the residuals are serially correlated over time, we conducted Wooldridge test for autocorrelation. The null hypothesis of this test is the absence of autocorrelation and if the Prob>F is below the confidence level, we reject this hypothesis, which proves the existence of autocorrelations between the error terms.

For both our models, Prob>F is greater than 5% 0.0115 for ROA. Hence, we accept the hypothesis that suggests the heteroscedasticity of the residues.

3.4. Sargan test of overidentifying restrictions

The Sargan test can be used to examine for excessive identification constraints in a statistical model. The null hypothesis is that the model is excessively constrained correctly which means that the instruments are valid.

In our case, Prob>chi2 = 0.1574 greater than 5%. Hence, we accept the null hypothesis.

3.5. Arellano and Bond (1991)

This test for the absence of serial correlation of the residuals is based on the following assumptions:

H1: presence of negative first-order correlation of the residuals.

H0: Absence of second-order correlation of the residuals.

The result found shows that the Prob>Z of the AR(2) auto-correlation is equal to 0.136, greater than 5%, which leads us to accept the hypothesis H0 indicating the absence of second order correlation of the residuals.

Section 3: Estimation Results

Table 12: Panel estimation Results

ROA	GLS Model	GMM Model
ROA L1		0.25867 (0.000)***
LQ	-0.00264 (0.476)	-0.0051 (0.174)
PWG	-0.00874 (0.605)	-0.0105 (0.001)***
UR	-0.05081 (0.004)***	-0.0441 (0.000)***
COMB	-0.14825 (0.000)***	-0.0763 (0.003)***
RCR	-0.38178 (0.022)**	-0.04045 (0.003)***
RRPHS	0.12993 (0.081)*	0.01410 (0.313)
SOLV	0.02633 (0.067)*	0.04248 (0.000)***
SIZE	0.00772 (0.031)**	0.0193 (0.000)***
AGE	0.00028 (0.014)**	0.0556 (0.000)***
LEV	0.00200 (0.213)	0.0630 (0.880)
TAN	-0.03148 (0.05)**	-0.3039 (0.362)
REV	-0.01380 (0.000)***	-0.1102 (0.284)
TEFF	0.01853 (0.055)*	0.4312 (0.293)
SEFF	0.00379 (0.296)	0.3255 (0.024)**
INTEREST	0.45368 (0.035)**	0.0126 (0.899)
GDP_Growth	0.05560 (0.005)***	0.0057 (0.928)
INF	0.10301 (0.465)	0.3829 (0.000)***
CONST	0.01853 (0.785)	11.5961 (0.000)***

***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.

I. The impact of previous performance on current profitability

The significant value of the lagged profitability variable (ROA_{t-1}) confirms the dynamic character of the model specification**.** The obtained results confirm the existence of a positive and statistically significant at a 1% level link between insurers' profitability and its past performance. The coefficient associated to the lagged ROA represents the speed of adjustment to equilibrium. Indeed, the fact that the adjustment coefficient is somewhere between 0 and 1 indicates that insurers' profits persist, but will eventually return to equilibrium. A coefficient close to 0 indicates a swift speed of adjustment, implying that the insurance sector is competitive. On the other hand, if the value of the adjustment coefficient is rather close to 1, it indicates a low speed of adjustment, which implies that the insurance market is not very competitive.

In the study hereby, the adjustment coefficient is equivalent to 0.24271 (closer to 0), which denotes a rapid speed of adjustment of the performance to its equilibrium level, thus proving the competitive aspect of the Tunisian insurance sector. This result is consistent with that stated by Pervan et al. (2012) in their study of the Republic of Macedonia.

II. The Impact of Independent variables on profitability

1. The Impact of Liquidity on profitability

The regression results in Table(12) clearly show that there is a not a significant relationship between the return on assets and liquidity. The coefficients for this variable are negative with -0.00264 and -5.05124 respectively for the GLS and GMM models. Thus, liquidity does not really affect Tunisian insurer's profitability.

Hence, consistent with the hypothesis that general insurers, whether they have more liquid assets or with less liquid assets, the performance of non-life companies can neither be mitigated nor enhanced by increases in asset liquidity.

However, though it might not be significant in terms of its relationship to performance, the investment objective of liquidity is of particular importance to general insurers. This is possibly because non-life contracts generally vary in terms of due dates or maturity, which means that non-life claims' payments can vary widely, depending on inflation, medical costs, construction costs, economic conditions, and changing value judgements by society. Nevertheless, it certainly does not mean that non-life firms should invest all of their funds in either non-liquid

or liquid assets, because liquid assets, in general, produce relatively low returns in the long run and non-liquid assets can cause a liquidity risk. They should limit their liquid assets to a certain amount or percentage. Further investigation would be required if the optimum amount or percentage were to be discovered.

2. The Impact of Premium Growth on profitability

Concerning the premium growth, the regression results in this research imply that the relation between premium growth and profitability is negative and significant at 1% significance level (p-value= 0.001) in the GMM model and insignificant in the GLS model. The negative coefficient of growth in writing premium indicates a negative relationship between growth in writing premium and profitability. It implies that Insurance companies underwrite more premium over the years have lesser chance of being profitable.

The linkage between the growth of gross written premiums and insurers' financial performance is negative, as in some cases, an excessive growth of underwritings generates a higher underwriting risk and the necessity to increase the volume of technical reserves. Plus, as stated by Chen and Wong (2004) excessively increasing the volume of the gross written premiums may lead the insurer to self-destruction, as other important goals, such as selecting lucrative investment portfolios, could be neglected.

This finding is consistent with previous studies by Charumathi (2012) and Burca and batrinca (2014). They concluded that growth of written premiums has a negative influence on the insurer's profitability.

3. The Impact of Underwriting Risk on profitability

The underwriting risk emphasizes the adequacy of the insurer's underwriting process and the exposure to financial loss resulting from the selection and acceptance of risks to be insured.

The coefficient of underwriting risk is negative in both GLS and GMM models with beta coefficients of -0.05081 and -4.41409 respectively and statistically significant at 1% significance level.

The negative result shows that there is inverse linkage between underwriting risk and ROA of Tunisian insurance companies. It implies that higher underwriting risk increases the operating ratio, indicating adverse effect on the firm's return on Assets. In fact, this negative influence on the insurer's profitability that underwriting risk has is due to taking an excessive exposure to

risk when heavily subscribing new policies which can affect the company's stability through higher liabilities and incurred claims.

This finding is consistent with previous study by Adames & Buckle (2000) and Burca and Batrinca (2014). They concluded that underwriting risk has a negative influence on the insurer's profitability.

4. The Impact of Combined Ratio on profitability

The combined ratio is a key element in the world of insurance, as it is not only a measure of the exposure of a company towards the risk it's undertaking but also it is used by an insurance company to measure how well it is performing in its day-to-day operations as it incorporates the expenses element in its calculation.

The regression result in Table (12) clearly shows that there is negative relationship between the return on assets and the combined ratio. In fact, the coefficients of the combined ratio is negative in both GLS and GMM models with beta coefficients of -0.14825 and -7.6320 respectively and statistically significant at 1% significance level.

We can clearly recognize the effect of the incorporation of the underwriting expenses into our model when we observe the coefficients of both GLS and GMM models in the combined ratio that are higher than those of the underwriting risk suggesting that expenses have a significant impact on profitability in the ROA model.

This finding is consistent with previous study by Malik (2011) and Pervan et al. (2012). They stated that Loss Ratio is negatively correlated with insurer's profitability.

5. The Impact of reinsurance on profitability

For the purpose of analyzing the effect of reinsurance on profitability of Tunisian insurers we suggested the study of two ratios on the ROA model namely RCR and RRPHS.

The regression result in Table (12) shows that there is a negative and significant relationship between RCR and return on assets in both GLS and GMM models. In fact, the coefficients of the regression are -0.38178 and -4.0456 respectively. The significance level of this variable is at 1% in the GMM model and at 5% in the GLS model suggesting that introducing the previous performance enhanced the significance of the output.

As for the second proxy, i.e. RRPHS, a positive and significant link was found through the GLS model and a positive and insignificant link was found in the GMM model. In fact, the coefficients of the regression are 0.12993 and 1.4108 respectively.

The RRPHS ratio offers a straightforward measure of the level of dependence of the insurance firm on its reinsurers to settle claims. In other words, an increase in reinsurance inward systemically means an increase in the insurer's capacity to settle claims which explains the positive link between RRPHS and the profitability of Tunisian insurers. This finding is contradicts previous studies conducted by Iqbal and al. (2014b) as well as Dansu and al. (2018), who found that insurance profitability is positively linked to RRPHS.

On the other hand, the coefficient estimates of reinsurance dependence is found to be negatively related to performance across both models. Many general insurers rely heavily on reinsurance because of their limited resources and the uncertain nature of their business. Thus, assessing an appropriate degree of retention is important for insurance companies and they must seek to find a balance between lowering insolvency risk and reducing future returns. Although it increases operational performance, increasing reinsurance dependence lowers retention levels and reduces potential profitability

If an insurance firm tends to cede an important level of its premiums and keeps lower retention, it operates as if it is an insurance broker rather than a firm and consequently it is likely to report less profit for it only cashes in returns from cuts given by reinsurers instead of those from its regular risk management activity. However, there is a cost related to reinsurance.

However, this evidence does not indicate that reinsurance cover should not be taken out by non-life companies at all. An implication of the results is that reinsurance benefits mitigates beyond a certain threshold. Further studies would be required to determine the optimal level of reinsurance.

This finding is consistent with those put forward by Burca and Batrînca (2014) and Lee (2014) who claim that with an important reinsurance dependency comes lower profitability rates.

6. The Impact of Solvency on profitability

The solvency margin of an insurance company is the size of its capital relative to all risks it takes.

The coefficient of solvency is positive and statistically significant in both GLS and GMM models with 10% and 1% significance level respectively, suggesting that introducing the lagged performance increased the significance of the variable in the model.

The positive coefficient of capital adequacy (β = 0.02633 for GLS and 0.04248 for GMM) in case of ROA implies that, increase in capital by one Tunisian Dinar, results in an increase in companies' performance by β cents (0.02633 for GLS and 0.04248 for GMM).

This result is key for insurers to note. Indeed, higher capital level brings higher performance because having more capital act as a buffer in case of adverse situation, which represents the insurance firms' financial soundness and its ability to overcome the risks it's facing.

7. The Impact of Efficiency on profitability

As already mentioned, cost efficiency is measured through technical efficiency (TEFF) and scale (SEFF) scores. The results found indicate that the technical efficiency score has a positive and significant impact (at the 10% threshold for GLS regression) however not significant for GMM regression. As for the scale efficiency score, its impact is positive and significant at the 5% threshold for the GMM regression, but not significant for the GLS regression.

This result resonates with the findings of Greene and Segal (2004) and Luhnen (2009), who found that cost inefficiency is expected to have a negative impact on profitability and thus they expected a positive link between cost efficiency and financial performance.

The magnitude of the coefficient indicates that the effect of efficiency on ROA evaluated at the mean of the efficiency estimate is 2% for technical efficiency and 32% for scale efficiency. Given the relatively low ROA in the industry (2%), this result suggests that efficiency is not only statistically significant but also economically significant.

It is important that we note that the impact of cost efficiency measures (technical efficiency and efficiency of scale) is not of the same degree. Efficiency of scale has a greater weight than Technical efficiency. This result shows that using economies of scale through an increase in the size or volume of activities (scale efficiency) has a more significant impact than reducing insurance operational expenses through good management of resources (i.e. technical efficiency).

III. The Impact of Control variables on profitability

Table (12) shows that variable AGE is statistically significant in a model were ROA is used as dependent variable. Same with SIZE variable the influence it has on ROA is both positive and significant. The positive sign of size indicates that the larger the insurance companies achieve a higher ROA than smaller ones. This means when the insurance companies' asset goes up the performance also moves in the same direction.

Both Tangibility of assets and the revolution dummy variable do not have a significant effect on profitability in the MCG model. However, they both do have a significant and negative effect on profitability in the GMM model. This indicates that the more fixed assets an insurance company has the less profitability it draw out. Moreover, the year 2011 was marked by the revolution of 14 January in Tunisia. The consequences of the events, resulting from the revolution, which Tunisia faced in 2011, have significantly mitigated insurers' pockets.

The results of our regression found that there is no relationship between insurance firms' financial Leverage and profitability, which is consistent with the findings of Boadi et al. (2013).

As for the external factors, the table (12) shows different results. For instance, Interest Rates and GDP growth have a significant and positive link with profitability in the MCG model while they have an insignificant link to ROA in the GMM model. However, Inflation, on the other hand, has a positive and significant correlation with profitability in the GMM model and does not have one in the MCG model.

This is because the country's economic growth has positive effects on the insurance sector. In fact, if the gross domestic product grows, the possibility of selling insurance policies increases accordingly and insurance companies may profit from it. The non-significance of this variable in the GMM model shows that Tunisian insurance companies might not benefit from the country's economic growth.

Besides, in Tunisia, bonds represent a large part of the inverted assets of insurance companies and the increase in interest rates brings higher bond income. Which explains that an increase in the interest rate positively affects the performance of insurance companies. However, the non-significance of this variable in the GMM model shows that Tunisian insurance companies do not use these revenues effectively.

Finally, the positive aspect of the relationship between inflation and profitability might be due to the fact that with higher consumer price indices rates insurance policies' prices become higher. Thus, the insurer will be expecting higher profitability. However, the non-significance of this variable in the MCG model might be because inflation also affects insurance performance by increasing the number of claims, expenses and technical provisions thus it balances itself.

Conclusion

This chapter has been devoted to the description and analysis of the major determinants of profitability subject of our study. Then, we empirically studied the effect of each and every factor on the profitability of insurance firms in the Tunisian context.

As a first step, we used the frontier analysis method using input oriented Data Envelopment Analysis with variable returns to scales (VRS) in order to approximate the best practice cost and determine technical and efficiency scores of Tunisian insurance firms.

Our study was conducted for the period between 2006 and 2018 using two estimation methods, namely the GLS and the GMM that we based on the panel model in which we regressed the ROA. The findings show that the different relationships linking the explanatory variables to the dependent variable keep the same signs for the two estimation methods with different levels of significance.

The results confirm the significance of Underwriting Risk, Combined Ratio, RCR, Solvency, Size and Age in both GLS and GMM models. RRPHS, Revolution dummy, Tangibility of assets Technical Efficiency, Interest rates growth and GDP growth are significant in the GLS model while Lagged ROA, Premium growth, Scale efficiency and Inflation growth rate are significant in the GMM model.

Summary and Conclusion

A strong and healthy financial system is a precondition for sustainable economic growth of a given country. In order to survive negative shocks and maintain a good financial stability, the financial managers and policy makers should identify the key performance determinants of insurance companies. Because of this, the current study specified an empirical framework to examine the firm specific and macroeconomic factors affecting profitability of insurance companies as measured by ROA. This study used secondary data during the period 2006-2018 and the sample of 9 insurance companies. Descriptive statistics and regression analysis were performed to describe the profitability of insurance companies among insurance companies using two estimation methods namely GLS (Generalized Least Squares) and GMM (Generalized Method of Moments).

The main objective of this study was to investigate most important determinants of insurance companies' profitability in Tunisia. According to previous studies made on the determinants of insurance companies' profitability, profitability is affected by both internal and external factors. Internal factors are factors that are under the control of insurance companies' management and also called company specific factors. Those factors include company age, size, loss ratio, leverage, liquidity, premium growth, underwriting risk, cost efficiency and tangibility of asset. Furthermore, external factors represent events outside the control of insurance companies which is composed of industry specific and macroeconomic factor like growth rate of GDP, growth of interest rates and inflation.

The central objective of insurers is to maximize their profitability in order to ensure their sustainability. This thesis seeks to highlight the most relevant factors on which Tunisian insurance firms should focus while emphasizing the predominance of both insurance specific determinants as well as business environment factors in determining financial performance.

The result of our analysis reveals a significant relationship between Underwriting Risk, Combined Ratio, RCR, RRPHS, Solvency, Size, Age, Tangibility of assets, Revolution, Technical Efficiency, Interest Rate Growth and GDP growth with the dependent variable ROA in the GLS model. This study also confirms a significant linkage between the past performance (lagged ROA), Premium Growth, Underwriting Risk, Combined Ratio, RCR, Solvency, Size, Age, Scale Efficiency and the Inflation Rate Growth with the dependent variable ROA in the dynamic GMM model.

Granted this work has certain limitations, this can be illustrated by the small number of observations that can be expanded.

With regards to the dependent variables, we could have made reference to other insurance performance measures such as return on equity (ROE), average return on assets (ROAA), average return on equity (ROE)) or Tobin's Q to compare the significance of the different relationships with the explanatory variables. However, through the related literature, ROA proved most relevant in the insurance context.

Concerning the evaluation of efficiency scores, we could have introduced among our outputs "Real" financial services relating to insured losses and intermediation as a relevant variable in the calculation of insurance efficiency, this was not done due to the unavailability of these data.

On the basis of the findings of this study, we have drawn the following recommendations

Through our research, we gathered a clear idea upon the most critical determinants that can influence profitability in Tunisia. Hence, insurers can, in return, focus on these factors and try to manipulate them as much as they can in order to draw the most return they can.

Plus, the insurance company's main function is to underwrite policies, hence, insurance firms should in a first place mitigate the severity of underwrite risk (amount of losses). First of all, to minimize the risk of underwriting, insurance firms should enhance their underwriting efficiency by using risk and product selection methods with geographical approaches and various pricing strategies according to regional and specific historical ground to assess the price of the same or other risk class.

Furthermore, in order to minimize the amount of losses the company should also increase the handling of claims procedure with continuous improvement in claim leakage control from both sides, from the employee of the firm (the reception, inspection and claim management).

Moreover, it is important for general insurers to use reinsurance as a tool of risk management to reduce the volatility of their claims. However, an excessive retention ratio can lead reinsurers to become simply insurance brokers and prevent them from better returns. Therefore, an optimal retention level is favorable if an insurer would like to remain competitive in a highly aggressive market like the Tunisian insurance market.

As for the size, it seems that the larger the insurance company gets the more profitable it becomes benefiting from the economies of scale. However, the results showed that an

aggressive premium growth is a hindrance to profitability. Hence, insurance firms should put in place a strategy to grow at a steady pace.

Besides, efficiency is also key to profitability. Our findings suggested that using economies of scale through an increase in the size or volume of activities (scale efficiency) has a more significant impact than reducing insurance operational expenses through good management of resources (technical efficiency). Thus, insurers should focus on getting to an optimal underwriting volume level in order to optimize their profitability.

Further, solvency is proven to be of a positive impact on profitability. Many studies have been conducted in this regards and Tunisian insurers should align with the solvency requirements put forth by the regulatory body or better yet meeting with the solvency requirements introduced by Solvency II.

Finally, insurance firms should be wary of their environment such as the growth of the nation’s economy, the interest rates or the inflation rates shocks. For instance, insurance firms should increase their share of underwriting in respect of the country's economic growth by defining the potential and priority direction of the country's overall economic activity and development. Plus, they should include the development of new insurance services, based on the economic direction.