Measuring the Managerial Ability in the Insurance Companies in the Republic of North Macedonia, Croatia, Serbia, and Slovenia, and Identifying its Determinants

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Abstract

The aim of this paper is to measure the managerial ability of the insurance companies in the Republic of North Macedonia, Croatia, Serbia, and Slovenia, and to identify its determinants with the use of two-stage methodology (DEA + OLS). Our sample consists of 164 insurance-year observations and the covered period is 2016 to 2019. As insurance inputs, we use material costs, agent costs, labour costs, and capital costs, while insurance lines with similar characteristics such as personal short-tail lines, personal long-tail lines, commercial short-tail lines, and commercial long-tail lines are used as outputs. After obtaining the efficiency scores using DEA, an OLS regression was conducted, where we find that the size, age, and personal long-tail lines have a statistically significant and negative relationship with firm efficiency, while the financial leverage and personal short-tail lines show a positive and statistically significant relationship. It has been found that size has a negative impact on the financial performance, while this association appeared positive for the capital ratio and insignificant for the managerial ability. The next OLS regression showed that CEO duality, board size, board composition, gender diversity, and CEO gender have an insignificant impact on the managerial ability, and the diversity of nationalities of the CEO revealed a positive and significant impact.

Keywords: Insurance, Relative Efficiency, Managerial Ability, DEA, OLS

JEL Classification: G22, C33, C44, M12

Introduction

Insurance companies as prominent institutional investors provide vital support to society, through pooling of risks and by suppressing the effects from adverse events that are significantly serious for individuals, and help with stabilising their financial condition without creating large immediate ones that costs others. By fulfilling its basic role of protection, a well-functioning mature insurance sector that offers stable and affordable products generates benefits for the whole economy, such as reducing poverty through effective quantification, aggregation, and distribution of risks; enabling greater savings from the population; and improving the approach to credit (KPMG, 2015). Taking into consideration the importance

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of the insurance itself, companies continuously strive to determine adequate mechanisms for professional management as necessary, when the organisation reaches a certain extent of its growth. Quality management skills are the foundation of the success of any organisation and the achievement of its goals. Managers who improve and adequately apply business skills are able to launch the company's mission and vision or business goals with fewer obstacles and objections from internal and external sources. Efficiency is an important constituent of management, which aims at using the minimum resources to produce the desired volume of production, and also refers to the relationship between the input and output. Managers who can motivate the employees have a great advantage in the company by increasing employee productivity and satisfaction. The right combination of skills provides managers with the ability to identify and cope with various impediments that may arise in the business processes. One of the most important responsibilities that managers should develop is effective communication and innovation, both with the employees and other stakeholders. Those companies stay on top, attract new customers, and retain existing ones with constant improvements. In such dynamic conditions and methods of managing the insurance companies, the leadership is taken over by professional managers, with the main task of enabling effective realisation of business and development goals of the organisation. The focus of efficient management is concentration of materials and human potential, the need for coordination, connection, and direction of numerous specialised knowledge and skills in well-thought-out purposeful units, from efficient use and layout of time in relation to human activities to the need for the organised realisation of set goals. While short-term competitiveness is significantly determined by efficiency of operational management, the long-term competitiveness, in terms of dynamic and rapid changes in the company environment, will largely depend on timely initiation and joint creation and implementation of organisational change.

In this paper, we measure the managerial ability in insurance companies in North Macedonia, Serbia, Croatia, and Slovenia during the period 2016 to 2019, by following Demerjian, Lev and McVay (2012), Banker and Natarajan (2008), and Banker, Luo and Oh (2021a). In the first stage, an input-oriented BCC model (Banker, Charnes & Cooper, 1984) is used to estimate the relative efficiency of insurers. In the second stage, we regress log efficiency scores of insurers on contextual variables that affect insurance efficiency by using OLS, and the residual of the second-stage regression is the ability. In addition, to determine the impact of the CEO characteristic and firm characteristics on the managerial ability, we use CEO duality, board composition, gender diversity, CEO gender, and CEO local/foreigner as independent variables, while managerial ability, which is the residual from the regression, is set as the dependent variable.

The paper is organised as follows. Section 2 provides an overview of the insurance systems in North Macedonia, Serbia, Croatia, and Slovenia. Section 3 presents the literature review, while Section 4 describes the methods and data used in the research. Section 5 presents and analyses the obtained results and Section 6 concludes the paper.

Insurance Systems in North Macedonia, Serbia, Croatia, and Slovenia

Insurance companies provide unique financial services for the growth and development of each economy. Such specialised financial services range from taking risks inherent in economic entities to the mobilisation of premium funds into long-term investments. To better understand and compare the insurance systems and their level of development, the following section provides an overview of the main insurance indicators in North Macedonia, Serbia, Croatia, and Slovenia.

North Macedonia

The legislative framework in the Republic of North Macedonia, as well as the Law on Insurance Supervision, was established in 2002, but the practical operation of the Insurance Supervision Agency (ISA) begins five years later. According to the National Insurance Bureau – Insurance Bulletin (2020), the total number of insurance companies in 2020 is 16 (11 non-life and five life) and the total number of employees in the insurance companies in the Republic of North Macedonia is 1,874. The leading insurance bodies in the Macedonian insurance market are the Insurance Supervision Agency (ISA) and the National Insurance Bureau (NIB). These organisations aim to initiate activities that stimulate the growth of the

insurance market; control the operation of the market; protect the interests of stakeholders; create opportunities for reconciliation of disputes between stakeholders; cooperate with domestic and foreign organisations, associations, and institutions in insurance-related issues; and also collect and process information on domestic and foreign insurance markets, and initiate educational and information campaigns. The insurance sector in the country has not yet built a sustainable system of market data and indicators for accurate actuarial calculations as a basis for risk assessment and setting the optimal level of premiums. One can identify numerous factors that affect the current level of development of the insurance industry in the country. These factors include uneven distribution of wealth, the legal system and property rights, insufficient availability of insurance products, and high regulation and market surveillance. Although there is a strong argument among insurance apologists for lower rates of regulation and supervision of the insurance market, to a greater extent than in the banking sector, due to the ability of insurers to diversify their portfolio risk through reinsurance, as seen in Latin American countries, the USA, and the Caribbean, the effect and potential directions of impact of lower regulatory rates in the insurance sector in the Republic of North Macedonia are not clear enough. Finally, the reason for the current level of development of the insurance market in the Republic of North Macedonia may be due to insufficient cooperation and lack of coordination between insurance companies and associations in facing market challenges. It is evident that this relationship has an adverse indirect impact on finding an organised and systematised approach to developing a unified strategy that will enable flexibility and knowledge exchange within the insurance sector and, consequently, will result in more successful attraction and retention of potential customers.

Serbia

The first mention of insurance in Serbia was in 1839. As of today, the total number of (re) insurance companies in the Republic of Serbia are 20, the same count as the previous year, of which 16 companies are engaged in insurance and four in the reinsurance business. Of these, four insurance companies offer life insurance exclusively, six provide non-life insurance exclusively, and six offer life and non-life insurance services. The insurance sector

in the Republic of Serbia is significantly below the average level of development reached of the European Union member states. This is strongly supported by the main insurance indicators of market development – the insurance density and penetration rates, analysed in the following section. According to the National Bank of Serbia (2020), the share of the premium in the estimated gross domestic product in 2018 is 2.0%, bringing Republic of Serbia to the 65th rank in the world, while this indicator for the EU member states reaches 7.3% in 2018. However, compared to the group developing countries, with an average of 3.2%, and Central and Eastern European countries, whose average is 1.7%, and given that countries such as Turkey, Romania, and Ukraine are behind the Republic of Serbia, it can be concluded that the Republic of Serbia is in a satisfactory position (National Bank of Serbia, 2020). The insurance market in the Republic of Serbia has noticed a fast development in recent years, especially in the non-mandatory health insurance sector, due to the fact that the public health sector is incapable of coping with the numerous challenges the modern medicine imposes. A similar trend has been observed in the country in liability insurance. Over the years, the National Bank of Serbia strived to correspond the local regulations with the European Union. One can notice a variance in the Serbian insurance market, i.e., insurance companies and brokers must be registered as national legal entities and pay all initial capital, and all risks must be borne by a local insurance company. More than 95% of total brokerage sales comes from non-life insurance. The insurance law allows banks and leasing companies to set up agency companies, allowing them to collect life insurance commissions on a regular basis. For more than 30 years, insurance companies have not gone bankrupt. In 2001 and 2002, several national insurance companies were liquidated and their debts were paid through guarantee funds because these companies mainly deal with MTPL. This has a short-term impact on customer confidence. The National Bank of Serbia has restored confidence in a short period of time through the legal framework provided by the Insurance Law. The 2016 new insurance law stipulates mandatory details that insurance participants must provide, to avoid disputes.

Croatia

Insurance in Croatia began with the founding of the Insurance Cooperative Croatia in Zagreb in 1884, for

which the share capital was laid by the Zagreb city government as part of the fight against economic dependence on foreigners. The Croatian financial system is bank-centric and is characterised by the dominant position of banks, with a 65.3% share in the total assets of all financial institutions. Insurance companies have a share of 7.1%, and with mandatory pension funds, a share of 17.7%; these are the most important institutional investors in the financial system of the Republic of Croatia. As of today, a total of 16 insurance companies are based in Republic of Croatia. Of these, three companies performed exclusively business life insurance, five companies exclusively non-life insurance business, while the remaining eight companies performed life and non-life insurance business. At the end of 2019, the insurance companies had 8,018 employees (8,238 in 2018). The total in the financial sector was 37,968, who were employed during the period (CIB, 2019), and employees in insurance companies accounted for 21.1% of the employees (CIB, 2019). The Croatian insurance market and Hanfa's scope of activities and related capabilities are regulated by the Insurance Law, the Transport Sector Compulsory Insurance Law, and the corresponding subsidiary legislation. Hanfa supervises the insurance market in Croatia and abides by the business operation laws of insurance market operators, to ensure the efficiency, fairness, and stability of the market, to protect the interests of policyholders and beneficiaries, and to strengthen the overall stability of the financial system. In addition to insurance and reinsurance companies, Hanfa also supervises the activities of legal entities carrying out insurance agency business or insurance and reinsurance brokerage business, as well as the Croatian Insurance Office. Supervised entities are required to abide by the licensing procedures. In this process, Hanfa verifies whether it meets the requirements of the law, before granting authorisation. In addition, Hanfa Group conducts examinations and obtains authorisation for professional knowledge required to engage in insurance agency business or insurance and reinsurance brokerage business, while granting actuaries' the authorisation to carry out activities, provided that the requirements of legislation and subsidiary legislation are met. The insurance operations in Croatia are in correspondence with the EU regulations, and as obligatory insurance lines are considered, the MTPL, marine and aircraft liability, and public transportation passenger liability.

Slovenia

The Slovenian Insurance Association (SIA) as a non-profit organisation of Slovenian insurance companies was established in 1992 and is a major insurance institution in the country. A total number of 20 insurance and reinsurance companies, pension, and other companies are registered in Slovenia as of today. In addition to the aforementioned companies, seven branches of foreign insurance companies and 833 insurance companies registered abroad also provide insurance services directly. Of the latter, a majority are accounted for by companies registered in the United Kingdom (16.2%), Luxembourg (13%), and Germany (11.9%). Membership of the SIA association is open to (national and foreign) insurance companies engaged in insurance contracts in the Republic of Slovenia, which are registered or have branches in the Republic of Slovenia or established in member states of the European Union and provide services through the exercise of freely participating in the insurance contract of the Republic of Slovenia. Membership of the association is also open to other organisations that satisfy the interests of the insurance industry. The Association represents the common and personal interests of its members, confronts national institutions and other organisations, cooperates with different organisations to promote the development of insurance, collects, processes, publishes, and provides aggregated statistics of insurance activities, and organises members and training of independent intermediaries. The annual meeting of the insurance industry carries out tasks and activities that are of common interest to members. SIA counted 21 members at the end of 2019. The insurance premiums written by the four largest members of the SIA accounted for 68.8% of the total insurance premiums written by all members, a decrease of 0.9% compared to the previous year. SIA members account for more than 98% of the Slovenian insurance market. SIA members (including reinsurance companies) had 6,255 employees in Slovenia at the end of 2019, of which, approximately 60% were women (SIA, 2020).

Comparative Analysis of the Insurance Systems in Selected Countries

Even though the insurance industry in the Republic of North Macedonia is relatively youthful and has evolved

over the years, this market is in a stage of development and it is far from the levels obtained in the insurance markets in economically advanced countries. For the purpose of profound understanding of the existent level of development of the insurance industry in the country, the penetration and density rates of the insurance industry are analysed and presented as the main insurance indicators for determining the operating efficiency in the market. The insurance penetration rate assesses the share of the gross written premium (GWP) to a country's gross domestic product (GDP). Consider that the world average penetration rate (7.23%) is more than four times higher than in the Republic of North Macedonia, it can be noticed that this rate in the Republic of North Macedonia is 1.52% in 2019 and is lower, relative to the countries analysed (Fig. 1), including Slovenia (5.05%), Croatia (2.64%), and Serbia (1.93%), which have higher penetration rates.
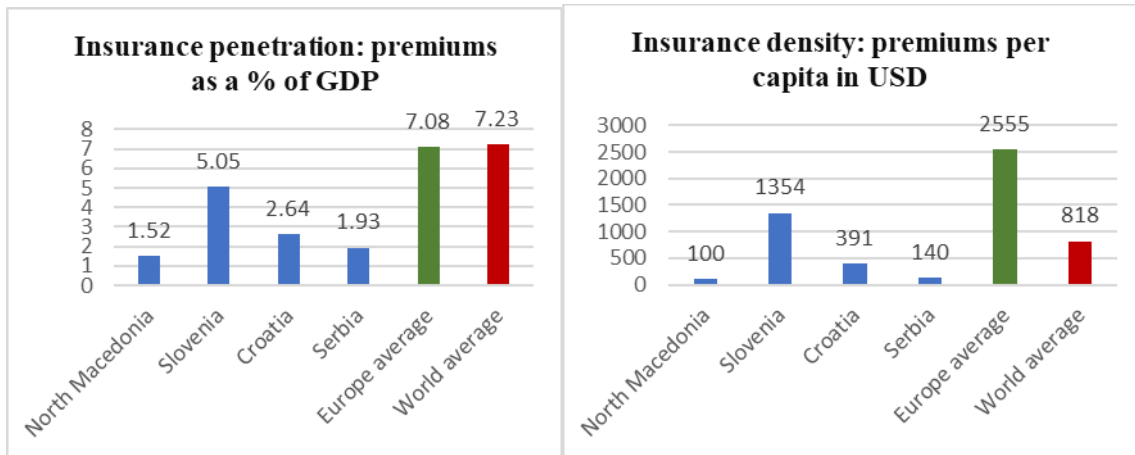

Source: ISA (2020), Swiss Re (2020) & Insurance Europe (2020).

Fig. 1: Insurance Penetration and Density Rates in Selected Countries (2019)

Further, the density rate, which is calculated as a ratio between the gross written premium (GWP) and the number of inhabitants in the country, provides an insight into the gross written premium (GWP) per capita and was $100 in 2019 in the Republic of North Macedonia, which is significantly lower compared to the selected countries and the world average (Slovenia $1354, Croatia $391, Serbia $140, and world average $818). The current stage of development of the insurance market in the Republic of North Macedonia can be a result of the delicate insurance culture, inadequacy of information, and overall insufficient awareness and knowledge among the potential clients of the broad spectrum of opportunities and benefits that the insurance itself provides. Moreover, from Fig. 2, it can be observed that the motor third-party liability (MTLP) insurance class has the highest share in the total GWP in the Republic of North Macedonia (43.45% in 2018 and 43.25% in 2019), due to the fact that the Law on Compulsory Traffic Insurance (2008) in the country implies that each and every owner and/or user of a motor vehicle is obligated to obtain a MTLP insurance policy. Additionally, the second-most dominant class in the GWP is property insurance, with a share of 17.31% in 2018 and 16.75% in 2019, followed by the life insurance class, with 16.8% in 2018 and 17.3% in 2019 (Fig. 2). This indicates that the insurance products and services are sighted as a luxury, superfluous, and expensive, rather than an investment for a secure future. To raise the awareness and knowledge levels of the insurance products among the population in the Republic of North Macedonia, insurance companies should emphasise the development and implementation of innovative distribution channels of optional insurance classes for consumer orientation, introduce new products, improve the existing ones, and implement educational campaigns to improve the insight of the benefits endowed by the insurance itself (Gockov & Kamenjarska, 2021).
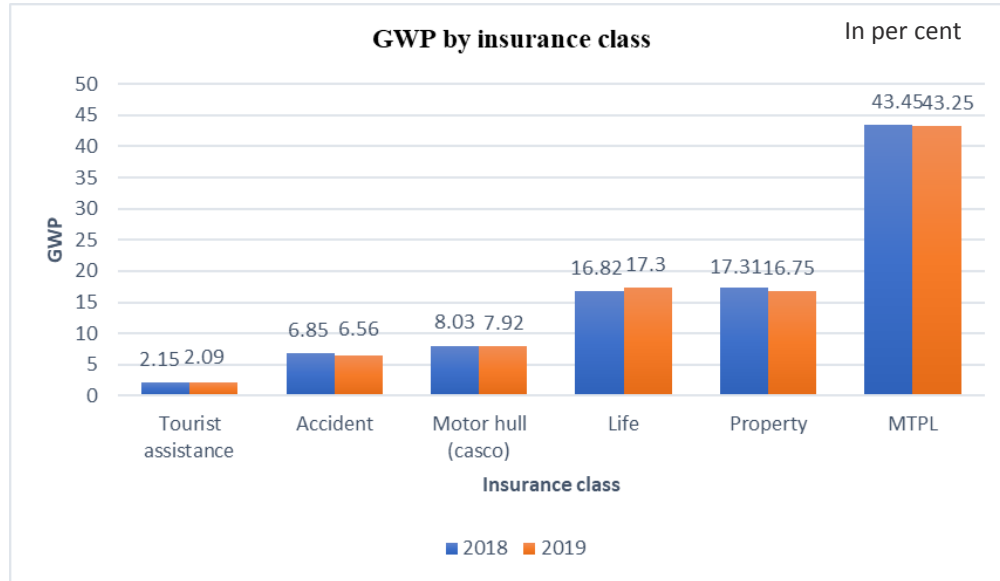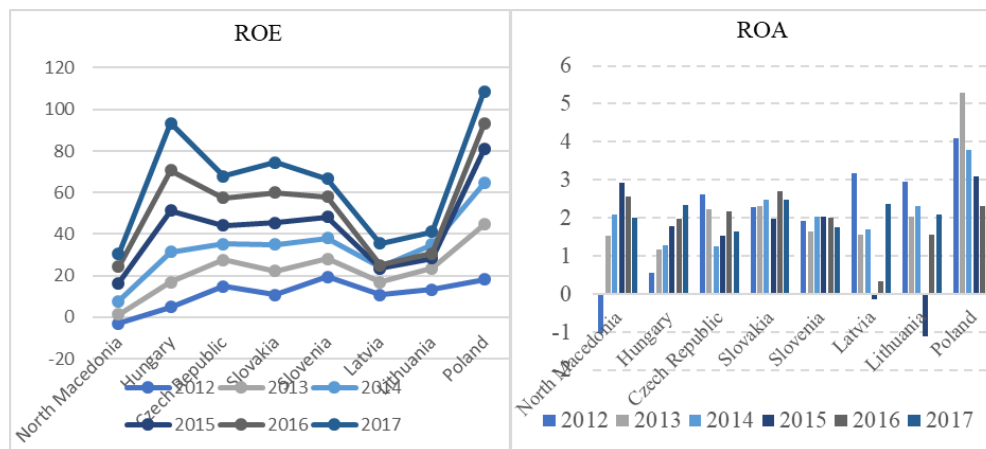
Source: Insurance Supervision Agency (2020).

Fig. 2: **Structure of GWP by Insurance Class (2018-2019) in the Republic of North Macedonia**

The financial performances of the insurance markets measured by the return on equity (ROE) and return on assets (ROA) in the selected countries over the period 2012 to 2017 are presented on Fig. 3. One can note that ROE in the Republic of North Macedonia in 2017 is 6.1%, which is significantly lower compared to Hungary (22.6%), Poland (15.6%), Slovakia (14.5%), Czech Republic (10.6%), Latvia (10.6%), Lithuania (10.5%), and Slovenia (8.6%), due to the fact that the insurance companies in the Republic of North Macedonia have a relatively high capitalisation because of the underdeveloped insurance market in the country. Furthermore, ROA in 2017 is 2.0% and it is lower compared to Poland (2.9%), Slovakia (2.5%), Latvia (2.4%), Hungary (2.3%), and Lithuania (2.1%). Additionally, the observed decline in ROA in the Czech Republic (1.63%) and Slovenia (1.74%) in 2017, compared to the 2016 results, is a lower profitability ratio contrary to the Republic of North Macedonia.

Source: ISA (2020), RAEX (2018) calculations based on data from the IMF, OECD, Hungarian National Bank, Czech National Bank, The National Bank of Slovakia, Slovak Insurance Association, Slovenian Insurance Supervision Agency, Latvian Insurers Association, Statistics Estonia, Polish Insurance Association, National Bank of the Republic of Belarus, and Ministry of Finance of the Republic of Belarus.

Fig. 3: **ROE and ROA in the Selected Countries (2012-2017)**

These indicators show an underdeveloped insurance market in the country and reveal that the insurance market still lags behind all of the selected and analysed countries in Europe (Fig. 3). In such circumstances, a prospective opportunity for the insurance companies in the country exists if adequate conditions are created for enhancing the current level of development of the insurance market, to reach a competitive position in both regional and the European context. This can be achieved through institutional arrangement of existing and new insurance companies in accordance with the developed market economies, developing conditions for market operation with dominant focus on the necessity for the development of insurance and reinsurance, creating conditions for insurance development as a crucial constituent of the economic system, and macroeconomic policy (Jovanovski, 2005), by conducting systematic analysis of the clients' expectations and preferences to enhance the insurance products and determine appropriate methods and approaches to reach the potential clients, while educating the population regarding the importance and need for insurance, as well as the benefits and opportunities offered.

Literature Review

Based on the literature survey from Emrouznejad and Yang (2018), from the first DEA paper (Charnes et al., 1978) since the end of 2016, there are 10,300 peer-reviewed articles published. A literature survey of DEA in the insurance sector is made by Kaffash, Azizi, Huang & Zhu (2020) who stress the importance of applying DEA as a paramount tool for assessing the relative efficiency and performance of insurance firms which, on the other side, is important and has gained significant interest among various insurance stakeholders, such as insurance regulators, academicians, researchers, investors, and so on. They analyse 132 DEA studies in the insurance industry over the period 1993 to 2018 and their research reveals that 68% of the DEA application studies applied the value-added approach, 10% the financial intermediary, 2.5% used both, 3% the production approach, and 17% did not report the applied approach. Around 50% of the studies used premiums and short-term and long-term personal lines as output; labour was used as input in 60.72% of the studies, while 49.18% of the research used capital debt, and 37.7% used equity capital. From the total

number of studies, the authors report that 76 investigated the impact of firm-specific and exogenous factors on firm efficiency. It is found that these factors and findings vary by insurer, period, country, and method.

Our paper focuses on measuring the managerial ability in the insurance companies in North Macedonia, Serbia, Croatia, and Slovenia, by following Banker et al. (2021), and therefore we provide review of the literature of conducted studies in those countries found in the SCOPUS and Web of Science database by searching the terms efficiency and managerial ability and insurance companies in North Macedonia, Serbia, Croatia, and Slovenia. Taking this into consideration, we make a pioneering attempt to expand the literature by adopting a novel and original measurement of firm efficiency and managerial ability in the selected countries.

To estimate the efficiency of the Macedonian insurance companies over the period 2009 to 2013, Micajkova (2015) measures the technical, pure technical, and scale efficiency of 11 insurance firms with the application of DEA (CCR and BCC output-oriented DEA models). The author uses administrative expenses, commission expenses, and total capital as inputs, and gross written premium and gross claims settled as outputs in their efficiency analysis. The obtained results show that the average efficiency and scale efficiency improved over almost the entire observation period. Regarding the estimated BCC model, the number of effective insurance companies and the industry average efficiency were higher than in the case of CCR, which means that the main source of inefficiency is scale inefficiency.

Knezevic, Marković and Brown (2015) consider the implementation of CCR input-oriented DEA model and use commercial assets, wages, salaries, and other personnel costs, and equity as inputs, and business functional revenue before tax (EBT) as the output for the model, to measure the efficiency of Serbian insurance companies over the period 2009 to 2011. The results observe a strong association between the total revenue (financial, business, and other) and total assets that an insurance company uses to achieve its business goals.

To determine the efficiency of the Croatian and Slovenian insurance industry over the period 2006 to 2010, Medved and Kavcic (2012) use DEA CRS (constant returns-to-scale technology). As inputs, they consider: assets, amount

of labour, and equity capital, while the revenues and EBT are set as outputs. Increased productivity and profitability of insurance companies positively affect the strength of their competition in the competition services market. Authors conduct efficiency surveys within and between countries, and the results show that Croatian companies are more efficient than Slovenian companies. As a result of mergers and acquisitions in Croatia in recent years, a positive trend in increasing scale efficiency has also been discovered. However, inter-industry analysis shows that the Slovenian insurance industry dominates Croatia's technical and cost efficiency, revealing low efficiency of the Croatian insurance market.

Jurčević and Žaja (2013) make an attempt to determine and compare the efficiency measurement results of the banks and insurance companies due to their relatively high asset share of about 83% in the total financial sector asset in Croatia, using the DEA method and accounting indicators before and after the financial crisis. The main difference between the DEA method and the accounting method in terms of results lies in the importance of the lag in the measurement score of the efficiency of the accounting method during the crisis. The DEA's efficiency score was the lowest in the insurance industry and bank in 2008; it was already significantly lower in 2007. The lower ROA and ROE accounting ratios in 2009 can be explained by the fact that although financial institutions operate more efficiently in terms of income and expense results in times of crisis, due to deteriorating market conditions and more conservative trade policies, accounting ratios cannot be the same as during boom times.

Demerjian et al. (2012) propose a measure for managerial ability, where DEA is used in the first stage, while Tobit regression in the second stage. Their results reveal that the proposed measure is strongly related to manager fixed effects and that the stock price reactions to CEO turnovers are positive (negative) when assessing the outgoing CEO as having low (high) ability. Similarly, they show that replacing CEOs with more (less) able CEOs is associated with improvements (decline) in subsequent firm performance. Consequently, the negative relation between equity financing and future abnormal returns documented in prior research is mitigated by managerial ability. Since they have not taken into account the banking industry, Banker and Tripathi (2021) propose and validate a measure for managerial ability in this

industry. They follow Demerjian et al. (2012) and Banker and Natarajan (2008) and use DEA + OLS (ordinary least squares) procedure. First, they use DEA to measure bank efficiency and then they regress the log of efficiency on contextual variables by using the OLS so that the residual is a measure of ability. Banker, Cvetkoska and Tripathi (2021) are the first to measure the organisational ability in the North Macedonian banking system and determine the determinants of ability. In addition, Banker et al. (2021) estimate the managerial ability as managers' success in generating insurance premiums. The authors use two-stage method DEA and OLS regression to determine the managerial ability of insurance companies of U.S. Property-Casualty (P/C) insurers from 2005 to 2015. Their sample totals over 1,500 insurance companies, with 17,040 firm-year observations per se. They set the inputs as material costs, agent costs, labour costs, and capital costs, while personal short-tail lines (e.g., auto physical damage insurance), personal long-tail lines (e.g., homeowner insurance), commercial short-tail lines (e.g., group accident and health insurance), and commercial long-tail lines (e.g., worker's compensation and medical malpractice) are considered as outputs. These are used to obtain the efficiency scores for each insurance company, which are followed by a two-stage OLS regression to determine the influence of managerial ability on ROA and observe the impact of CEO and firm characteristics on managerial ability. The obtained results show that this measure is strongly related to manager fixed effects and is positively associated with ROA. Similarly, replacing low-ability CEOs with high-ability CEOs leads to an increase in ROA. By examining the type of firms with high managerial ability, the authors reveal that CEOs who manage more affiliated insurers have higher managerial ability, and companies managing more risks require higher managerial ability.

Methodology and Data

To measure the managerial ability of the insurance companies in the selected countries, we follow Demerjian et al. (2012), Banker and Natarajan (2008), and Banker et al. (2021). In the first stage, an input-oriented BCC model (Banker et al., 1984) is used to estimate the relative efficiency of insurers. In the second stage, we regress log efficiency scores of insurers on contextual variables that affect insurance efficiency by using OLS, and the residual

of the second-stage regression is the ability.

We follow Banker et al. (2021) in the selection of inputs and outputs in the first (DEA) stage. As insurance inputs, we take into consideration four types of inputs (i.e., material costs, agent costs, labour costs, and capital costs), while insurance lines with similar characteristics such as personal short-tail lines (e.g., auto physical damage insurance), personal long-tail lines (e.g., homeowner insurance), commercial short-tail lines (e.g., group accident and health insurance), and commercial long-tail lines (e.g., worker's compensation and medical malpractice) are considered as outputs, as proposed by Banker et al. (2021). In addition, we follow Banker et al. (2021) in the selection of the contextual variables for the OLS regression: *firm size, firm age, financial leverage, underwriting leverage, and business mix (premiums proportion written in four categories of business lines)*. Due to lack of data, direct distribution, business concentration, and geographic concentration are omitted from the regression and we use a two-stage method DEA and OLS, as proposed by Banker and Natarajan (2008) and Banker et al. (2021).

The linear program that follows estimates the efficiency score of an insurer j, θ_j, on $j = 1, \ldots, N$ insurers (Banker et al., 2021).

$$\hat{\theta}_J = \arg\min\left\{\theta | \theta x^j \geq \sum_{k=1}^{N} \lambda^k x^k; y^j \leq \sum_{k=1}^{N} \lambda^k y^k; \right.$$
$$\left. \sum_{k=1}^{N} \lambda^k = 1, \lambda^k \geq 0, \forall k = 1, \ldots, N \right\} \qquad (1)$$

Where, x = (material costs, agent costs, labour costs, capital costs) ≥ 0; y = (LTP premium, STP premium, LTC premium, STC premium) ≥ 0.

The definition of the variables used in the DEA+OLS stage is given in Table A-1 (Appendix 1). For the collection of the inputs and outputs in the first stage, we use manual collected data from the annual financial reports of the registered insurance companies in The Republic of North Macedonia, Serbia, Slovenia, and Croatia, while for the second stage we use manual collected data from the Insurance Supervision Agency (ISA), National Bank of Serbia (NBS), Slovenian Insurance Association (SIA), and Croatian Financial Services Supervisory Agency – HANFA from 2016 to 2019, as well as the annual financial reports. We have checked the data for potential errors and our sample consists of 164 insurance-year

observations (40 observations North Macedonia – 10 firms, 48 observations Serbia – 12 firms, 44 observations Croatia – 11 firms, 32 observations Slovenia – 8 firms) for the period 2016-2019.

The descriptive statistics for the used variables in DEA+OLS is given in Table A-2 (Appendix 2).

To obtain the OLS regression results of the financial performance and managerial ability of the analysed insurance companies, we use Return on Assets (ROA) as a proxy for profitability, while firm size, capital ratio, and managerial ability as the residual of the regression, are set as independent variables, as proposed by Banker et al. (2021). In this stage, the geographic concentration and stock ('1' if the firm is owned by stockholders and '0' if the firm is a mutual insurer) are withheld from the regression due to unavailability of data. Finally, to determine the impact of the CEO characteristic and firm characteristics on managerial ability, we use CEO duality, board composition, gender diversity, CEO gender, and CEO local/foreigner as independent variables, while managerial ability, which is the residual from the regression, is set an independent variable.

Results and Analysis

Determinants of Insurers' Efficiency

To generate the efficiency scores for each insurance company, we take into consideration the above-mentioned inputs and outputs. The efficiency scores in the conducted OLS regression are log-transformed. As one can observe from Table 3, the total number of observations is 164, while the Adjusted R^2 is 0.71, meaning that 71% of the dependent variable is explained by the included independent variables in the model.

Table 3: Determinants of Insurers' Efficiency

Dependent Variable	Firm Efficiency (1)	(2)
	Expected Sign	OLS of the Log-Transformed Dependent Variable
Size	+	−7.93
		(0.00)
Age	+	−12.09

Dependent Variable	Firm Efficiency (1)	(2)
	Expected Sign	OLS of the Log-Transformed Dependent Variable
		(0.00)
Financial Leverage	+	7.10
		(0.00)
Under-writing Leverage	+	−0.25
		(0.80)
Commercial Long-tail	+	0.12
		(0.90)
Commercial short-tail	+	0.83
		(0.41)
Personal Short-tail	+	3.09
		(0.00)
Personal Long-tail	+	−3.09
		(0.00)
Constant		8.37
		(0.00)
Year FE		Yes
Adjusted R^2		0.710
Observa-tions		164

Firm size is a commonly used control variable in measuring firm efficiency and is calculated as the natural logarithm of an insurer's total admitted assets. Cummins and Zi (1998) and Cummins and Nini (2002) note that larger firms are cost- and revenue-efficient, because they define the production technology for the industry and are more efficient in the allocation of resources. Similarly, Banker et al. (2021) find a statistically significant and positive relationship between firm size and firm efficiency, suggesting that large firms are more efficient than smaller firms. On the contrary, Yuengert (1993) shows that this relationship is statistically insignificant. Our results, according to which a statistically significant and negative relationship was obtained between firm size and firm efficiency, suggest that it is possible for insurance firms to have higher growth in assets than the optimal ratio. Due to increased bureaucracy, it may be more difficult for larger firms to improve productivity significantly over time.

Underwriting leverage is calculated as the ratio of net premiums written to policyholders' surplus. Net premiums written are equal to direct insurance and reinsurance estimated for one period, less reinsurance ceded.

Although the variable is expected to be positively related to the firm efficiency (Banker et al., 2021), due to the fact that larger premiums-to surplus ratios use less capital relative to revenues or could suggest a more efficient allocation of resources and risk management practices, the obtained result shows a statistically insignificant and negative relationship. This result can indicate that the underwriting risk is higher when this ratio increases, which consequently can result in higher insolvency, thus undermining the contract terms with policyholders and causing lower revenue efficiencies than better-capitalised firms. That is, firms with higher underwriting leverage have a lower capacity in growing business, which can result in a slower growth in productivity. Additionally, underwriting above the optimal levels may lead to significant losses (Doron, 2010). It is noteworthy that insurance firms with lower leverage ratios have higher potential for business growth, without having to dilute existing shareholders.

Financial leverage is calculated as the ratio between the total liabilities and surplus, which is a proxy for financial risk. The obtained results reveal a statistically significant and positive relationship between the financial leverage and firm efficiency. This suggests that insurers with higher financial leverage can be more cost efficient due to the more efficient use of equity capital input. The result shows that the cost of equity financing is high and the use of financial leverage allows insurance companies to enjoy the benefits of debt financing, thereby improving performance. Financial leverage increases the variability of equity returns, which in turn means that it increases systemic and specific risks, and solvency risks. Due to limited debt capacity, highly indebted companies have limited ability to borrow additional funds when they need such loans. That being said, debt-laden companies rely on the debt market for continuous refinancing and are, therefore, more sensitive to changes in interest rates, credit spreads, and capital availability. High financial leverage also means that the capital buffer available to absorb losses is relatively small. In addition, financial leverage will affect business risks. When the company's wealth deteriorates, customers and other stakeholders often need to consider additional factors for dealing with the company, thereby exacerbating the negative impact of the initial decline in wealth. This is especially true in the insurance industry, where financial stability is a key element of the products offered by insurance companies. In addition, due to extensive supervision, when the loss

caused by financial leverage increases, the ability of insurance companies to conduct business may decline.

Firm age is measured as the number of firm's operating years. Taking into consideration that firms which have been operating for a longer period in the market tend to have developed a better reputation and experience, as well as have learned from all key aspects of the business (better technology, developed supply channels, and mature customers), the results obtained from the conducted regression are not consistent with the apriori expectation of a positive relationship between age and firm efficiency (Banker, 2021), thus implying an inverse relationship. This can be explained by the reason that, as companies age, they often attempt to codify decision-making procedures, making them highly bureaucratic and reducing organisational flexibility and the ability to change quickly. Strict rules and procedures can be a major obstacle to organisational change and innovation, which is essential in today's highly competitive and globalised modern business environment. In addition, as they grow older, companies can follow a "quiet life" strategy to avoid risks (large R&D investment), major restructuring, and conflicts with employees. Avoiding organisational changes and long-term R&D investments can lead to loss of competitiveness and reduced efficiency.

Business mix is the proportion of premiums written in each business group. Similar to the results obtained by Banker et al. (2021), companies which conduct more business in commercial long-tail and personal short-tail lines are more efficient than firms which focus their business operations on commercial short-tail lines, or in our case, in the personal long-tail lines.

Managerial Ability and Financial Performance in Insurance Companies in North Macedonia, Serbia, Croatia, and Slovenia

After determining the key drivers of efficiency in the insurance companies with the use of DEA, and identifying the current level of managerial ability in the selected insurance sectors, we next make an attempt to determine their level of influence on the financial performance of insurance companies in North Macedonia, Slovenia, Serbia, and Croatia, and provide empirical support in the process of making strategic decisions to enhance the managerial efficiency in critical business

areas. Based on the findings, we consider the possible challenges and managerial implications while providing recommendations for potential long-term strategies for improving the managerial ability in insurance companies. To do so, an OLS regression is considered, where return of assets (ROA) as a proxy for the financial performance of the insurance companies is calculated as the ratio of earnings after tax and interest to total assets and is considered as the dependent variable, while capital ratio, firm size, and managerial ability are set as independent variables, as proposed by Banker (2021). From Table 4, we can notice that the total number of observations are 164, while the Adjusted R^2 is 0.35, meaning that 35% of the dependent variable is explained by the included independent variables in the model.

Table 4: Managerial Ability and Financial Performance

Dependent Variable	ROA (1)	(2)
	Expected Sign	OLS of the Log-Transformed Dependent Variable
Size	+	−9.18
		(0.00)
Capital Ratio	+	2.84
		(0.00)
Ability	+	−1.54
		(0.12)
Constant		10.57
		(0.00)
Year FE		Yes
Adjusted R^2		0.359
Observations		164

Source: Author's calculations.

Managerial ability is calculated as the residual of the first-stage OLS regression. Banker and Park (2020) suggested that industry-specific context variables should be considered in the second-stage model, so that the residuals from the industry-specific second-stage model can better capture the management capabilities of the industry (Banker & Park, 2020). Although firms with higher managerial ability tend to have higher profitability (Banker et al., 2021), the results from the regression reveal a negative yet insignificant impact on ROA of insurers, meaning that it is not associated with managers' fixed effects.

The firm size is calculated as the natural logarithm of firms' total assets. Even though it is expected for this relationship to be positive because larger firms convey stronger market power and lower insolvency risk and can charge higher insurance prices (Sommer, 1996; Cummins & Nini, 2002), our results showed a strong significant yet negative relationship with ROA. Although the profitability of large companies is often higher than that of small companies, the fact that the company's assets continue to grow, and due to the non-linearity of the size-profitability correlation, it reduces their profitability (Isik, Unal & Unal, 2017).

The *capital ratio* is calculated as the policyholder surplus divided by total admitted assets. It is expected that the higher capitalised insurers have less insolvency risk and can charge a higher price (Sommer, 1996). The results show that capital ratio has a significant and positive relationship with the profitability of insurers, meaning that the higher the equity to asset ratio, the higher the insurer's capital, which is also supported by Banker et al. (2021).

Table 5: Managerial Ability, CEO Characteristics, and Firm Characteristics

Dependent Variable	Managerial Ability (1)	(2)
	Expected Sign	OLS of the Log-Transformed Dependent Variable
CEO Duality	+	1.64
		(0.10)
Board Size	+	−0.50
		(0.62)
Board Composition	+	−0.73
		(0.46)
Gender Diversity	+	1.28
		(0.20)
CEO Gender	+	−0.93
		(0.35)
CEO Local/ Foreigner	+	3.09
		(0.00)
Constant		−1.62
		(0.10)
Year FE		Yes
Adjusted R^2		0.06
Observations		164

To further explore the extent to which our indicators reflect managerial ability, we study the association among ability, the CEO, and firm characteristics in the insurance companies. It is expected that the more capable the CEO, the higher the profitability for the company. To do so, we set the managerial ability as the dependent variable, while CEO duality, board size, board composition, gender diversity, CEO gender, and CEO local/foreigner are used as independent variables. Table 5 presents the results from the OLS regression. It can be observed that the adjusted R^2 is 0.06; that is, 6% of the change in the dependent variable is explained by the included independent variables in the model.

CEO duality is a dummy variable: '1' for firms with the CEO as Chair, '0' if positions are separated. The results obtained show that the relationship between CEO duality and financial performance is not significant, which is supported by Chen, Barry Lin and Yi (2008) and Valenti, Luce and Mayfield (2011). The effect of this variable is similar to the situation where gender diversity and firm performance are irrelevant, and it is consistent with most existing studies, that is, the connection between the two variables is not significant (Chappell & Humphrey, 2013; Gordini & Rancati, 2017). Although the impact of these variables on the financial performance of the company is negligible, these correlations should encourage focused scientific discussions, and should be carefully investigated and analysed.

Board size is measured as the number of directors on the board. Research reports indicated that a larger board of directors can spend more time supervising the activities of managers, can bring different experiences and insights (Bacon, 1973; Herman, 1981), and can be effective among board members. Singh and Davidson (2003) show that a larger board of directors is negatively correlated with asset utilisation. However, they do not include managerial expenses, which means that larger boards cannot effectively monitor and control agency costs. There is an insignificant and negative correlation between the size of the insurance company's board of directors and financial performance, which may be related to the prevalent one-level management model and the medium-sized board of directors. However, the negative correlation should be a subject of further analysis, as well as an in-depth method of determining changes, and an attempt should be made for more conclusive and qualitative supporting results,

compared to previous research and findings (Harris & Raviv, 2008; Cheng, 2008).

Board composition is the number of independent directors to the total number of directors on the board. The inconclusive effect of the board composition on the profitability, even though positive and significant in other studies (Kamardim & Haron, 2009; Awan, 2012), defines the importance of the management structure, understood in wider terms, that underlines the significance of the professionals and empirical knowledge-based managers who would undertake adequate and market-oriented and sustainable policies and actions.

Gender diversity is the number of female directors to the total number of directors on the board, while CEO gender is a dummy variable: '1' for firms with a female CEO, '0' if the CEO is male. By following the board's diversity philosophy, it is believed that the company's overall governance will be improved (Singh & Vinicombe, 2004), and by adding women to the board it will help the company acquire shares, better understand customer needs (Liu, Wei & Xie, 2013), while promoting social inclusion. Similarly, the heterogeneous structure of the board of directors in terms of gender, race, and occupation will bring new ideas, creativity, and innovation within the organisation, and will use the greater problem-solving ability to promote the decision-making process and critical and strategic thinking. With the increase in the number of women on the board of directors, there are more opportunities for innovation and expressions of different opinions. New opinions can emerge and be practiced, as observed in various types of research (Lazzaretti, Kleinübing, Parodi & Marcon, 2013; Torchia, Calabrò & Michèle, 2015). A large number of studies have found that there is a positive correlation between the number of women on the board of directors and company performance (Liu et al., 2013; Lückerath-Rovers, 2013; Isidro & Sobral, 2014; Low, Roberts & Whiting, 2015). The obtained results show that the relationship between the number of female directors and company performance is not significant, as supported by many studies (Chapple & Humphrey, 2013; Gordini & Rancati, 2017).

CEO local/foreigner is a dummy variable '1' for firms with a local CEO, '0' if the CEO is a foreigner. It is supposed that the directors with work experience from abroad have a better understanding of how foreign organisations operate, and promote the adoption of best practices. By bringing a different perspective to the decision-making process of the company's board of directors, they can improve the performance of the company. The obtained results reveal a positive and significant impact of the diversity of nationalities of the CEO, which is also supported by Rodrigues (2014).

Conclusion

In this paper, we measure the managerial ability of the insurance companies in North Macedonia, Croatia, Serbia, and Slovenia, by following and adopting the Banker & Natarajan (2008) and Banker et al. (2021) approach. The efficiency scores were obtained using DEA and the results revealed that size, age, and personal-long-tail lines have a statistically significant and negative effect on firm efficiency, while the financial leverage and personal short-tail lines show a positive and statistically significant relationship. While size has a negative impact on ROA, this relationship is found to be positive for the capital ratio, yet insignificant for the managerial ability of the insurance companies. Furthermore, we used CEO duality, board size, board composition, gender diversity, and CEO gender and CEO nationality as independent and not-yet-used variables to estimate their effect on the managerial ability. Altogether, these relationships appeared insignificant, with an exception of CEO nationality, which suggested that CEOs with international expertise and know-how are likely to increase the efficiency and managerial ability of the insurance companies in which they operate. On that note, further studies can be carried out, focusing on improving understanding of the important determinants of knowledge sharing in insurance companies, with the function of enhancing firm efficiency. In addition, the research model should be further evaluated and expanded with samples from different countries, since organisational differences between insurance firms vary, which can affect the overall assessment of the managerial ability. The expanded theoretical and empirical research will provide stronger verification of the results obtained from this study. One should also take into consideration the increasing challenges insurers face, such as rising customer acquisition costs, increased competition, and rapid technological change. Altogether, the way in which managers cope with these factors can have a significant impact on the insurers' efficiency. Thus, managers are

encouraged to continuously analyse the dynamic business environment and bring managers with innovative perceptions that will forge strategic business alliances with other companies, to regulate their own operations and reduce costs by creating new distribution channels and flexible products and services, all aimed at augmenting existing offerings and providing accessible insurance services. Further research can make an attempt to expand the input and/or output sets or second-stage estimations to obtain a more sophisticated measure. In summary, a more accurate and universal measure of management competence would allow us to expand our knowledge of the crucial management role in the efficient allocation of resources. Finally, the managers of insurance companies in the analysed countries should place additional emphasis on finding a balanced and systematic way of structuring the boards of directors, since that is considered a key tool for achieving sustainable competitive power.

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Appendices

Table A-1: **Variable's Description**

Inputs	
Material cost	expenses incurred to the firm as the net of labour and agent expenses*
Agent cost	insurer's total payments to agents, consisting of commissions and other contributions to agents
Labour cost	insurer's payments for salaries, employee benefit plans, and payroll taxes
Capital cost	average of financial capital at the beginning and end-of-year capital, deflated by CPI
Outputs	
Long-tail personal (LTP)	group lines with similar characteristics (e.g., homeowner insurance)
Short-tail personal (STP)	group lines with similar characteristics (e.g., auto physical damage insurance)
Long-tail commercial (LTC)	group lines with similar characteristics (e.g., worker's compensation and medical malpractice)
Short-tail commercial (STC)	group lines with similar characteristics (e.g., group accident and health insurance)
Firm characteristics	
Firm size	logarithm of an insurer's total admitted assets
Firm age	number of operating years
Financial leverage	measured by total liabilities divided by surplus
Underwriting leverage	measured by the ratio of net premiums written divided by surplus
Business mix	the proportion of premiums written in short-tail personal, long-tail personal, short-tail commercial, and long-tail commercial lines
Return on assets (ROA)	ratio of earnings after tax and interest to total assets
Capital ratio	policyholder surplus divided by total admitted assets
Ability	the residual of the regression
CEO duality	dummy variable, '1' for firms with the CEO as Chair, '0' if positions are separated
Board size	number of directors on the board
Board composition	number of independent directors to the total number of directors on the board
Gender diversity	number of female directors to the total number of directors on the board
CEO gender	dummy variable, '1' for firms with CEO female, '0' if CEO male
CEO local/foreigner	dummy variable, '1' for firms with CEO local, '0' if CEO foreigner

*The material inputs are the expenses scaled by the national price index of specific materials.

Table A-2: **Descriptive Statistics for Variables**

Variable	Mean	Median	Std. Dev.	Min.	Max.	Percentiles		
N = 164						25	50	75
Labour costs	5378.401	1871.184	13092.812	325.971	81729.602	743.278	1871.184	2872.663
Agent costs	15334.387	6489.400	25158.103	133.909	236382.160	2724.770	6489.400	16572.280
Materials costs	32172.591	9830.469	75466.640	736.462	579939.444	4907.133	9830.469	23142.249
Capital costs	13675.517	5649.099	19899.345	1989.756	100557.214	4151.798	5649.099	15316.753
STP premium	267279.435	118190.038	315795.572	23527.387	853871.585	57448.252	118190.038	686652.159
LTP premium	492880.962	586729.371	220326.441	112074.895	752716.386	500135.333	586729.371	647188.979
STC premium	145068.254	66753.736	178222.093	3123.719	546185.861	47272.717	66753.736	190915.161
LTC premium	28373.340	21267.017	18695.963	8779.558	67002.645	16552.297	21267.017	33824.992
FIN_LEV	10.40205	1.402005	17.63874	.0153368	86.02364	.4299244	1.402005	10.62566

Variable	Mean	Median	Std. Dev.	Min.	Max.	Percentiles		
UW_LEV	3.901176	3.015147	3.695512	.1466562	19.25296	1.376136	3.015147	4.537722
FIRM_SIZE	8.139247	8.252446	.558098	6.915442	9.139515	7.638116	8.252446	8.631676
FIRM_AGE	32.80488	24	26.98167	6	137	19	24	30
ROA	.3028926	.2585349	.2165923	.0165556	.9869353	.1012524	.2585349	.4942979
CAP_RAT	1.243508	5.598707	1.695908	-5.710008	7.042408	2.955807	5.598707	1.545308
Ability	-2.440657	.0332107	.1965514	-.8092112	.4129322	-.1024134	.0332107	.1479168
CEO_DUAL	.8841463	1	.3210296	0	1	1	1	1
BRD_SIZE	3.585366	3	1.443846	2	8	3	3	4
BRD_COM	.2134146	0	.5512423	0	3	0	0	0
GEN_DIV	.9695122	1	.9095524	0	4	0	1	1
CEO_GEN	1.231707	1	.4232153	1	2	1	1	1
CEO L/F	1.170732	1	.3774268	1	2	1	1	1

Source: Authors' calculations.