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THE DETERMINANTS OF NON-LIFE INSURANCE CONSUMPTION: A VECM ANALYSIS IN CENTRAL AND SOUTH-EASTERN EUROPE

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This study examines the determinant of non-life insurance consumption in 14 countries of Central and South-Eastern Europe between 1995 and 2010 within a vector error correction model (VECM). We use non-life insurance penetration as a measure for non-life insurance consumption. Empirical results provide evidence that the number of dwellings and number of passenger cars positively and significantly influence non-life insurance consumption in the long run, while the existence of the rule of law and EU membership are significant in the short run.

Keywords: non-life insurance demand, Central and South-Eastern European countries, cointegration, VECM

JEL classification indices: C39, G22, O16

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1. INTRODUCTION

With the collapse of socialism, all former centrally-planned economies began their path towards building a market economy and their final results depended on their starting positions, as well as their internal and external factors.

The first process, the liberalisation of price and trade, led to inflation in almost all transition countries. Early in the transition, inflation averaged 450% a year in the Central Eastern European countries (CEE), nearly 900% in the Baltic States, and over 1000% in the Commonwealth of Independent States (CIS). Unfortunately, the data for the mentioned period are not available for the South-Eastern European region. By 1998, however, annual inflation had been lowered to a single digit in the first two groups and to around 30% in the third. Along with the high inflation rate, the transition countries needed to cope with another shock, the decline of production, and this reduction varied among transition countries. Therefore, the decline in output as well as economic growth in the CEE countries during the 1990s was the reflection of the national, policy strengths and weaknesses as well as external influences.

One key area has been the development of the financial services sector. Thus far, a great deal of attention has been given to the transformation of the banking industry and, to a somewhat lesser degree, to the development of local capital markets. In contrast, scant attention has been paid to insurance, the third cornerstone of the financial services sector.

Following the adoption of the Stalinist economic model, the state became the sole provider and thus exerted a monopoly over the market. In some instances, the state operated a two-tier insurance system, one through a state-owned enterprise (SOE) that was responsible for handling all domestic insurance and another SOE that dealt with all forms of insurance that required an element of foreign (hard) currency due to the international nature of the coverage. In the Soviet Union, *Gosstrakh* (State Insurance) was founded in 1921 to handle all domestic and international insurance business on behalf of the state. In 1947, responsibility for international business was transferred to a newly created SOE called *Ingosstrakh* (International State Insurance). In 1958, the state further refined the role of Gosstrakh by dividing the firm into separate operating units for each of the 15 republics, although Gosstrakh retained central control of these via the Ministry of Finance.

A number of CEE countries had also established similar two-tier systems, although some at a much later date than in the Soviet Union. In Hungary, the state insurer was *Állami Biztosító* (ÁB), which had acted as the sole provider of both domestic and international insurance after taking over these duties from the Ministry of Finance in 1954. In 1986, as part of further reform measures, the state

enacted legislation that partially liberalised the country's insurance industry by removing ÁB's monopoly with the formation of a second state-owned insurer, *Hungária Biztosító* (Hungarian Insurance Co.). Government legislation specified that ÁB retain the bulk of the life insurance policies, while Hungária took over the portfolios of foreign trade insurance, motor liability, and reinsurance accounts. Hence, these two state providers exercised a duopoly control over the Hungarian insurance market.[1]

In Yugoslavia, the state insurer was *DOZ* (State Insurance Establishment), established during the 1940s to transact all domestic and international insurance business. In the early 1960s, DOZ's monopoly position was abolished and replaced by 128 communal insurance establishments spread throughout the country. Poor performance and national interests led to the restructuring of the system during 1968 into 11 insurance and reinsurance firms based in each of the respective republics. This created two amalgamated insurers/re-insurers, two sole re-insurers, and seven sole insurers. Under this system, appropriate premium payments were simply deducted directly from the wages of the employees participating in the scheme. However, it should be noted that such policies were often very simplistic in nature and of limited value and utility.[2]

Generally, non-life policies focused on motor, household as well as numerous compulsory types of insurance. Non-life policies were paid for in the same manner as life policies and they too were quite basic and of a limited and restricted scope, especially given the reality of a continuous shortage economy experienced during the 1970–80s. In the case of motor insurance, which was a compulsory line, it tended to concentrate on the aspect of liability for many of the same reasons cited above. Most other types of non-life coverage were seen as non-essential under the communist system since the state guaranteed the basic needs of the citizenry in terms of healthcare, education, employment, and pensions. In addition, compulsory insurance such as third party motor and agriculture related policies had a very unique character.

Overall, the domestic insurance system was controlled by the state provider, which established premiums at almost arbitrary levels for each of the few products it offered and for which the state was the sole underwriter. Therefore, the premiums charged bore very little correlation, if any, to the actual risks involved, given the nature of the coverage. Premium payments were used to offset both losses incurred via claims during the year and the operating expenses of the pro-

[1] For further details of the evolution of the Hungarian insurance market, see Pye (1999: 59–92).

[2] For further details on the evolution of the Yugoslav insurance market, see Rajičić (1997: 75–90).

vider. Subsequently, surpluses from operations were absorbed by the state and deficits were guaranteed by it. Regarding non-life products, there was little or no attempt to estimate or provide for future liabilities that had not materialised during the course of the year.

The non-life insurance markets of almost all transition countries in Eastern Europe started to grow rapidly in the 1990s due to improved economic conditions and the introduced reforms, which had to be implemented prior to the EU accession. By introducing risk pooling and reducing the impact of large losses on firms and households, the sector reduced the amount of capital that would be needed to cover these losses individually, encouraging additional output, investment, innovation, and competition. By introducing risk-based pricing for insurance protection, the sector can change the behaviour of economic agents, contributing to the prevention of accidents, improved health outcomes, and efficiency gains. Finally, the sector can also improve the efficiency of other segments of the financial sector such as banking and bond markets (e.g., by enhancing the value of collateral through property insurance, and reducing losses at default through credit guarantees and enhancements). Nevertheless, this growth did not occur in the Eastern European countries at the same level (*Chart 1*).

This paper's contribution lies in a new effort to understand what drives non-life insurance consumption in 14 Central and South-Eastern European countries. As a measurer of non-life insurance demand, we use non-life insurance penetration. We apply the Johansen cointegration and vector error correction approach to estimate the relationship between the variables.

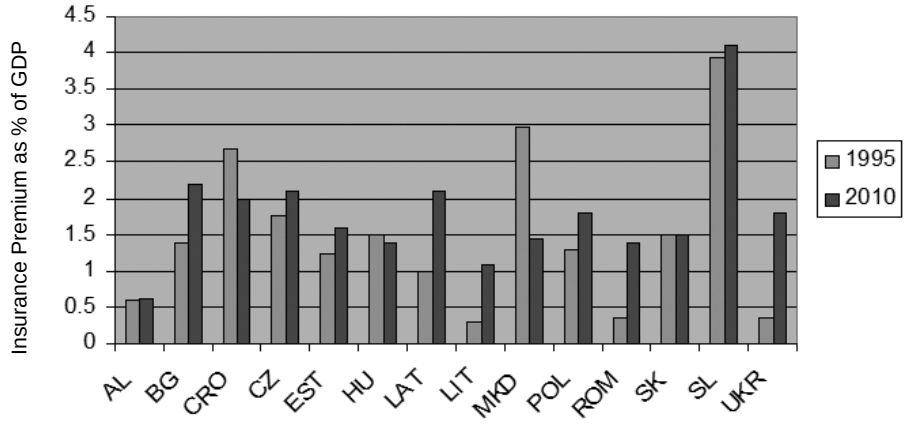

Chart 1. Non-life insurance penetration in selected Central and South- Eastern European countries, 1995–2010

The rest of the paper is organised as follows. Section 2 reviews the literature on theoretical research and empirical findings. Section 3 presents the methodology and data, which we incorporate into the analysis. The results of the empirical research are given in Section 4. The paper finishes with some concluding remarks and suggestions for future work that are outlined in Section 5.

2. LITERATURE REVIEW

According to economic theory, risk insurance products enhance welfare by transferring uncertainty from risk-averse individuals to risk-neutral ones, the insurers, who pool many risks together and manage them efficiently (Mossin 1968). Theoretical models of non-life insurance demand, following the seminal papers of Pratt (1964), Arrow (1971), and Mossin (1968), predict that for a given level of risk exposure and a given price, insurance demand increases with risk aversion, probability of loss, and total wealth (Szpiro 1985; Sweeney – Beard 1992). Whether the propensity to insure – i.e., the desired coverage as a percentage of the wealth at stake – should increase or not depends on the behaviour of risk aversion: Arrow (1971) shows that it increases if people are characterised by increasing relative risk aversion. Most of the above authors have commented on the elasticity of insurance consumption with respect to income and wealth, in the light of the long-standing debate on insurance as an inferior good. Mossin (1968) first gave conditions for this to happen: the intuition is that if the utility function is characterised by decreasing absolute risk aversion, a higher endowment of wealth reduces risk aversion and therefore the demand for insurance. Moreover, while Mossin's Theorem claims that full coverage is optimal under the fair actuarial price,[3] the degree of coverage decreases with the loadings[4] (Schlesinger 2000).

The so-called "inverted economic cycle" of insurance, in which one pays first, then, in the event of loss, receives his dues, suggests that the financial rate of return, seen as an opportunity cost for those who allocate funds in an insurance

[3] Actuarially fair insurance has an expected net pay-off of zero. From a consumer's point of view, an insurance contract is actuarially fair if the premiums paid are equal to the expected value of the compensation received. This expected value is, in turn, defined as the probability of the insured-against event occurring multiplied by the compensation received in the event of a loss. The reason that economists define actuarial fairness from the consumer's point of view is that it yields useful predictions about consumer behaviour.

[4] Loading is the amount added to the pure insurance cost to cover the operations cost of an insurer, the possibility that losses will be greater than statistically expected, and fluctuating interest rates on the insurer's investments. The "pure" insurance cost is that portion of the premium estimated to be necessary for losses.

policy, should be inversely related to demand. That is, self-insuring gives an opportunity-gain to invest the saved amount of the premium on financial markets, which increases along with the prevailing rate of return. However, Falciglia (1980) shows that higher market interest rates should lower insurance demand only if consumers have a decreasing risk aversion and are net savers; although these conditions seem reasonable, the relationship between interest rates and insurance demand nevertheless remains an empirical question.

The bulk of the existing empirical research focuses on the growth of the life sector, as the most frequently cited papers indicate (Browne – Kim 1993; Outreville 1996; Beck – Webb 2003; Li et al. 2007). The dependent variables for the vast majority of models were the life insurance density (money spent annually on life insurance per capita) and the life insurance penetration (total life premium volume divided by GDP). Explanatory variables that have been shown to significantly impact life insurance demand are GDP per capita, inflation (real, anticipated, or feared), development of the banking sector, and institutional indicators (such as investors protection, contract enforcement, and political stability). Variables that appear to have a borderline impact include education, old and/or young dependency ratio (ratio of the population above the age of 65, or below 15, to the number of persons aged 15 to 64), urbanisation, size of the social security system, life expectancy, and market structure.

Sherden (1984) was first to focus on the sensitivity of non-life insurance purchase. In a cross-sectional analysis of consumption patterns limited to automobile insurance in 359 towns and cities of the state of Massachusetts in 1979, he finds that the demand for motor insurance is generally inelastic with respect to price and income, and that the demand for comprehensive and collision coverage increases substantially with increased population density.

Using an international dataset (12 countries over a period of 12 years), Beenstock et al. (1988) examine the relationship between property liability insurance premiums and income, finding that marginal propensity to insure, i.e., an increase in insurance spending when income rises by 1$, differs from country to country, and premiums vary directly with real rates of interest. Thus, again, the decision of the consumer and his/her initial wealth status too are significant factors when short-run or long-run consumption of insurance is considered.

Based on a cross-sectional logarithmic model of non-life insurance penetration of 55 developing countries, Outreville (1990) confirms the main result of income elasticity being greater than unity. The level of financial development is the only other factor found to significantly impact non-life insurance consumption.

Browne et al. (2000) study 22 OECD countries from 1987 through 1993 and focus on the premium density of two lines of insurance: motor vehicle (usually purchased by households) and general liability (normally bought by businesses).

Panel data analysis demonstrates that income (GDP per capita), wealth, foreign firms' market share, and the form of legal system (civil law or common law) are significant factors in explaining the purchase of the two types of insurance. Per capita income has a much greater impact on motor insurance than on general liability.

Park et al. (2002) examine the impact of culture on insurance pervasiveness, defined as the combined penetration of life and non-life insurance. Four of Hofstede's cultural dimensions are included in the panel regression analysis in addition to GNP, socio-political stability, and economic freedom. Esho et al. (2004) expand the work of Browne et al. (2000) by using a larger set of countries and by introducing the origin of the legal system and a measure of property rights in their model. Dummy variables, characterising the English, French, German, and Scandinavian legal system origin, are found to have an insignificant effect. Results show a robust relationship between the protection of property rights and insurance consumption as well as a significant effect of loss probability and income. Esho et al. (2004) also include one of Hofstede's dimensions, Uncertainty Avoidance, as a proxy for risk aversion. They find a marginally positive relationship and conclude that culture does not seem to play an important role in non-life insurance demand. Nakata – Sawada (2007) test a semi-parametric model including per capita income, population, the Gini coefficient, financial development, and contract enforceability. The coefficients usually have the expected signs, but only the contract enforceability variable is significant.

The research of Njegomir – Stoic (2012) examines factors that affect the attractiveness of 15 Eastern European non-life insurance markets for foreign insurers for the period 2004–2009. The results indicate that the main forces affecting market attractiveness are insurance demand, entry barriers, market concentration and the return on investment, and that only market concentration has negative impact.

3. OUR DATA AND METHODOLOGY

We focus on factors that determine consumption of non-life insurance in our sample of 14 countries of Central and South-Eastern Europe (Albania, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania, Slovak Republic, Slovenia, and Ukraine)[5] over the period of 1995–2010. In order to get more observations, we used annual panel data. We

[5] Serbia is not covered in the present study. For a separate analysis of that country's insurance market, see Knežević et al. (2015).

also carry out the analysis for three more homogeneous sub-groupings: the Balkan countries (BAL-4), the Baltic countries (B-3), and CEE-7.

Following a similar approach, nearly every single international comparative study uses insurance density and penetration as dependent variables. These variables have the advantage of being easily available, annually, for a large number of countries. A disadvantage of density and penetration is that they add up premiums across various lines of insurance. In some countries, motor insurance is the dominant non-life policy, while other nations emphasise more liability insurance. Aggregate premiums result in a loss of information, reducing the likelihood that significant explanatory variables will be discovered. Density and penetration measure slightly different effects. Penetration measures non-life insurance consumption relative to the size of the economy, while density compares non-life insurance purchases across countries without adjusting for income. High GDP countries will spend more on insurance in absolute terms, as they have more assets to protect. We therefore expect a very high correlation between insurance density and GDP – indeed, one of the reasons for the paucity of research in determinants of non-life insurance may have been a belief that purchases are driven by wealth and little else. Penetration measures relative insurance consumption, as the overall wealth effect has been removed through division by GDP per capita. It measures how wealth is allocated to insurance in relative terms: two countries with similar GDP per capita may exhibit different insurance consumption patterns, an effect captured by penetration and not by density. For this reason, we use penetration as our primary variable, and we do not use density in our research.

The factors that we use as control variables, which may explain the consumption of non-life insurance, include the following:

- Economic: GDP per capita and number of passenger cars per 1000 people, number of dwellings per 1000 inhabitants, ratio of quasi-money, inflation, and trade;
- Demographic: population density and level of education;
- Institutional: rule of law;
- Dummy variable for EU membership.

Insurance penetration data are obtained from Sigma, Swiss Re Economic Research & Consulting, Swiss Re, Zurich, and national insurance associations. Education figures are obtained from EdStats, World Bank. GDP per capita, inflation, number of passenger cars per 1000 people, ratio of quasi-money, trade, and population density are obtained from the World Development Indicators (WDI) database. The number of dwellings per 1000 inhabitants is taken from the websites of national statistical offices. The rule of law index is obtained from Worldwide Governance Indicators (WGI).

3.1. Economic factors

All previous studies, whether devoted to life or non-life insurance, conclude that income, measured as GDP per capita, is the most important factor affecting purchasing decisions (Fortune 1973; Campbell 1980; Beenstock et al. 1986; Lewis 1989; Outeville 1990). Beck – Webb (2003), Ward – Zurbruegg (2000), and Beenstock et al. (1988) point out a positive relationship in industrialised countries between national income and non-life insurance spending. Browne et al. (2000) analyse general liability and motor vehicle insurance in OECD countries, and find a significant positive relationship between premium density and GNP per capita. Additionally, Esho et al. (2004) examine developed and developing countries between 1984 and 1998, and find a strong positive relationship between national income and non-life insurance premium. Outreville (1990) and Ward – Zurbruegg (2000) strongly emphasise that the insurance industry, through risk transfer, financial intermediation, and employment can generate externalities and economic growth. The larger the level of income, the greater the demand for non-life insurance to safeguard acquired property. We expect income to have a strong, positive impact on non-life insurance consumption.

Arrow (1971) suggests that the insurance demand increases with wealth when individuals are characterised by increasing relative risk aversion. In contrast, Mossin (1968) postulates conditions under which the optimal level of insurance coverage decreases with increases in wealth. The conflicting theoretical suggestions of Arrow (1971) and Mossin (1968) on the influence of wealth on insurance demand make it difficult to judge the variable's empirical results. This study employs the number of dwellings per 1000 inhabitants as a measure of private wealth and assumes that its effect is positive on non-life, property-liability insurance demand. Theoretically oriented research and models are also fond of employing housing or durable consumption stock in utility function. Aoki et al. (2004) provide a microeconomic foundation of how housing wealth affects consumption expenditure via risk premium of households' loan. Another interesting examination of households' wealth is the paper of Bruce et al. (2004), in which they investigate the relation between economic and subjective well-being. According to their results, consumption, income, and wealth together alter the satisfaction level of households. This result rationalises the appearance of housing and financial wealth in utility function, for instance, the money-in-the-utility approach in the literature of monetary theory.

Financial development is associated with the widespread securitisation of cash flows, which enables households to secure future income through the ownership of financial assets. By offering similar benefits, life insurance is expected to generate higher sales in countries with a high level of financial development.

The measurement of financial development is very controversial (Jung 1986), but two alternative proxies are usually employed. One is the ratio of quasi-money (M2-M1) to the broad definition of money (M2), which shows the complexity of the financial structure (a higher ratio indicates a higher level of financial development), another is the ratio of M2 to the nominal GDP – financial deepening (demand for money per unit of output). Broad money M2 is often taken as an adequate measure of the financial sector in developing countries in view of the predominance of the banking sector as well as owing to the lack of data on other financial assets (Hemming – Manson 1988; Liu – Woo 1994). Following above-quoted previous studies, we use the ratio of quasi-money (M2-M1) as a measure of financial development. We hypothesise a positive correlation with non-life insurance demand. The next economic variable that we used in our research is the inflation rate. It is used to account for monetary discipline. It is expressed by the GDP deflator (annual percentage). For non-life insurers, unanticipated inflation leads to higher claims costs, thereby eroding profitability. Inflation is often accompanied by rising interest rates, which reduce the value of return guarantees. Rising inflation can have a negative effect on demand and may lead to policyholders cancelling their policies as well as increasing costs for insurers. In the case of deflation, or if very low inflation persists, interest rates tend to fall. With this variable, we expect a negative correlation with non-life insurance consumption.

We also consider trade activity, the sum of import and export activities as a fraction to GDP (trade), since trade often relies on the availability of marine, cargo, and liability insurance.

3.2. Demographic factors

Feyen et al. (2011) claim that population size determines the operating background, that is to say, the size of the market, for the non-life insurance industry. Therefore, we include the total population for each country into our regressions and assume that its effect on the non-life insurance consumption is positive. The level of education positively affects the demand for life insurance for several reasons. Namely, the primary motive for purchasing insurance is risk aversion to avoid loss. Schlesinger (1981) demonstrates that an individual with a higher loss probability, a higher degree of risk aversion, or a lower level of initial wealth, will purchase more insurance. Mayers – Smith (1990) believe that closely held firms are more likely to purchase insurance than firms with less-concentrated ownership for the same reason that an individual purchases insurance, namely risk aversion. They further suggest that a company does not exhibit proper risk

aversion because risk aversion is not so obvious to the corporate purchasers of insurance. As stated previously, even though risk aversion could not perfectly explain why consumers would buy insurance, it is still an important indicator. Although risk aversion is a "rational" motive for an individual's purchase of insurance, unfortunately, it is difficult to measure. According to Browne – Kim (1993), in general, a higher level of education may lead to a greater degree of risk aversion and a greater awareness of the necessity of insurance. Nonetheless, Szpiro (1985) and Outreville (1990) proved the negative correlation between the level of education and risk aversion. They deemed that higher education leads to lower risk aversion, which, in turn, leads to more risk-taking by skilled and well-educated people. When Browne et al. (2000) and Esho et al. (2004) discussed non-life insurance, they also took the level of education as a proxy for risk aversion.

On the other hand, the more people are involved in education process, the less labour force is presented on the market, reducing thereby the overall GDP of the country. Therefore, education is hypothesised to be ambiguous in relation to non-life insurance demand. As an indicator of the level of education across countries, we use the tertiary gross enrolment ratio defined by the UNESCO Institute of Statistics as the total enrolment in tertiary education, regardless of age, expressed as a proportion of the eligible school-age population.

3.3. Institutional factors

Legal stability is important for a vibrant and growing non-life insurance market. The more stable the legal system in a country, the higher the willingness of contracting parties to initiate business relationships. To measure property right protection, we use the rule of law index. This index reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. The legal system in force in a country may impact the development of insurance, as it specifies the liabilities of those responsible for damage, and defines the business environment of insurers (Browne et al. 2000). For instance, the United States leads the world in per capita consumption of liability insurance. The American legal system may be a contributing factor, by encouraging Americans to over-consume property-liability insurance (Syverud et al. 1994). Browne et al. (2000) find the legal system to be a significant factor in the development of non-life insurance. Esho et al. (2004) also investigate the impact of the legal system, but find it non-significant after controlling for income and property rights. Recently, Park et al. (2010) showed

that the use of a common law legal system is the most important determinant of the toughness of bonus–malus systems in automobile insurance. Therefore, a positive relationship is hypothesised with non-life insurance consumption.

These institutional factors are measured in units ranging from about –2.5 to 2.5, with higher values corresponding to lower levels of corruption.

Apart from the actual variables in the empirical model, we will include a dummy variable which reflects the accession process to EU membership. We assume that joining the EU leads to the increasing openness of the financial markets of the countries, the inflow of foreign companies to the internal markets, a rise in competition between companies, and thus to more favourable conditions for consumers of non-life insurance. Also, the EU dummy can partially explain people's confidence in the financial stability of the economy. Therefore, the positive correlation between the EU dummy and the demand for non-life insurance is expected. This variable will reflect the importance of joining the EU for non-members included in the research (Albania, Croatia,[6] Macedonia, and Ukraine). Together with the demand side, membership in the European Union can have an impact on suppliers of non-life insurance, increasing the diversity of products offered, reducing the prices due to rise in competition. The EU dummy takes the following values: 0 – membership, 1 – non-membership.

Given the hypotheses specified above, we employ the cointegration and error correction technique to capture the long-run relationship and short-run dynamics between the dependent and independent variables, while avoiding problems of spurious correlation often associated with non-stationary time series data (Engle – Granger 1987; Adam 1992; Thomas 1993). We specify the model for the determinants of non-life insurance consumption (NLIC) in Central and South-Eastern Europe with an expected sign for each variable, as follows:

$$NLIP = f(GDPPC(+), NPV(+), NDW(+), RQM(+), INF(-), TRADE(+), PD(+), EDU(+), RL(+), DUM(+)) \quad (1)$$

where NLIP = non-life insurance premiums divided by GDP; GDPPC = GDP per capita; NPV = number of passenger vehicles per 1000 people; NDW = number of dwellings per 1000 inhabitants; RQM = ratio of quasi-money; INF = annual percentage; TRADE = trade activity (the sum of import and export activities as a fraction to GDP trade); PD = population density; EDU = level of education; RL = rule of law; DUM = EU membership.

[6] Croatia joined the European Union as its 28th member state in July 2013.

The log-linear form is indicated for demand functions specified on macroeconomic variables, which tend to display exponential growth. The above model is hereby written in log-linear form as:

$$L(\text{non-life insurance penetration})it = \beta 0 + \beta 1 L(\text{GDP per capita})it + \beta 2 L(\text{number of passenger cars per 1,000 people})it + \beta 3 L(\text{number of dwellings per 1000 inhabitants})it\ \beta 4 (\text{ratio of quasi-money})it + \beta 5(\text{inflation})it + \beta 6 L(\text{trade})it + \beta 7 L(\text{population density})it + \beta 8 L(\text{education level})it + \beta 9(\text{rule of law})it + DUMit + uit \quad (2)$$

where β is a coefficient that will be estimate, *uit* is a scalar disturbance term, *i* indexes country in a cross-section, and *t* indexes time measured in years. Based on the established model, we will estimate the determinants that affect the demand for non-life insurance in (1) the Balkans countries, (2) the Baltic countries, (3) the CEE countries, and in the fourth specification we will estimate the determinants of non-life insurance consumption in 14 countries in Central and South-Eastern Europe (CSEE).

4. EMPIRICAL RESULTS

To avoid the problem which may arise because of the existence of non-stationary variables, one might have to identify the order of integration of variables. Although several methods have been proposed by considering different assumptions, there is no uniformly powerful test for unit root. Nevertheless, it seems there are two approaches more popular than the rest. The first approach was provided by Dickey – Fuller (1979), which has been developed by Said – Dickey (1984). The second was presented by Philips – Perron (1988), which is sometimes known as the nonparametric method.

The ADF and PP tests were performed using 95% critical values (in parenthesis after each statistic). The results[7] show that rate of inflation (INF) and population density (PD) are stationary at levels in all four specifications. EDU was not included in the first and third specifications because the results show that this variable is stationary at levels while TRADE was not included in the second specification because this variable was stationary at the second difference. The immediate conclusion from this analysis is that any dynamic specification of the model in the levels of the series is likely to be inappropriate and may be plagued by problems of spurious regression (Adam 1992). It is also argued that the econometric results of the model in the levels of the series may not be ideal for policy

[7] The results are available upon request to the authors.

making. This proposition thus lends credence to the earlier doubts cast over the efficacy of past studies in policy decisions. Lastly, the above-mentioned variables were not included in the cointegration analysis because by definition, if variable is stationary at levels or if variable was stationary at the second difference it is not expected to have a long-run relationship with first difference of the variable (Adam 1992).

Since it has been determined that the variables under examination are integrated of the first difference the cointegration test is performed. Cointegration analysis addresses the problem of spurious regressions among non-stationary time series. Estimation in a system context may shed light on important interrelationships among series while reducing the risk of endogeneity bias (Banerjee et al. 1993). The most important application of cointegration in economic estimations is that it shows that there is a long-run relationship between variables which are cointegrated. The cointegration test proposed by Johansen (1988) is the most popular test.

When we applied Johansen's test, we first determined the underlying VAR (Vector Auto Regression) model for the optimal choice of lag length and the conventional information criteria were only used as a rough guideline.[8] The lag length of VAR was chosen to be $k = 1$ for all four specifications using different information criteria such as Final Prediction Error (FPE), Akaike (AIC), Schwarc (SC), and Hannan-Quinn (HQ) for different time lags (Enders 2004). The results are shown in *Table 5*. Next, Johansen's test takes the vector autoregression (VAR) of order k may be written as:

$$y_t = \mu + A_1 y_{t-1} + ... + A_P y_{t-k} + \varepsilon_t \tag{3}$$

where y_t is an $n \times 1$ vector of variables that are integrated of order one – commonly denoted first difference – and ε_t is an $n \times 1$ vector of innovations. This VAR can be re-written as

$$\Delta y_t = \sum_{i=1}^{k-1} \Gamma_i \Delta y_{t-k} + \Pi y_{t-k} + \varepsilon_t \tag{4}$$

where y_t is a $n \times 1$ vector of endogenous variables, i.e. y_t [*LNLIP LGDPPC LNPC LNDW RQM LTRADE*]$^{\tau}$, ε_t a $n \times 1$ vector of stochastic disturbances. The rank r of

[8] On account of the overparameterisation problem associated with VAR models, we set the maximum lag length to three for all four specifications. Excessive parameterisation of regression equations can cause depletion of degrees of freedom and contribute to estimates of irrelevant and biased coefficients.

matrix Π gives the statistical properties of the VAR. Full rank $r = n$ implies that VAR is stationary. Rank $r = 0$ implies that VAR is nonstationary with no cointegrating equations. Reduced rank $0 < r < n$ means r cointegrating equations. Matrix Π can be decomposed as $\Pi = \alpha\beta\tau$, where α is $n \times r$ matrix of speed of adjustments and β is an $n \times r$ matrix of F parameters which determines the cointegrating relationships. The columns of β are interpreted as long-run equilibrium relationships between the variables. Matrix α determines the speed of adjustment towards this equilibrium. Values of α close to zero imply slow convergence.

Johansen's procedure is used for cointegration testing. Johansen derives a test on the number of characteristic roots that are different from zero by considering the two following statistics: the trace eigenvalue statistic (λ_{trace}) and maximum eigenvalue statistic (λ_{max}) (Johansen 1988). The likelihood ratio statistics suggested by Johansen (1988) for trace and eigenvalue test are:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{p} In(1 - \hat{\lambda}_r). \tag{5}$$

The trace λ_{trace} statistics test the null hypothesis that the number of distinct characteristics roots is less than or equal to *r,* against the general unrestricted alternative. Where the value of the characteristics root is close to zero, the λ_{trace} statistics is smaller, and it will be larger relative to the value of the characteristics root, when further from zero.

The maximum eingenvalue λ_{max} statistics is:

$$\lambda_{max}(r, r+1) = -TIn(1 - \hat{\lambda}_{r+1}) \tag{6}$$

where T represents the number of usable observations; λ represents the largest estimated value of ith characteristics root (eigenvalue) obtained from the matrix $r = 0, 1, 2, 3, \ldots\ldots\ldots$ P–1.

For λ_{max} statistics, the null hypothesis $r = 0$ is tested against the alternative that $r = 1$, the alternative $r = 2$, and so on. Where the estimated value of the characteristics root is close to zero, λ_{max} will be smaller. If there is a different result between trace statistic and maximum eigenvalue test, maximum eigenvalue result is preferred (Banerjee et al. 1993).

The result of the cointegration tests suggests that there is one cointegrating vector in trace eigenvalue statistic, and one cointegrating vector in maximum

eigenvalue statistic.[9] The results suggest that there is a long-run relationship between the tested variables in all four specifications.[10]

Following the literature (Johansen1990), we normalised this vector by setting the coefficient on the non-life insurance penetration at –1.0 so that the vector may be interpreted as a dependent variable.[11] First, note that the long-run regression results indicate a positive association between the number of passenger vehicles per 1000 people and non-life insurance consumption in all four specifications. This finding confirms the empirical result in the literature that a high number of passenger cars per 1000 people impacts positively on non-life insurance consumption (Feyen et al. 2011). This result suggests that car liability insurance takes a dominant place in the insurance market in CSEE countries and confirms that car penetration is a driver of insurance development in CSEE countries. The reason for this is that people in these countries are not yet sufficiently informed and have not yet acquired an insurance culture, and mainly use car insurance or compulsory motor third party liability insurance (comprehensive car insurance is usually voluntary but also common in many countries). This could also explain why LTRADE does not enter significantly in our models.

The positive effect of GDP per capita in non-life insurance consumption in the long-run as amplified in the development literature is confirmed by the results of this study. GDP per capita has a positive impact on non-life insurance consumption during the period under investigation, but is statistically significant only in the first sub-group (Balkan countries). Obviously, increased income allows for higher consumption in general, makes insurance more affordable, and creates a greater demand for non-life insurance to safeguard acquired property. The positive impact of macroeconomic conditions on purchasing decisions of non-life insurance indicates that the good shape of the domestic economy of the Balkan countries is a source of the growth of operations of the real sector and other customers of insurance companies, and creates higher demand for new insurance (i.e. property insurance and protection against financial risk). At the same time, a dynamically growing economy is associated with lower values of gross paid claims.

We used the number of dwellings per 1000 inhabitants in this study as a measure of risk-aversion. This variable is positively and statistically significant in our fourth model. This result means that the higher the number of dwellings, the

[9] The results are available upon request to the authors.

[10] Exogenous variables (RL, LEDU, LPD and DUM) will not appear in the long run because we presume that the variables are determined outside the system and will only appear in the short run, while these variables are assumed to be independent from others in the long run.

[11] The results are available upon request to the authors.

greater the demand for insurance. This corresponds to the prior research of Esho et al. (2004), which confirms that risk aversion has a significant impact on non-life insurance demand.

Furthermore, we transform VAR in VECM (Vector Error Correction Model) and we estimated VECM system with the short-run dynamic.

$$\Delta L(NLIP)_t = \sum_{k=1}^{n} \mu' \Delta L(NLIP)_{t-k} + \sum_{k=0}^{n} \gamma' \Delta F_{t-k} + DUM + \alpha ECM_{t-1} \quad (7)$$

where F is a vector of the stationary forms for nine vectors related to GDP per capita, number of passenger cars per 1000 people, number of dwellings per 1000 inhabitants, ratio of quasi-money, trade, inflation, population density, education level and rule of law, and one dummy variable which reflects the accession process to European Union membership. The error-correction-term ECM_{t-1} is defined as the difference between the actual non-life insurance penetration at time t–1 and its estimate from the long-run equation in the same period. The presence of ECM_{t-1} in this equation demonstrates the dynamic short-run adjustment. When the non-life insurance penetration deviates from its long-run equilibrium, the ECM term will subsequently work to bring it back to the equilibrium level. Therefore, its coefficient is expected to be negative.

In the short run, only the rule of law has significant influence on non-life insurance consumption, in the third and fourth specifications. The positive estimated coefficient on the rule of law is consistent with the idea that this variable provides individuals and firms with the right to own and sell assets, and protection against damage or devaluation of such assets by third parties. Knack – Keefer (1995, 2000) have shown that the insecurity of property rights reduces economic growth, as firms may adopt less than optimal fixed capital assets because of expropriation risk, avoid investments in assets that are capital intensive, or operate at an inefficient scale. In terms of non-life insurance, the enforcement of property rights create an economic incentive to acquire and insure property, since government and legal enforcement of property rights help to protect individuals from loss or damage to the asset. Moreover, given that insurers have a positive probability of insolvency, insurance liabilities may be viewed as analogous to risky corporate debt (Cummins – Danzen 1997). Therefore, as in the case of debt and equity markets, it is likely that the development of insurance markets and thereby additional financial intermediation in CSEE countries is also critically dependent upon the quality of the underlying legal and political system.

The dummy variable is statistically significant in the fourth specification at the 1% level of significance and points to 0.15 percentage points higher demand for non-life insurance only as a result of membership in the European Union. The membership in EU increases consumers' confidence in the stability of the market,

thus stimulating the demand for non-life insurance products. Prior to becoming a member of the EU, new entrants had to implement a number of reforms in order to improve their economic environment and measure up the EU standards. Therefore, we can mark the importance of working on joining the EU by non-members included in the research (Albania, Croatia, Macedonia, and Ukraine).

Moreover, parameter α has expected negative sign in all four groups, which determines the speed of adjustment towards equilibrium. The speed of the adjustment parameter is –0.73 in CSEE-14, followed by –0.32 in CEE-7, 0.11 in B-3 and 0.03 in BAL-4. This means that the disequilibrium can be corrected at the rate of 73%, 32%, 11%, and 0.03%, respectively.[12]

The models are also checked for the explanatory power of the coefficient of determination, important influence of dependent variables, heteroscedasticity, serial correlation, and normality of the parameters of the equations.

The coefficient of determination R^2 in the presented four equations is 72.43% in BAL-4, 68.56% in B-3, 70.56% in CEE, 78.67% in CEE-7, –0.32 in CSEE-14. This means that the dependent variable is explained at 72.43%, 68.56%, 70,56%, and 63.67%, respectively, by the independent variables. The estimated equation F in the equations is 0.029, 0.084, 0.047, and 0.036 for all four specifications. As a consequence of these results, we can conclude that the explanatory variables have a significant influence on the variation of dependent variables at the 5% level in all four specifications. The residual heteroscedasticity Breusch-Pagan-Godfrey test (p-value 0.9982, 0.8735, 07542 and 0.7421) indicates no heteroscedasticity in the models. The Lagrange Multiplier (LM) test showed there is no serial correlation between residuals at any lag (p-value 0.1264, 0.1178, 0.2367 and 0.1954). The Jarque-Bera test is used for testing whether the series is normally distributed. The test statistic measures the difference of the skewness and kurtosis of the series compared to those from the normal distribution. From the results, we cannot reject the null hypothesis of a normal distribution, and can therefore conclude that these residuals have a normal distribution in all four specifications.[13]

5. CONCLUSION

This paper ascertains empirically the determinants of non-life insurance consumption in 14 countries of Central and South-Eastern Europe using time series data from 1995 to 2010 by applying cointegration and vector error correction models. We found proof of the existence of a long-run relationship and short-

[12] The results are available upon request to the authors.
[13] The results are available upon request to the authors.

run dynamics among the variables under consideration. We showed that the number of *dwellings* per 1000 inhabitants and the number of *passenger cars* per 1000 people positively and significantly influence non-life insurance consumption. On the other hand, we discovered that the number of passenger cars, the quality of the rule of law, and EU membership are significant predictors of non-life insurance consumption in the short run only. In addition, the results indicate a well-defined error correction term, which is significant at 5% with a feedback effect of about 63%.

In general, B-3 and CEE-7 countries have a more developed insurance (life and non-life) sector than BAL-4 countries. Better regulation and supervision in B-3 and CEE-7 were partly motivated by the need to adopt EU standards. Thus, many of the insurance sector weaknesses traditionally characterising emerging markets have gradually been eliminated. EU membership increases consumers' confidence in the stability of the market, thus stimulating the demand for non-life insurance products. Prior to becoming a member of the EU, new entrants had to implement a number of reforms in order to improve their economic environment and measure up the EU standards. Therefore, we can mark the importance of working on joining the EU by non-members included in the research.

The result of this paper is that the Central and South-Eastern Europe countries should be regarded as a highly potential region with dynamic and fast-growing insurance markets. Taking into account the impact of insurance development on economic growth, the increase of the non-life insurance sector should be viewed as an inevitable part of stable economic development. In future research, when more data become available, it would be useful to take a much bigger sample in terms of countries and periods, which would lead to a better understanding and knowledge of the determinants of non-life insurance demand.

REFERENCES

Adam, C.S. (1992): Recent Developments in Econometric Methods: An Application to the Demand for Money in Kenya. *African Economic Research Consortium Special Paper,* 15. Nairobi, Kenya.

Aoki, K. – Proudman, J. – Vlieghe, M. (2004): House Price, Consumption and Monetary Policy: A Financial Accelerator Approach. *Journal of Financial Intermediation,* 13(4): 414 – 435.

Arrow, K. (1971): *Essays in the Theory of Risk Bearing*. Chicago: Markham.

Beck, T. – Webb, I. (2003): Determinants of Life Insurance Consumption across Countries. *World Bank Economic Review,* 17(1): 51–88.

Banerjee, A. – Dolado, J.J. – Galbraith, J.W. – Hendry, D. (1993): *Co-Integration, Error Correction, and the Econometric Analysis of Non-Stationary Data. Advanced Texts in Econometrics.* Oxford: Oxford University Press.

Beenstock, M. – Dickinson, G. – Khajuria, S. (1986): The Determination of Life Premiums: An International Cross-Section Analysis 1970–1980. *Insurance: Mathematics and Economics,* 5: 261–270.

Beenstock, M. – Dickinson, G. – Khajuria, S. (1988): The Relationship between Property-Liability Insurance and Income: An International Analysis. *Journal of Risk and Insurance,* 55: 259–272.

Bruce, H. – Muffels, R. – Wooden, M. (2004): Money Doesn't Buy Happiness… Or Does It? A Reconsideration Based on the Combined Effects of Wealth, Income and Consumption. *IZA (Institute for Study of Labor) Discussion Paper,* No. 1218.

Browne, M.J. – Kim, K. (1993): An International Analysis of Life Insurance Demand. *Journal of Risk and Insurance,* 60(4): 616–634.

Browne, M. – Chung, J. – Frees, E. (2000): International Property-Liability Insurance Consumption. *Journal of Risk and Insurance,* 67: 73–90.

Campbell, R.A. (1980): The Demand for Life Insurance: An Application of the Economics of Uncertainty. *Journal of Finance,* 35(5): 1155–1172.

Dickey, D.A. – Fuller, W.A. (1979): Distribution of the Estimation for Autoregressive Time Series with a Unit Root. *Journal of the American Association*, 74: 427–431.

Enders, W. (2004): *Applied Econometric Time Series.* (Second edition). Hoboken, N.J.: Wiley & Sons.

Engle, R.F. – Granger, C.W.T. (1987): Co-Integration and Error Correction Representation, Estimation and Testing. *Econometrica,* 55(2): 251–276.

Esho, N. – Kirievsky, A. – Ward, D. – Zurbruegg, R. (2004): Law and the Determinants of Property Casualty Insurance. *Journal of Risk and Insurance,* 71(2): 265–283.

Falciglia, A. (1980): The Demand for Non-Life Insurance: A Consumption-Oriented Model. *Geneva Papers on Risks and Insurance*, 17:45–53.

Feyen, E. – Lester, R. – Rocha, R. (2011): What Drives the Development of the Insurance Sector? An Empirical Analysis Based on a Panel of Developed and Developing Countries. *Policy Research Working Paper,* No. 5572. World Bank.

Fortune, P. (1973): A Theory of Optimal Life Insurance: Development and Tests. *Journal of Finance,* 28(3): 587–600.

Fuller, W.A. (1976): *Introduction to Statistical Time Series.* Hoboken, N.J.: Wiley & Sons.

Hemming, R. – Manson, A. (1988): Is Privatization the Answer? *Finance and Development, 25*(3): 31–33.

Johansen, S. (1988): Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamic and Control,* 12: 231–254.

Johansen, S. (1990): Estimation and Hypothesis Testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models. *Econometrica*, 59(6): 1551–1580.

Jung, W.S. (1986): Financial Development and Economic Growth: International Evidence. *Economic Development and Cultural Change*, 34(2): 333–346.

Knežević, S. – Marković, M. – Brown, A. (2015): Measuring the Efficiency of Serbian Insurance Companies. *Acta Oeconomica,* 65(1): 91–106.

Lewis, F.D. (1989): Dependents and the Demand for Life Insurance. *American Economic Review,* 79(3): 452–466.

Li, D. – Moshirian, F. – Nguyen, P. – Wee, T. (2007): The Demand for Life Insurance in OECD. *Journal of Risk and Insurance,* 74(3): 637–652.

Liu, L.Y. – Woo, W.T. (1994): Saving Behaviour under Imperfect Financial Markets and the Current Account Consequences. *Economic Journal,* 104: 512–527.

Mayers, D. – Smith, C.W. (1990): On the Corporate Demand for Insurance: Evidence from the Reinsurance. *Journal of Business,* 63:19–40.

Mossin, J. (1968): Aspects of Rational Insurance Purchasing. *Journal of Political Economy,* 79: 553–568.

Nakata, H. – Sawada, Y. (2007): The Demand for Non-Life Insurance: A Cross-Country Analysis. *CIRJE F Series*, No. 461, University of Tokyo.

Njegomir, V. – Stoic, D. (2012): Determinants of Non-Life Insurance Market Attractiveness for Foreign Investments: Eastern European Evidence. *Ekonomska istraživanja*, 25(2): 297–310.

Outreville, J.F. (1990): The Economic Significance of Insurance Markets in Developing Countries. *Journal of Risk and Insurance,* 57: 487–498.

Outreville, J.F. (1996): Life Insurance Markets in Developing Countries. *Journal of Risk and Insurance,* 63(2): 263–278.

Park, H. – Borde, S.F. – Choi, Y. (2002): Determinants of Insurance Pervasiveness: A Cross-National Analysis. *International Business Review*, 11(1): 79–96.

Park, S. – Lemaire, J. – Chua, C.T. (2010): Is the Design of Bonus-Malus Systems Influenced by Insurance Maturity or National Culture? *The Geneva Papers Issues and Practice,* 35: S7–S27.

Pratt, J. (1964): Risk Aversion in the Small and in the Large. *Econometrica,* 32: 122–136.

Said, S.E. – Dickey, D.A. (1984): Testing for Unit Roots in Autoregressive-Moving Average Models of Unknown Order. *Biometrika,* 71(3): 599–607.

Schlesinger, H. (1981): The Optimal Level of Deductibility in Insurance Contracts. *Journal of Risk and Insurance,* 48: 465–481.

Schlesinger, H. (2000): The Theory of Insurance Demand. In: Dionneed, G. (ed.): *Handbook of Insurance.* Boston, MA: Kluwer.

Sherden, W. (1984): An Analysis of the Determinants of the Demand for Automobile Insurance. *Journal of Risk and Insurance,* 51: 49–62.

Syverud, K.D. – Bovbjerg, R.R. – Pottier, S.W. – Will, R.W. (1994): On the Demand for Liability Insurance: Comments. *Texas Law Review,* 72: 1629–1702.

Szpiro, G.G. (1985): Optimal Insurance Coverage. *Journal of Risk and Insurance,* 52(88): 705–710.

Sweeney, G. – Beard, T. (1992): The Comparative Statics of Self-Protection. *Journal of Risk and Insurance,* 59(2): 301–309.

Thomas, R.L. (1993): *Introductory Econometrics: Theory and Applications*. (Second edition.) Harlow: Longman.

Ward, D. – Zurbruegg, R. (2000): Does Insurance Promote Economic Growth? Evidence from OECD Countries. *Journal of Risk and Insurance,* 67(4):489–506.

Webb, I. – Grace, M.F. – Skipper, H. (2002): The Effect of Banking and Insurance on the Growth of Capital and Output. *Working Paper* 02-1, Georgia State University, Center for Risk Management and Insurance.