



Стопански
факултет

Социално- икономически анализи

Книга 1/2017 (11)

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DETERMINANTS OF NON-LIFE INSURERS PROFITABILITY IN BULGARIA FOR THE PERIOD 2006 – 2014

Abstract: The paper analyses the effects of insurance companies specific factors (age of company, size of company, volume of capital, leverage ratio and loss ratio) on profitability proxy by ROA. The sample in this paper includes 23 non-life insurance companies that cover the period of 2006- 2014. Secondary data are obtained from the financial statements (Balance sheet and Profit/Loss account) of insurance companies, financial publications of Bulgarian Financial Supervision. Since our aim was to investigate what are determinants of the profitability issue of the non-life insurance companies, taking into consideration the methodology used in previous studies we select to measure it by the Return on Assets (ROA) ratio. We do a test whether Company Size, Leverage Ratio, Loss Ratio, Capital RatioMarket Share, Age of Company would have a statistically significant effect on the profitability. We used panel data regression model when we looking for the relationship between profitability (ROA) and the chosen factors.

Key words: Insurance profitability, panel data regression model, Bulgarian insurance market

Introduction

The insurance industry in Bulgaria (together with the banking sector) is a key factor for the development of financial market in the country. The insurance system played a significant role for the remarkable transformation of the country from a communist financial system toward a free market economy

During the first ten years of the development of the insurance sector (1989 – 1999) the insurance companies are either state-owned or small local private insurers, in some cases even connected with the grey economy. After 2000 European insurers (Allianz, Generali, QBE, Eureka, Uniqa, VIG, AIG, HDI, Groupama) entered into this market, bringing their know-how, product portfolio, investments in people. For the year of 2013 GWP is € 861 million, 56% of tis is broker's business. (The Commission of Financial Supervision, 2013). However, the insurance penetration is 2,09% – far away from the average EU insurance penetration of 7%. The non-banking sector in Bulgaria is regulated by the Financial Supervision Commission that was set up in 2003 for supervising the non-banking sector.

The main aim of this paper is to analyse the performance in term of profitability of the Bulgarian insurance market during the period 2006 – 2014. Among the key issues for a company appraisal are profitability and solvency, however ROE (return on equity) together with ROA (return on assests) are one of the oldest and most used methods for a firms' financial performance.

Profitability is a common aim of the financial management due to the ultimate goal of financial management is to maximize the owner's wealth, thus profitability appears as a key determinants of performance. The insurance regulation goal is often related to market imperfections such as agency problems. Agency problems refer to the contradiction between the insurance company's owners (and managers) on one hand and policyholders on the other hand. It was admitted that there are needs for a form of supervision to attempt to minimize the risk of a possible failure. In fact, insolvency of non-life insurance companies has raised the concerns of parties such as insurance regulators, investors, management, financial analysts, banks, auditors, policyholders and consumers. The asymmetry between profitability as one of the main drivers for a company in insurance business and the solvency issue as a form of guarantee for the policyholders can be

resolved by acquiring and distributing more information and regulation. Based on these problems, numerous forms of insurance regulation have existed last 15 years. Many countries all over the world focused on stronger regulation of insurance sector, in 1994 the European Union (EU) introduced the Third Generation Insurance Directive, the first of many other EU regulations that changes insurance business in EU. Five years later, in 1999 USA approved the Gramm-Leach-Bliley Financial Services Modernization Act, while meanwhile, since 1996 on Japan focused on financial system deregulation in 1996. Solvency II is a the last form of EU regulation for the insurers. It represent a fundamental review of the capital adequacy regime for the European insurance industry. It aims to establish a revised set of EU-wide capital requirements and risk management standards that will replace the current solvency requirement. On April 22, 2009, the European Parliament approved the Solvency 2 framework directive, effective January 1, 2014.

There have been numerous studies focusing on the determinants of both profitability and insolvency of insurance firms which function in the developed economies of the world Berger and Humphrey (1997), Rai (1996), Cummins and Weiss (2000), Eling and Luhnen (2010). However the profitability studies on smaller, developing markets are rather isolated and focused on markets like Pakistan, Thailand, Poland Malik, H. (2011), Karim and Chanta (2005), Kozak, S. (2011).

Objective of the study is to investigate the situation of Bulgarian insurance system profitability and to examine the determinants of profitability of insurance companies for the period 2006-2014. This study aimed to contribute to the theory focusing on the determinants of the profitability of a single insurance market in Bulgaria. The study seeks to examine the effect and impact of insurance specific industry related and macroeconomics variables to the profitability of Bulgarian insurance sector. There has not been studied yet the profitability problem for the Bulgarian market; although there are studies for the insurers profitability toward a given time. There is no empirical study on the insurance efficiency determinants of the longer period than an year. Thus, this paper will contribute to the theory focusing on the nine years period 2006-2014 and having data from the Bulgarian insurance industry as single country study. Thus the findings of this study can be compared and contrast with the results of the previous papers focusing on insurance markets in Central and East Europe and Balkans. On the other hand as this study can contribute to the broader interested public, business, insurance managers, insurance companies' shareholders, insurance companies' stakeholders, business policy makers and supervising bodies.

In this regard our study will be the first for both topics using the period 2006-2014 and Bulgarian data only. Contribution to the existing studies will be the analysis of an extended period of 9 years and the expected conclusions about Bulgarian insurance market profitability as a study for a single country. We recon the expected comparison between the results of this study with other studies for insurers profitability, this making the paper useful not only for academic purposes, but will contribute to the interest of a wider public audience, business policy makers, insurance business managers, owners.

Literature review: The determinants of profitability:

Bulgarian Insurance Industry played a critical role in the financial development of Bulgaria and its economic development last 25 years as the second biggest representative of the financial market in the country. The insurance industry in Bulgaria was the main focus of many studies about the general organization of an insurance firm, insurance investments analysis, the analysis of the insurance premium income: The book by Gavriiski, V. (1955) „The organization and the planning of insurance” is the first Bulgarian study that analyzes the insurance business in Bulgaria, based on the insurance theory. Hristozov, J. (2013) studies the Solvency II – theory and implications in Bulgaria, Hristozov, J. and Todorov, R. focused on insurance and investments activities of Bulgarian non-life and life insurance companies for the period 1999 – 2002; Vazov, R. and Hristozov, J. analyzed the premium income of Bulgarian non-life insurance companies 1999 – 2004. Ivanov, K. and Milinov, V (2013) reviewed the nature and changes in the investment portfolios of insurance companies in crisis with an accent on the investment of equity and reserves as an essential part of the overall activities of insurance companies, Draganov, H. (2012) studied the basic principles of organizing and managing insurance business. However the profitability and its determinants for the insurance industry in Bulgaria are very rarely in the focus of the research for Bulgarian insurance industry: Krustev, L. (2009) reviewed the problems of the evaluation of a non-life insurance company, Vassilev, V. (2010) focused on analysis of the cash-flow in insurance company, later Ivanov, K. and Milinov, V. (2013) study essence, structure and main problems in the investment portfolios of insurance companies. The determinants of profitability of insurance business in Bulgaria for a respective period for the whole market in the country have not been studied yet.

Discussing insurance profitability literature focused on many different economic models in different countries and the impact of many factors. Throughout the years many studies focused on the determinants of the insurance profitability

A general overview on the profitability studies differentiates two major type of factors: internal (that depends on the development of the sole company) and external (that refer to the specific factors out of the company). Among internal factors the researchers study determinants found in firm's annual and other type of reports, and financial statements like the size of a company, the volume of capital, the leverage of a firm, the market share, the cost efficiency, the market portfolio of an insurer. External factors refer to different industry specific characteristics and macro economic factors. Among macroeconomic variables that were recently used in the profitability studies are gross domestic product growth, inflation, others. Industry specific variables used in the studies from the last decade are industry size, market share. The ratio analysis reflects the insurer's profitability analyzing the ROA (Return on Assets) and ROE (Return of Equity) ratios.

If we summarized the most studied determinants are the size of the company (Malik, 2011; Spathis, C. et al 2002, Karim and Chanta 2005, Charumathi 2012); the volume of capital (Malik, 2011), the leverage of the company (Malik, 2011 and Charumathi 2012); the loss ratio (Malik 2011), the cost efficiency (Eling and Luhnen 2010, Greene and Segal 2004, the age of the firm (Karim and Chanta, 2005); the liquidity (Charumathi 2012); the product portfolio; (Kozak 2011); the increase of GDP (Kozak 2011) the increase of the market share (Kozak 2011).

Ferrari (1968) reviewed the two approaches to insurance business – the approach of the investors, which is concentrated on the investment returned and the approach of the insurance business and the actuary. Although Ferrari's study did not conclude the way in which „investment should be included in the current ratemaking process. It is suggested that somehow simply plugging a rate of return into current ratemaking formulas is too narrow an approach.“, p. 302. Ferrari (1968) argued that, although the theory states that management should maximize the return to the shareholders, „It appears, however, that management in general, and actuaries in particular, have been over-zealous in addressing themselves to regulators rather than the shareholders.“ The author suggested that a competition might be a natural regulator of this dilemma.

Reviewing the size of the company as a determinant of profitability different authors came to opposite conclusion: according to Malik, H. (2011) concludes that the size of the insurance company is positively related with ROA, however Adams, M. and Buckle, M. (2003) proved „that highly leveraged, lowly liquid companies and reinsurers have better financial performance than lowly leveraged, highly liquid companies and direct insurers. However, financial performance was positively related to underwriting risk. However, the size of companies and the scope of their activities were not found to be important explanatory factors.“, p. 142. The above mention conclusion of Malik, H. (2011) is supported by the implication of Spathis, C. et al (2002) based on a study on Greek banking sector.

Malik, H. (2011) studied the determinants of insurance companies profitability in insurance sector in Pakistan, the sample is 34 Pakistani companies for the period 2005-2009. Descriptive statistics and multiple regression analysis were performed to describe the profitability among Pakistani insurance companies. The paper concludes that ROA and five variables that represent age of company, size, volume of capital, leverage and loss ratio were developed to test which factor best explains profitability of Pakistani insurance companies. Result shows that there is no relationship between profitability and age of the company, however there is significantly positive relationship between profitability and size. Result also shows that volume of capital was significantly and positively related to profitability. On the other hand the analysis suggests that reverse and significant relationship between leverage ratio and loss ratio as independent variables and profitability. The author concluded that ROA is affected positively by size, volume of capital and negatively by leverage and loss ratio.

Spathis, C. et al (2002) observing Greek banking system profitability uses ratios from financial statements documents (endogenous variables) to measure the performance of small and large banks. The authors use t-test in order to conclude whether the efficiency is related to the size of the bank. The same approach is used to estimate how factors like efficiency, liquidity, leverage refer to the size of the banks, combined with the M.H.DIS and the UTADIS methods. The results show that large banks are more efficient than small once.

In a study for the relationships among market structure and performance in property-liability insurers in United States the authors Choi, B. and Weiss, M. (2005) conclude that cost-efficient companies can

charge lower prices and earn higher profit, although prices and profits are found to be higher for revenue-efficient firms.

In a study by Karim and Chanta (2005) coping with cost efficiency and its relationship with profitability in Thailand's life insurance companies for a period 1997-2002 using the stochastic cost frontier approach. The authors conclude that there is 82 to 140 percent inefficiency within this industry. The mean inefficiency of the same study is negatively correlated with the size shows that there is no significant relationship between inefficiency and age. It is concluded that inefficiency is negatively correlated with ROE and ROA ratios. This shows that efficient firms, on average, have higher return on equity and on assets and, respectively the author concludes that "an inefficiency has substantial effect on the profitability of life insurance companies.", p. 19.

In his paper Kozak, S. (2011) observes the determinants of the profitability of Polish non – life insurance companies for the years 2002 – 2009. The author stresses that the freedom of the investment capital transfer within the European Economic Area (EEA) and a single passport rule have boosting effects for Polish insurance companies due to the access they were given to foreign investment, know-how, new technologies and management. Kozak, S. (2011) concludes that all this benefits Polish insurers, improving their profitability and cost efficiency. Other determinants that impact positively the profitability of Polish non–life insurance companies are the increase of the share of non motor business in the insurer's portfolio, the increase of GDP and the increase of the market share of non local insurance companies.

When Charumathi (2012) reviewed the factors determining the profitability of life insurers operating in India he proved that profitability of life insurers is positively and significantly influenced by the size (net premium) and liquidity. The leverage, premium growth and logarithm of equity capital have negatively and significantly influenced the profitability of Indian life insurers. This study does not find any evidence for the relationship between underwriting risk and profitability.", p. 1. The study of Charumanti (2012) proposes a mixed model of regulation and competition.

In order to review profitability issue we need to have a deep understanding of solvency and efficiency problems. As Eling and Luhnen (2010) mentioned there is increasing number of studies 15 years onwards, that measure insurance efficiency, many of those apply the frontier efficiency methods. Berger and Humphrey (1997) and Cummins and Weiss (2000) did 8 and 21 studies, respectively. The introduction of the single European Union (EU) insurance license in 1994 raised concerns over international competitiveness among EU insurers. Consequently, there have been quite a few efficiency studies that focus on competition in the EU. Diacon et al. (2002) proved the existence of striking international differences in average efficiency with highest level of efficiency in UK, Spain, Denmark, Sweden where insurers do a long term business, while UK insurers appears to have lower level of efficiency compared to other EU insurers, Eling and Luhnen (2010) in their cross-country analysis did an analysis based on data from 6462 insurance companies from 36 countries using both data envelopment analysis and stochastic frontier analysis to study their efficiency. The authors determine technical and cost efficiency for 12 countries, according to them emerging markets like Brazil, Mexico, Indonesia, Poland, Russia have lower efficiency compared to developed countries in Europe and Asia. Among these, Norway turns out to be highly efficient. The conclusions support and confirmed the conclusion from the studies done earlier – (Rai, 1996; Diacon et al., 2002; Fenn et al., 2008).

METHODOLOGY

Research approach:

1. Data

For the purpose of this thesis several factors and financial ratios are used to test if there is a statistically significant relationship between the selected factors and the profitability of the non-life insurance companies in Bulgaria for the period 2006 – 2014 or 9 years. The data necessary for the calculations is from the annual financial statements of the non-life insurance companies in Bulgaria published on the Bulgarian Financial Supervisory Commission's (FSC) website. Financial Statements of the non-life insurers in the country for the period before 2006 are not available on the FSC's website, hence the period 2006 – 2014 is chosen. The number of non-life insurance companies in Bulgaria varies during the specified period with some companies

exiting the market and other entering. Non-life insurance companies which changed ownership during the period are considered one entity for the purpose of this research. For 2013 and 2014 financial statements are available also for health insurance companies. These have been excluded from the calculations since their business model is somewhat different from that of a typical non-life insurance company offering a wide range of insurance products.

The data that is used in this research has both cross-section and time series elements – observations of all non-life insurance companies in Bulgaria (cross-section data) taken at equally spaced (end of year) intervals (time series data). Such type of data is called panel data or longitudinal data. As Brooks explains: “*A panel of data will embody information across both time and space. Importantly, a panel keeps the same individuals or objects (henceforth we will call these ‘entities’) and measures some quantity about them over time. Hence, strictly, if the data are not on the same entities (for example, different firms or people) measured over time, then this would not be panel data.*” (Brooks, 2008, p. 487)

Panel data can be divided in two general classes – balanced and unbalanced panel data. A balanced panel has the same number of cross-sectional units at each point in time, while an unbalanced panel has different number of cross-sectional elements at different times. The same techniques are usually used for both balanced and unbalanced panels and most modern econometric software packages automatically account for missing observations and unbalanced panels when estimating such models.

Since the number of non-life insurance companies in Bulgaria does not vary greatly over the years in the period 2006 – 2014, a few non-life insurance companies, which did not exist for the whole duration of the period in question, were excluded from the dataset, so as to make the panel balanced and to avoid including a survivorship bias effect in the research results. The resulting panel dataset has observations over 15 non-life insurance companies in Bulgaria at the end of each of the 9 years of the researched period 2006 – 2014 or 135 observations. The exclusion of some companies should not affect the quality of the sample, as for all practical purposes the sample used in this thesis is as large as the entire population.

2. Variables

The profitability of the non-life insurance companies in this research is measured by the Return on Assets (ROA) ratio. This ratio is widely used as a measure of profitability in financial analysis in general and it is the preferred choice in a number of research papers examining profitability of insurance companies (see the next section 3.2. Research Methods for Profitability). The ROA ratio is calculated by dividing net profit from ordinary business activities from the Income Statement by the amount of Total Assets from the Balance Sheet. The reason that the net profit from ordinary business activities is used in this research is that this way the effect on profit of extraordinary items, which have a one-off effect usually not related to the financial profile of the company, is excluded.

In this research the following factors were selected to test if they have a statistically significant effect on the profitability of the non-life insurance companies in Bulgaria:

– **Company Size** – this will be measured by Total Assets of the company. This factor/variable is expected to have a positive effect on profitability, since large companies usually benefit from economies of scale. This is not always the case however, since in some cases small companies are more effective and profitable than large ones.

– **Leverage Ratio** – the leverage ratio is calculated by dividing the total debt to the value of equity of the company. This ratio generally has a positive effect on profitability, as long as the as the cost of borrowing is lower than the Return on Assets (ROA). Usually when the Leverage Ratio gets too high, creditors require higher risk premium, hence higher borrowing cost and the use of leverage becomes counterproductive for profitability.

– **Loss Ratio** – this ratio is calculated for the purpose of this thesis by dividing the incurred claims to the earned premiums. This ratio should have negative effect on profitability.

– **Capital Ratio** – is calculated by dividing the book value of equity to the amount of the Total Assets. The higher the Capital Ratio, the less risky the company is, for it has a greater loss-absorbing capacity. But at the same time, high Capital Ratio means that the company uses less leverage which usually leads to lower profitability than its peers that use leverage responsibly, so we expect this to have negative effect on profitability.

– **Market Share** – this ratio is calculated as the percentage of the premium income of the company of the total premium income collected by the non-life insurance companies in Bulgaria. The reason this ratio is chosen for the purpose of this thesis is that in some cases medium sized companies offer very attractive pricing of their products and manage to attract considerable amount of premium, benefiting from the fact that the majority of consumers are very price sensitive and usually choose the lowest price. The reason this ratio is chosen for the purpose of this thesis is that in some cases medium sized companies offer very attractive pricing of their products and manage to attract considerable amount of premium, benefiting from the fact that the majority of consumers are very price sensitive and usually choose the lowest price.

– **Age of Company** – will be measured from the number of years to date since the establishment of the company.

The choice of factors is similar to the factors in a number of researches of profitability of insurance companies, which have been reviewed shortly in the Chapter 2 of this thesis.

3. Methodology

Since the data that is used in this research is a panel dataset, the natural starting point of the numerical analysis of the relationship between profitability (ROA) and the selected factors, namely – Company Size, Leverage Ratio, Loss Ratio, Capital Ratio, Market Share and Age of the Company, is to use panel data regression model. This approach is followed in similar researches on profitability of insurance companies, one of which is briefly reviewed in Chapter 2 of this paper, i.e. Kozak, S. (2011).

Other possible approach to analyzing the data would be to pool the data together and use a multiple regression as if we have a large cross-sectional dataset. As Brooks put it: “*The simplest way to deal with such data (panel data) would be to estimate a pooled regression, which would involve estimating a single equation on all the data together, so that the dataset for y is stacked up into a single column containing all the cross-sectional and time-series observations, and similarly all of the observations on each explanatory variable would be stacked up into single columns in the x matrix. Then this equation would be estimated in the usual fashion using OLS.*” (Brooks, 2008, p. 488). This approach is very simple and the number of parameters that need to be estimated is minimal compared to panel data regression models, yet it has several significant drawbacks and imitations, and most importantly, as Brooks points out: “*pooling the data in this way implicitly assumes that the average values of the variables and the relationships between them are constant over time and across all of the cross-sectional units in the sample.*” (Brooks, 2008, p. 488). Similar approach is followed in several researches of profitability in the insurance sector, some of which, i.e. Malik, H. (2011) and Charumathi (2012), are reviewed in the Chapter 2.

In this thesis we decided to use independently both panel data regression model and a multiple regression model on the pooled data to check if there is statistically significant relationship between the profitability and the selected factors for non-life insurance companies in Bulgaria during the period 2006-2014 and compare the results.

The following models have been estimated:

Panel Data Regression Model:

$$ROA_{it} = \alpha + \beta_1 \text{Company Size}_{it} + \beta_2 \text{Leverage Ratio}_{it} + \beta_3 \text{Loss Ratio}_{it} + \beta_4 \text{Capital Ratio}_{it} + \beta_5 \text{Market Share}_{it} + \beta_6 \text{Age of Company}_{it} + \varepsilon_{it} \quad (1)$$

Multiple Regression Model on the Pooled Data:

$$ROA_i = \alpha + \beta_1 \text{Company Size}_i + \beta_2 \text{Leverage Ratio}_i + \beta_3 \text{Loss Ratio}_i + \beta_4 \text{Capital Ratio}_i + \beta_5 \text{Market Share}_i + \beta_6 \text{Age of Company}_i + \varepsilon_i \quad (2)$$

4. Model Estimation

4.1. Panel Data Regression Model:

There are two main classes of panel estimator approaches – **fixed effects models (FEM)** and **random effects models (REM)**.

In the **fixed effects models** the disturbance term is decomposed into an individual specific effect – μ_i , or time specific effect – μ_t , and the residual disturbance – v_{it} , that varies over time and entities, capturing everything left unexplained about the dependent variable. Brooks points out that: „*The simplest types of fixed effects models allow the intercept in the regression model to differ cross-sectionally but not over time, while all of the slope estimates are fixed both cross-sectionally and over time.*” (Brooks, 2008, p. 490).

Panel Regression Model (1) can be rewritten in in fixed effect model with individual specific effect form as:

$$ROA_{it} = \alpha + \beta_1 \text{Company Size}_{it} + \beta_2 \text{Leverage Ratio}_{it} + \beta_3 \text{Loss Ratio}_{it} + \beta_4 \text{Capital Ratio}_{it} + \beta_5 \text{Market Share}_{it} + \beta_6 \text{Age of Company}_{it} + \mu_i + v_{it} \quad (3)$$

Random effects models (REM) or error components models (ECM), similar to fixed effects models use different intercept terms for each entity which are constant over time, and the relationships between the explanatory and explained variables is assumed to be the same both cross-sectionally and temporally, yet unlike fixed effects models, in random effects models “*the intercepts for each cross-sectional unit are assumed to arise from a common intercept α (which is the same for all cross-sectional units and over time), plus a random variable “ μ_i that varies cross-sectionally but is constant over time. “ i measures the random deviation of each entity’s intercept term from the ‘global’ intercept term α .”* (Brooks, 2008, p. 498)

$$ROA_{it} = \alpha + \beta_1 \text{Company Size}_{it} + \beta_2 \text{Leverage Ratio}_{it} + \beta_3 \text{Loss Ratio}_{it} + \beta_4 \text{Capital Ratio}_{it} + \beta_5 \text{Market Share}_{it} + \beta_6 \text{Age of Company}_{it} + \mu_i + v_{it} \quad (4)$$

Fixed or random effects

Brooks points that: „*It is often said that the random effects model is more appropriate when the entities in the sample can be thought of as having been randomly selected from the population, but a fixed effect model is more plausible when the entities in the sample effectively constitute the entire population (for instance, when the sample comprises all of the stocks traded on a particular exchange). More technically, the transformation involved in the GLS procedure under the random effects approach will not remove the explanatory variables that do not vary over time, and hence their impact on y it can be enumerated. Also, since there are fewer parameters to be estimated with the random effects model (no dummy variables or within transformation to perform) and therefore degrees of freedom are saved, the random effects model should produce more efficient estimation than the fixed effects approach.*” (Brooks, 2008, p. 500)

Hsiao’s opinion on the matter is that: „*The advantage of fixed effect inference is that there is no need to assume that the effects are independent of x_i . The disadvantage is that it introduces the issue of incidental parameters. The advantage of random-effect inference is that the number of parameters is fixed and efficient estimation methods can be derived. The disadvantage is that one has to make specific assumptions about the pattern of correlation (or no correlation) between the effects and the included explanatory variables.*

Finally, it should be noted that the assumption of randomness does not carry with it the assumption of normality. Often this assumption is made for random-effects, but it is a separate assumption made subsequent to the randomness assumption. Most estimation procedures do not require normality, although if distributional properties of the resulting estimators are to be investigated, then normality is often assumed.” (Hsiao, 2002, p. 49)

Gujarati also points that: “*The challenge facing a researcher is: Which model is better, FEM or ECM? The answer to this question hinges around the assumption one makes about the likely correlation between the individual, or cross-section specific, error component e_i and the X regressors. If it is assumed that e_i and the X ’s are uncorrelated, ECM may be appropriate, whereas if e_i and the X ’s are correlated, FEM may be appropriate.*

The assumptions underlying ECM is that the e_i are a random drawing from a much larger population. But sometimes this may not be so. For example, suppose we want to study the crime rate across the 50 states in the United States. Obviously, in this case, the assumption that the 50 states are a random sample is not tenable. Keeping this fundamental difference in the two approaches in mind, what more can we say about the choice between FEM and ECM? Here the observations made by Judge et al. may be helpful:

1. If T (the number of time series data) is large and N (the number of cross-sectional units) is small, there is likely to be little difference in the values of the parameters estimated by (FEM) **Random effects models** and error components models (ECM). Hence the choice here is based on computational convenience. On this score, FEM may be preferable.

2. When N is large and T is small, the estimates obtained by the two methods can differ significantly. Recall that in ECM $\beta_{1i} = \beta_1 + \varepsilon_i$, where ε_i is the cross-sectional random component, whereas in FEM we treat β_{1i} as fixed and not random. In the latter case, statistical inference is conditional on the observed cross-sectional units in the sample. This is appropriate if we strongly believe that the individual, or cross-sectional, units in our sample are not random drawings from a larger sample. In that case, FEM is appropriate. However, if the cross-sectional units in the sample are regarded as random drawings, then ECM is appropriate, for in that case statistical inference is unconditional.

3. If the individual error component ε_i and one or more regressors are correlated, then the ECM estimators are biased, whereas those obtained from FEM are unbiased.

4. If N is large and T is small, and if the assumptions underlying ECM hold, ECM estimators are more efficient than FEM estimators.” (Gujarati, 2004, p. 650)

Gujarati also adds that: *Is there a formal test that will help us to choose between FEM and ECM? Yes, a test was developed by Hausman in 1978... The null hypothesis underlying the Hausman test is that the FEM and ECM estimators do not differ substantially. The test statistic developed by Hausman has an asymptotic χ^2 distribution. If the null hypothesis is rejected, the conclusion is that ECM is not appropriate and that we may be better off using FEM, in which case statistical inferences will be conditional on the ε_i in the sample. Despite the Hausman test, it is important to keep in mind the warning sounded by Johnston and DiNardo. In deciding between fixed effects or random effects models, they argue that, “...there is no simple rule to help the researcher navigate past the Scylla of fixed effects and the Charybdis of measurement error and dynamic selection. Although they are an improvement over cross-section data, panel data do not provide a cure-all for all of an econometrician’s problems.”* (Gujarati, 2004, p. 651)

5. Multiple Regression Model on the Pooled Data

Since all observations are pooled together and the goal is to estimate a single equation on the whole dataset, not taking into account any changes in the relationship developing over time, all the 135 observations in the sample are treated as one cross-sectional dataset. In other words we would like to know if for instance a lower level of the Capital Ratio is associated with a higher level of ROA all other things kept equal, and we are not interested whether these levels were measured in 2008 or 2013. That is why the standard approach in estimation regression models on cross-sectional data using OLS is used for the estimation of pooled data regression model.

6. Research Results

The results of the estimation of the two models show some interesting findings. Almost all factors in the pooled data multiple regression model have a statistically significant effect on the profitability of the non-life insurance companies in Bulgaria, whereas only two factors are statistically significant in the panel data model. It is worth noting also that some of the factors affect the ROA not in the way it was expected prior to the estimation of the models.

The two models – panel data model and multiple regression model on the pooled data, show similar results in terms of the sign of the coefficients of the independent variables. The Adjusted Coefficient of Determination R^2 of the multiple regression model is almost twice as high as that of the panel regression model, which most likely is due to the fact that the panel data was estimated on differenced data and one variable was excluded in the estimation process. The high explanatory power of some of the factors which are used to describe the ROA can be explained by the fact that there is a relationship between some of the factors and ROA that can be explained from an accounting point of view.

The results of the estimation of the multiple regression model on the pooled data using the EViews econometrics package are shown in **Figure 1** and Figure 2 below. More details of the estimation process and diagnostics of the model are presented in Appendix 1 of the thesis.

Figure 1: Estimation results of the multiple regression model on pooled data for the period 2006 -2014, where the dependent variable ROA of non-life insurance companies in Bulgaria is explained by 6 factors.

Dependent Variable: ROA
 Method: Least Squares
 Date: 06/06/15 Time: 00:56
 Sample: 1 135
 Included observations: 135

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CAPITALRATIO	0.221552	0.057547	3.849957	0.0002
COMPANYSIZE	-8.52E-08	1.62E-07	-0.526386	0.5995
AGE	0.006610	0.001298	5.092606	0.0000
LEVERAGERATIO	-0.081595	0.030221	-2.699942	0.0079
LOSSRATIO	-0.243321	0.055656	-4.371902	0.0000
MARKETSHARE	0.786777	0.316801	2.483510	0.0143
C	-0.058949	0.049744	-1.185041	0.2382
R-squared	0.567839	Mean dependent var		0.044075
Adjusted R-squared	0.547581	S.D. dependent var		0.095886
S.E. of regression	0.064495	Akaike info criterion		-2.594000
Sum squared resid	0.532429	Schwarz criterion		-2.443356
Log likelihood	182.0950	Hannan-Quinn criter.		-2.532783
F-statistic	28.03095	Durbin-Watson stat		2.100435
Prob(F-statistic)	0.000000			

Based on the data on non-life insurance companies in Bulgaria for the period 2006-2014 the estimated Equation (2) looks like this:

$$ROA_i = -0.058949 - 0.0000000852 * Company Size_i - 0.081595 * Leverage Ratio_i - 0.243321 * Loss Ratio_i + 0.221552 * Capital Ratio_i + 0.786777 * Market Share_i + 0.006610 * Age of Company_i + \varepsilon_i \text{ (5)}$$

ε_i - the disturbance term;

The results from the estimated regression model show that based on our sample one can conclude that there is a relatively strong relationship between the profitability of the non-life insurance companies measured by ROA and the selected variables in this research. The Adjusted Coefficient of determination (Adjusted R²), which is a measure that shows how good the sample regression line fits the data, shows that the variations in the selected variables explain almost 55% of the variations of the ROA.

All of the selected independent variables with one exception are statistically significant at the 5% level of significance, with some variable being significant even at 1% significance level. The estimation results show that we cannot reject the Null Hypothesis that the Company Size measured by the total assets of the non-life insurance companies, does not have effect on the company’s profitability (ROA). This result points to the conclusion that based on the data at hand there are most likely no meaningful economies of scale in the non-life insurance sector in Bulgaria.

The Age of the company measured by the number of years since its establishment has a statistically significant effect on the company’s ROA. One explanation of this is that companies become more profitable as they gain experience and establish market position. In addition to that, the first years after an insurance company is establish, it usually does not have a good profitability, for often the company needs to make some one-off expenses, while the business still has not reach its full potential which affects negatively the company’s revenues.

The results for the Capital Ratio and the Leverage Ratio are both statistically significant, yet the signs of the estimates of the coefficient are bit surprising and seems counter-intuitive. The Capital Ratio has e

positive effect on ROA, while higher Leverage Ratio leads on average to lower ROA. The only reasonable explanation that comes to mind is that cost of funding of the non-life insurance companies in Bulgaria is higher than the ROA of the companies, which makes it not economically feasible for the non-life insurers to use leverage. Other possible explanation is that if a insurer incurred a loss due to business activities, this would lower its capital position and negative ROA. This might have affected somewhat the slope of the coefficient. One should bear in mind that in “normal” companies (not insurance companies) the sum of the two ratios should be generally equal to one, because the sum of the Shareholders Equity and Liabilities equals the sum of the company’s total assets. This is not the case with insurance companies, for they hold specific reserves, related to the expected incurred claims, which is not included in the shareholder equity and it is not include when calculating the Capital Ratio for the purpose of this thesis.

The Market Share of a non-life insurer has a statistically significant positive effect on its profitability measured by its ROA. A possible explanation of this finding is that in some cases medium sized companies offer very attractive pricing of their products and manage to attract considerable amount of premium, benefiting from the fact that the majority of consumers in Bulgaria are very price sensitive and usually choose the lowest price. These companies probably set premiums below “fair value” so as to attract more premium income and hence higher profitability (and ROA), yet this tactic is unlikely to leads sustainable profits over a longer period of time, if the lower premiums turn out to be insufficient to cover the incurred claims.

The results of the estimation of the panel data regression model using the EViews econometrics package are shown in **Figure 2** below. More details of the estimation process of the model are presented in Appendix 2 of the thesis.

Figure 2: Estimation results of the panel data regression model for the period 2006 – 2014, where the dependent variable ROA of non-life insurance companies in Bulgaria is explained by 6 factors

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D_MARKET_SHARE	0.060948	0.671131	0.090815	0.9278
D_LOSS_RATIO	-0.168623	0.065034	-2.592850	0.0108
D_LEVERAGE_RATIO	-0.056601	0.031616	-1.790262	0.0761
D_COMPANY_SIZE	-2.91E-08	3.32E-07	-0.087636	0.9303
D_CAPITAL_RATIO	0.454229	0.112166	4.049629	0.0001
C	0.007118	0.006429	1.107118	0.2706

Effects Specification		S.D.	Rho
Cross-section random		0.000000	0.0000
Idiosyncratic random		0.057301	1.0000

Weighted Statistics			
R-squared	0.356891	Mean dependent var	-0.006144
Adjusted R-squared	0.328684	S.D. dependent var	0.068791
S.E. of regression	0.056363	Sum squared resid	0.362154
F-statistic	12.65277	Durbin-Watson stat	2.398263
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.356891	Mean dependent var	-0.006144
Sum squared resid	0.362154	Durbin-Watson stat	2.398263

Based on the data on non-life insurance companies in Bulgaria for the period 2006-2014 the estimated Equation (4) looks like this:

$$ROA_{it} = 0.007118 - 0.0000000291 * Company\ Size_{it} - 0.056601 * Leverage\ Ratio_{it} - 0.168623 * Loss\ Ratio_{it} + 0.4542298 * Capital\ Ratio_{it} + 0.060948 * Market\ Share_{it} + \mu_i + v_{it}$$

The results from the estimated regression model show that based on our sample one can conclude that there is a relatively strong relationship between the profitability of the non-life insurance companies measured by ROA and the selected variables in this research. The Adjusted Coefficient of determination (Adjusted R²), shows that the variations in the selected variables explain almost 33% of the variations of the ROA.

Same as with the pooled data multiple regression model the estimated results show that the Capital Ratio has a statistically significant positive effect on the non-life insurance companies in Bulgaria during the period 2006 – 2014. Likewise, same as with the pooled data multiple regression, the Leverage Ratio has a negative effect on insurers' profitability, yet the panel data regression model, the estimate of coefficient is not statistically significant at 5% level of significance, although it is at 10%.

The Loss Ratio, same as with the pooled data multiple regression, has statistically significant negative effect on ROA. The panel data regression also showed Company size not to affect profitability, so there really seem to be no economies of scale in the sector.

Interestingly, the ratio Market Share does not have a statistically significant effect on profitability of the non-life insurers.

The variable Age of the company, was excluded from the specification of the panel data model, since the data was differenced to address a unit root problem with some of the variables, which made the variable irrelevant, for its value was equal to 1 for every company for every year.

Conclusion

The results from the estimated multiple regression model on pooled data and random-effect multiple panel regression model showed that the Capital Ratio positively affects profitability of non-life insurers in Bulgaria in the period 2006 – 2014. At the same time, the Leverage Ratio has a negative effect on profitability, which might be due to the fact that the level at which insurers finance their liabilities is higher than the ROA. The Loss Ratio also has a negative impact on the profitability, since higher incurred claims lower the company's profit.

Age of the Company, as well as Market Share, are likely to have a positive effect on profitability, yet panel data model was not able to confirm the findings of the pooled data multiple regression model.

The results of both estimated models showed that the size of the company measured by its total assets, seem to have no statistically significant effect on profitability. Undoubtedly, insurance industry is integrated in the financial industry and the last decades the financial industry worldwide has been globalized. With the beginning of the financial crisis in 2008 the supervisory authorities concentrate not only on the legal framework, but on the solvency requirements of the insurance companies.

The problem of possible insolvency was brought to the attention of EU financial regulators in regards to the financial crisis, started at 2008, this crisis was followed by massive insurance losses where worldwide insurance industry faced serious losses of the insurance market (in 2001 after the terrorism risk), as well as massive claims and losses after several catastrophes risks (in 2005, 2009, 2010). The financial authorities emphasize on the need to ensure the interest of the policyholders (both individuals and business) reviewing the insurance reserves, insurers' financial stability and their capital adequacy. Thus the profitability issue appears as one of the most important problems in insurance industry, especially for countries from CEE economies, where the free market is relatively new.

REFERENCES

1. **Adams, M. and Buckle, M.** The determinants of corporate financial performance in the Bermuda insurance market. *Applied Financial Economics*, 13 (2), 2003, p. 133 – 143. *Business Source Complete*, EBSCOhost (accessed November 2, 2014).
2. **Ayadi, R.** Solvency II: A Revolution for Regulating European Insurance and Re-insurance Companies. *Journal Of Insurance Regulation*, 2007, 26(1), p. 11 – 35.

3. **Berry-Stölzle, T. et al.** Successful Business Strategies for Insurers Entering and Growing in Emerging Markets. *Geneva Papers On Risk & Insurance – Issues & Practice*, 2010, 35(1), p. 110 – 129.
4. **Burmeister, C. et Barrie, A.** The Solvency Scenarios – Four Perspectives on Solvency II Compliance. *Credit Control*, 2010, 31(3/4), p. 51 – 56.
5. **Cather, D. et al.** A Profitability Analysis of Property-Liability Insurers Using Alternative Distribution Systems. *Journal Of Risk & Insurance*, 1985, 52(2), p. 321 – 332.
6. **Charumathi, B.** On the determinants of profitability of Indian life insurers—an empirical study. In *Proceedings of the World Congress on Engineering, WCE 2012, London, July 4-6*. Department of Economics Johanssen Kepler University, 2012.
7. **Choi, B. and Weiss, M.** An empirical investigation of market structure, efficiency and performance in property–liability insurance. *The Journal of Risk and Insurance*, 2005, 72 (4), p. 635 – 673.
8. **Charumathi, B.** On the determinants of profitability of Indian life insurers—an empirical study. In *Proceedings of the World Congress on Engineering, WCE 2012, London, July 4-6*. Department of Economics Johanssen Kepler University, 2012.
9. **Cummins, J. and Weiss, M.** Analyzing firm performance in the insurance industry using frontier efficiency and productivity methods. In *Handbook of insurance*, 2013, p. 795 – 861.
10. **Cummins, J. and Rubio-Misas, M.** Deregulation, Consolidation, and Efficiency: Evidence from the Spanish Insurance Industry. *Journal Of Money, Credit, And Banking*, 2006, 38(2), p. 323 – 355.
11. **Jarraya, B. and Bouri, A.** Efficiency Concept and Investigations in Insurance Industry. *Management Science Letters, Forthcoming*, 2012.
12. Diacon et al. Size and Efficiency in European Long–term Insurance Companies: An International Comparison’, *Geneva Papers On Risk & Insurance – Issues & Practice*, 2002, 27 (3), p. 444 – 466, Business Source Complete, EBSCOhost, viewed 2 November 2014.
13. **Dobrinsky, R.** The transition crisis in Bulgaria. *Cambridge Journal of Economics*, 2000, 24(5), p. 581 – 602.
14. **Doff, R.** A Critical Analysis of the Solvency II Proposals. *Geneva Papers On Risk & Insurance – Issues & Practice*, 2008, 33 (2), p. 193 – 206.
15. European Insurance in Figures, Statistic N 48, February 2013, available at <http://www.insuranceurope.eu/uploads/Modules/Publications/european-insurance-in-figures-2.pdf>
16. **Eling, M. and Luhnen, M.** Efficiency in the international insurance industry: a cross-country comparison. *Journal of Banking & Finance*, 2010, 34(7), p. 1497 – 1509.
17. **Ferrari, J. R.** The relationship of underwriting, investments, leverage, and exposure to total return on owners’ equity. In *Proceedings of the Casualty Actuarial Society*, 1968, 55, p. 295 – 302.
18. **Jarraya, B., and Bouri, A.** Efficiency Concept and Investigations in Insurance Industry. *Management Science Letters, Forthcoming*, 2012.
19. **Greene, W. and Segal, D.** Profitability and Efficiency in the U.S. Life Insurance Industry. *Journal Of Productivity Analysis*, 2004, 21(3), p. 229 – 247.
20. **Ivanov, K. and Milinov, V.** Investment Portfolios of Insurance Companies: Essence, Structure, Problems. *Electronic Journal Dialog* (01), 2013, p. 47 – 60.
21. **Kantor, B. & Holdsworth, C.** Lessons from the Global Financial Crisis (Or Why Capital Structure Is Too Important to Be Left to Regulation). *Journal Of Applied Corporate Finance*, 2010, 22 (3), p. 112 – 122.
22. **Kasilingam, R. and Jayabal, G.** Profitability and Solvency Analysis of A Manufacturing Company using Dupont and Altman Model. *BVIMR Management Edge*, 2012, 5 (2), p. 53 – 64.
23. **Karim, M. and Chanta J.** Cost efficiency and profitability in Thailand’s life insurance industry: a stochastic cost frontier approach. *International Journal of Applied Econometrics and Quantitative Studies*, 2005, 2 (4), p. 19 – 36.
24. **Kupiec, P. and Nickerson, D.** Insurers are not Banks: Assessing Liquidity, Efficiency and Solvency Risk Under Alternative Approaches to Capital Adequacy’. *Geneva Papers On Risk & Insurance – Issues & Practice*, 2005, 30(3), p. 498 – 521.
25. **Kozak, S.** Determinants of profitability of non-life insurance companies in Poland during integration with the European financial system. *Electronic Journal of Polish Agricultural Universities*, 2011, 14(1).
26. KPMG Report, Solvency II A closer look at the evolving process transforming the global insurance industry Available at <https://www.kpmg.com/US/en/IssuesAndInsights/ArticlesPublications/Documents/solvency-II.pdf>
27. Non-Life Insurance: Benchmarking Reserve Adequacy and Profitability Across the Cycle. *Black Book – Non-Life Insurance: Benchmarking Reserve Adequacy & Profitability Across the Cycle*, 2007, p. 1 – 181.
28. **Ziemele, J. and Voronova, I.** Financial stability of the EU’s insurance companies. *Economics & Management*, 2013, 18(3), p. 436 – 448.
29. **Malik, H.** Determinants of insurance companies profitability: an analysis of insurance sector in Pakistan, *Academic Research International*, 2011, 1(3), p. 315 – 321.

30. **Munch, P. and Smallwood, D.** Solvency Regulation in the Property-Liability Insurance Industry: Empirical Evidence. *Bell Journal Of Economics*, 1980, 11(1), p. 261 – 279.
31. **Naghi, L.** Influence of the prudential supervision over the capitalization of the Romanian insurance market. *Theoretical & Applied Economics*, 2013, 20(2), p. 113 – 128.
32. Non-Life Insurance: Benchmarking Reserve Adequacy and Profitability Across the Cycle. (2007). *Black Book – Non-Life Insurance: Benchmarking Reserve Adequacy & Profitability Across the Cycle*, 1 – 181.
33. **Pfeifer, D. and Strassburger, D.** Solvency II: stability problems with the SCR aggregation formula. *Scandinavian Actuarial Journal*, 2008(1), p. 61 – 77.
34. Research and, M 0007, ‘Research and Markets: The Insurance Industry in Bulgaria, Key Trends and Opportunities to 2016’, *Business Wire (English)*, March, Regional Business News, EBSCOhost, viewed 2 November 2014.
35. **Sandström, A.** Solvency II: Calibration for skewness. *Scandinavian Actuarial Journal*, 2007(2), p. 126 – 134.
36. **Salcedo-Sanz, S. et al.** Genetic programming for the prediction of insolvency in non-life insurance companies, *Computers & Operations Research* 32, 2005, p. 749 – 765.
37. **Sharpe, I. And Stadnik, A.** APRA’s Expert Judgment Ratings and Solvency Cover of Australian General Insurers. *Journal Of Risk And Insurance* [serial online], 2008, 75(3), p. 593-616. Available from: EconLit with Full Text, Ipswich, MA. Accessed November 1, 2014.
38. **Shiu, Y.** The determinants of solvency in the United Kingdom life insurance market. *Applied Economics Letters*, 2005, 12(6), p. 339 – 344.
39. **Spathis, C. et al.** Assessing profitability factors in Greek banking system: A multicriteria methodology. *International transaction in operational research* 2003(9), 2002, p. 517 – 530.
40. **Todd, J. and Richard, W.** Profitability and Risk in the Title Insurance Industry. – The Texas Experience. *Journal Of Risk & Insurance*, 1974, 41 (3), p. 415 – 434. *Business Source Complete*, EBSCOhost (accessed November 1, 2014).
41. **Tooze, A. and Ivanov, M.** Disciplining the ‘black sheep of the Balkans’: financial supervision and sovereignty in Bulgaria, 1902-38’, *Economic History Review*, 2011, 64 (1), p. 30 – 51, Humanities Source, EBSCOhost, viewed 2 November 2014.
42. **Van Bragt, D. et al.** Market Consistent ALM for Life Insurers. – Steps toward Solvency II. *Geneva Papers On Risk & Insurance – Issues & Practice*, 2010, 35 (1), p. 92 – 109.
43. **Vassilev, V.** Относно анализа на паричния поток в застрахователното дружество. *Електронно списание ”Диалог”*, 2010, (01), p. 32 – 43.