9. AN ANALYSIS OF NON-LIFE INSURANCE DETERMINANTS FOR SELECTED COUNTRIES IN CENTRAL AND SOUTH EASTERN EUROPE: A CO-INTEGRATION APPROACH

Mihail PETKOVSKI[1]
Kjosevski JORDAN[2]

Abstract

This study examines the determinant of non-life insurance consumption in 16 countries in Central and South-Eastern Europe (CSEE) during the period 1992-2011 with an Larsson et al. (2001) cointegration test and the dynamic ordinary least squares. These techniques will help us to understand which are the determinants of non-life insurance consumption in 16 countries in Central and South- Eastern Europe (CSEE), revealing the significant influence between endogenous variables. Empirical results provide the evidence that GDP per capita, and number of passenger cars per 1.000 people positively and significantly influence non-life insurance consumption in the long-run.

Keywords: non-life insurance penetration, consumption, Central and South- Eastern European countries, panel unit root tests, Larsson *et al*. (2001) cointegration test, the dynamic ordinary least squares

JEL Classification: C39, G22, O1

1. Introduction

The non-life insurance sector played a critical role in the financial and economic development over the last few decades as provider of financial services to consumers. By introducing risk pooling and reducing the impact of large losses on firms and

1 Financial Management, Faculty of Economics, Ss Cyril and Methodius University in Skopje, Skopje, Republic of Macedonia.
2 Corporate Sector Lending in Stopanska Banka AD – Skopje, Republic of Macedonia. Email:jordan_kos@yahoo.com

households, the sector reduces 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 (for instance, by enhancing the value of collateral through property insurance, and reducing losses at default through credit guarantees and enhancements).

However, the growth of non-life insurance did not rise on the same level, not only among industrial countries and developing countries, and also there is a difference between the developing countries. For instance, in 1999 the non-life insurance density in Western Europe countries was 2.97%, and it reached 5.96% in 2010, while in Central and South-Eastern Europe was 1.24% in 1999, and decreased to 0.58% in 2010, leading to a huge unexploited market in the Central and South-Eastern Europe countries. In some developing countries, such as Slovenia, in 1999 the non-life insurance density was 2.88%, and it reached 4.1% in 2010, while in Romania it was 0.79% in 1999 and reached 1.4% in 2010. The large disparity across countries in the use of non-life insurance raises questions about what causes this variation and, thus, what determines the non-life insurance consumption. Some authors have proposed a variety of different socio-economic and institutional factors as possible determinants of non-life insurance consumption.

This paper contribution resides in a new effort to understand what drives the non-life insurance consumption within a sample of 16 Central and South-Eastern Europe countries (Albania, Belarus Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Former Yugoslav Republic of Macedonia, Moldova, Poland, Romania, Slovak Republic, Slovenia and Ukraine) for the period 1992-2011. As measurers of non-life insurance demand we use: non-life insurance penetration (non-life insurance premiums in relation to GDP). We apply the Larsson *et al*. (2001) cointegration test and the dynamic ordinary least squares to estimate the relationship between the variables.

The paper is organized as follows. Section 2 highlights the literature on empirical findings relevant to the demand for non-life insurance. Section 3 presents methodology and data, which we incorporate in the analysis. The results of the empirical research are given in section 4. The paper finishes with some concluding remarks and suggestions for the future work that are outlined in section 5.

2. Literature Review

Despite the critical role that the insurance sector may play in the financial and economic development and the reasonable evidence that the sector has promoted economic growth, there were few studies examining the factors that drive the development of the insurance sector. Moreover, the bulk of the existing empirical research focuses on the growth of the life insurance sector, with the most frequently cited papers Beck and Webb, 2003; Browne and Kim, 1993; Outreville, 1996; Li *et al*., 2007. The dependent variables for the vast majority of models were the life insurance

density (number of US Dollars spent annually on life insurance per capita) and life insurance penetration (total life premium volume divided by GDP). Explanatory variables that have been shown to impact significantly the life insurance demand are GDP per capita, inflation (real, anticipated, or feared), development of the banking sector, 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 age 15 to 64), urbanization, size of the social security system, life expectancy, and market structure.

Sherden (1984) was the 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 townships of the state of Massachusetts in 1979, Sherden (1984) 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.

Beenstock *et al*. (1988) using an international dataset (12 countries over a period of 12 years) to examine the relationship between property liability insurance premiums and income found out that marginal propensity to insure, i.e., the increase in insurance spending when income rises by 1$, differs from country to country and premiums vary directly with the real rates of interest. Thus, again, the decision of 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 Beenstock *et al*. (1988) main result of income elasticity greater than unity. The level of financial development is the only other factor found to significantly impact on non-life insurance consumption.

Browne *et al*. (2000) studied 22 OECD countries from 1987 through 1993 and focused 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 demonstrated that income (GDP per capita), wealth, foreign firms' market share, and the form of legal system (civil law or common law) were significant factors that explained 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) examined 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. In contrast with the life insurance demand studies of Chui and Kwok (2008, 2009), the results show that only masculinity is positively correlated with insurance pervasiveness. This conflicting result may be due to the aggregation of life and non-life insurance, which may produce a bias against finding meaningful relationships if the cultural impact on insurance demand is different for life and non-life insurance. Esho *et al*. (2004) expanded 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, characterizing 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 and 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.

Although there are several empirical explanations for determinants of non-life insurance, almost none of them focus on the Central and South-Eastern Europe countries in particular. According to our opinion, only Beck and Webb (2003) include some of the former socialist countries of CSEE (Bulgaria, the Czech Republic, Hungary, Poland and Slovenia), but they investigate the determinants of life insurance. In order to contribute to the filling of the gap, the following is a new empirical study on selected countries from the Central and South-Eastern Europe (Albania, Belarus Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, FYROM, Moldova, Poland, Romania, the Slovak Republic, Slovenia and Ukraine).

3. Data

For our research, we focus on factors that determine consumption of non-life insurance in 16 countries in Central and South-Eastern Europe (Albania, Belarus Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, FYROM, Moldova, Poland, Romania, the Slovak Republic, Slovenia and Ukraine). The dataset consists of an unbalanced panel of annual observations from 1992 to 2011**.** Following 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 emphasize 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 the relative insurance consumption, as the overall wealth effect has been removed by dividing 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 to be 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, number of passenger cars per 1,000 people, trade, ratio of quasi money and inflation;
- Demographic: population density and level of education;
- Institutional: rule of law.

Data are obtained from various sources. Non-life insurance penetration is obtained from Sigma, Swiss Re Economic Research&Consulting, Swiss Re, Zurich and national insurance associations. Education is obtained from EdStats, World Bank. GDP per capita, inflation, numbers of passenger cars per 1.000 people, trade and population density are obtained from World development indicators (WDI) database. Rule of law, is obtained from the Heritage Foundation.

3.1 Economic Factors

The economic variables were primarily used for empirical studies of the life insurance, but several of them are in principle relevant for the non-life sector as well. For example, when analyzing the impact of national income on non-life insurance demand, Beenstock *et al*. (1988) indicate a positive relationship between the national income in industrialized countries and spending on property-liability insurance. Esho *et al*. (2004) also test the impact of national income on property and casualty insurance by analyzing data from developed and developing nations between 1984 and 1998. Again, they detect a strong positive relationship between national income and non-life insurance demand. The World Bank confirms these findings and states that non-life insurance can be regarded as a normal good, implying that insurance demand rises as income increases (Lester, 2002). Despite these findings, insurance penetration in some countries differs from the international average. This would suggest that income alone could not determine the insurance consumption. However, we also obtained other economic variables that are more closely related to the non-life sector, such as number of passenger vehicles per 1,000 people and the volume of trade activity.

All the previous studies, whether devoted to life or non-life insurance, conclude that income, measured as GDP per capita, is the most important factor affecting the purchase decisions (for example Fortune, 1973; Campbell, 1980; Beenstock *et a*l., 1986; Lewis, 1989; Outreville, 1990). Beck and Webb (2003), Ward and Zurbruegg (2000), Beenstock *et al*. (1988), point out a positive relationship in the industrialized countries between national income and non-life insurance spending. Browne *et al*. (2000) analyzes general liability and motor vehicle insurance in the OECD countries, and finds a significant positive relationship between premium density and GNP per capita. Additionally, Esho *et al*. (2004) examines developed and developing countries between 1984 and 1998, and finds a strong positive relationship between national income and the non-life insurance premium. Outreville (1990) and Ward and Zurbruegg (2000) strongly emphasize that the insurance industry, through risk transfer, financial intermediation, and employment can generate externalities and

economic growth. The larger the level of income is the higher is the demand for non-life insurance to safeguard acquired property. We expect income to have a strong, positive impact on non-life insurance consumption.

The next three are also economic variables which examine the non-life sector. We include the number of passenger vehicles per 1,000 inhabitants, because most countries require at least third party liability insurance (comprehensive car insurance is usually voluntary, but also common in many countries). 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.

Financial development is associated with the widespread securitization of cash flow, which enables households to secure future income through the ownership of financial assets. By offering similar benefits, non-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 (higher ratio indicates higher level of financial development), and 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 the 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 and Manson, 1988). Following the previously mentioned studies, we use the ratio of quasi-money (M2-M1) as a measure of financial development. We hypothesize a positive correlation with the non-life insurance demand.

The last 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 claim 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 policy holders 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.

3.2 Demographic Factors

Feyen *et al*. (2011), tells that the size of population determines the operating background, that is to say, the size of the market for the non-life insurance industry. We, therefore, include the population density for each country into our model and assume that its effect on the non-life insurance consumption is positive.

The level of education positively affects the demand for non-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 and 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 - risk aversion. Mayers and Smith (1990) further indicate a supposition 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, although 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 the discussion of Browne and Kim (1993), in general, a higher level of education may lead to a greater degree of risk aversion and greater awareness of the necessity of insurance. Nonetheless, Szpiro (1985) proved the negative correlation between the level of education and risk aversion. They deemed that higher education leads to lower risk aversion, and that, in turn, leads to more risk-taking by skilled and well-educated people. When Browne *et al*. (2000), Esho *et al*. 2004) were discussing 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 the education process, the less labor force is presented on the market, therefore reducing the overall GDP of the country. Therefore, education is hypothesized to be ambiguously related to non-life insurance demand. As an indicator of the level of education across countries we use secondary gross enrollment ratio defined by the UNESCO Institute of Statistics.

3.3 Institutional Factors

Legal stability is important for a vibrant and growing non-life insurance market. The more stable is the legal system in the country the higher is the willingness of contracting parties to initiate the business relationships.

To measure property right protection, we use rule of law, provided by the Heritage Foundation. 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. The legal system in force in a country may impact the development of insurance, as it specifies the liabilities of those responsible of 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) finds the legal system to be a significant factor in the development of non-life insurance. Esho *et al*. (2004) also investigates 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 toughness of bonus-malus systems in automobile insurance. Therefore, it hypothesized a positive relationship with non- life insurance consumption.

This institutional factor is measured in units ranging from 0 to 100, with higher values corresponding to better control of corruption.

4. Methodology

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

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

Where: *NLIP* = non-life insurance premiums divided by GDP;

GDPPC = *GDP* per capita;

NPV = number of passenger vehicles per 1,000 people;

TRADE = trade activity (the sum of import and export activities as a fraction to GDP trade);

RQM=ratio of quasi-money (M2-M1);

INF = inflation annual percentage;

PD = population density;

EDU = level of education;

RL= rule of law.

Because we use a mix of continuous, discreet statistical variables, as well as sociological variables with specific scales, we should consider to transform and to normalize variables in the model construction. There are four common transformations that are used for dependent variables, including the logarithmic, exponential, power, and logistic transformations (Lynch, 2003). The most common specification is the log-linear form used by Outreville 1996; Browne and Kim 1993; Ma and Pope 2003; and Feyen *et al*., 2011. 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:

$$L(NLIPit) = \beta 0 + \beta 1L(GDPPCit) + \beta 2L(NPVit) + \beta 3L(TRADEit) + \beta 4RQMit + \\ + \beta 5INFit + \beta 6L(PDit) + \beta 7L(EDUit) + \beta 8L(RLit) +) + uit \quad (2)$$

where: β is a coefficient that should be estimated, u_{it} is a scalar disturbance term, *i* indexes country in a cross section, *t* indexes time measured in years.

To estimate an econometric model, it is important to know whether the data generating the variables are based on a stationary process or not. Variance and covariance of a stochastic process are finite and independent of time in the stationary process. In the presence of non stationary, properties of standard estimation are not valid. In addition, it might caused problem of spurious regression (Verbeek, 2004).

To avoid the problem which may arise because 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. Recent literature suggests that a panel-based unit root test has a higher power than a unit root test based on individual time series (Levin, Lin and Chu 2002; Im, Persaran and Shin 2003; Breitung, 2000).

In this research, we will focus on two types of panel unit root test, such as Breitung (2000) which assumes that there is a common unit root process so that p_i is identical across cross-sections, and the Fisher test using ADF and PP-test (Maddala and Wu, 1999) that combines the p-values from individual unit root tests. In all these tests, the null hypothesis is non-stationarity.

Similar to individual unit root tests, cointegration tests in the time series literature suffer from low power when the time horizon is short. Panel techniques may be better in detecting cointegration relationships, since a pooled levels regression combines cross-sectional and time series information in the data when estimating cointegrating coefficients. For these analysis, we use the Larsson, Layhagen and Löthgren (2001) cointegration test. They constructed their model based on Johansen's (1988) maximum likelihood estimator tests on residuals, i.e. a panel extension of VAR cointegration analysis. This model permitted to avoid from unit root tests on residuals, widening the unique cointegrating vector assumption (Asteriou, 2005). The construction of this test statistic is similar to Im, Pesaran, and Shin (2003) and, hence, the test statistic is given by a suitably centered and scaled version of the cross-sectional average of the individual trace statistics (Wagner and Hlouskova, 2006). The Larsson *et al*. (2001) model is based on the estimation for each cross sectional unit LR_{iT} by employing the maximum likelihood models to compute the trace for each. The standardized panel cointegration rank trace-statistic (denoted by YLR) is then given by:

$$Y_{LR} = \sqrt{N}(LR_{NT} - E[Z_K])/\sqrt{Var(Z_K)} \quad (3)$$

where: LR_{NT} is average of the trace statistic for each-cross sectional unit, and $E(Z_K)$ and $Var(Z_K)$ are the mean and variance of the asymptotic trace statistic reported by Larsson *et al*. (2001).

Although Larsson *et al*. (2001) methodology allows us to test the presence of cointegration it could not provide estimation of long-run relationship. For panel framework, in presence of cointegration, several estimators are proposed: OLS, fully modified OLS (FMOLS), dynamic OLS (DOLS), and Pooled Mean Group (PMG). Chen, McCoskey and Kao (1999) analyzed the proprieties of the OLS estimator and found that the bias-corrected OLS estimator does not improve over the OLS estimator in general. These results suggest that alternatives, such as the FMOLS estimator or the DOLS estimator, may be more promising in cointegrated panel regressions. The DOLS estimator is preferred to the non-parametric FMOLS estimator because of its better performance. According to Wagner and Hlouskova (2010), the DOLS estimator outperforms all other studied estimators, both single equation estimators and system estimators, even for large samples. Therefore, for the long-run model in this study we

employ the dynamic ordinary least squares DOLS procedure developed by Stock and Watson (1993). In our case, we can write the Stock-Watson DOLS model as follows:

$$Y_{it} = \alpha_i + \beta X_{it} + \sum_{j=-q}^{q} c_j \Delta X_{i,t+j} + \varepsilon_{it} \quad (4)$$

where: *i* =1,..,N refers to each country in the panel and t =1,..,T denotes the time period,

Y_t is the dependent variable,

α_i are individual fixed effects,

X is the matrix of explanatory variables,

β is the cointegrating vector; i.e., represents the long-run cumulative multipliers or, alternatively, the long-run effect of a change in X on Y,

ε_{it} are the error terms,

p lag length of the first differenced of the explanatory variables,

q lead length of the first differenced of the explanatory variables.

When using panel data estimation, choosing between fixed effects and random effects is crucial. The intercepts, α_i in equation (4), stand for the parameters that are estimated for each cross-section in fixed effects estimation whereas they are assumed to be randomly drawn from a certain distribution in random effects estimation. When the sample size consist of a specific set of countries, the fixed effect estimation is appropriate, while when the sample size includes randomly chosen countries from all around the world representing the population, the random effect estimation is more suitable (Baltagi, 2005). Therefore, in this study we choose fixed effects to estimate the parameters in equation (3). In order to remove the serial correlation, we estimate the long-run covariance by applying the Bartlett Kernel and select the leads and lags based on the Akaike information criterion following the suggestion of Kejriwal and Perron (2008).

5. Empirical Results

In this section, we begin with the analysis of the results of the panel unit root tests. The results are presented in Table 1. We used the test of Madalla and Wu (1999) (no cross-dependence) and the test of Breitung (2000) (has cross-dependence). According to the test Madalla and Wu (1999) in most cases the null hypothesis of a unit root is rejected even at 1%-level, but the differences are obvious when you consider the results of the test of Breitung (2000), which takes into account the dependence of the cross member. According to this test, the non-life insurance penetration, GDP per capita, number of passenger cars per 1,000 people, trade activity, population density, and rule of law are non-stationary and they are stationary only at their first difference I(1), at 5% level. However, rate of inflation (INF), ratio of quasi-money (RQM) and level of education (EDU) are stationary at I(0) levels. 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). However, according to Juselius (2003), if the time perspective of the studies considers macroeconomic behaviour in the medium and long run, then most macroeconomic variables exhibit considerable inertia, consistent with non-stationary rather than stationary behaviour. Because inflation, for example, would not appear to be statistically different from a non-stationary variable, treating it as a stationary variable is likely to invalidate the statistical analysis and, therefore, leads to wrong economic conclusions. On the other hand, treating inflation as a non-stationary variable gives us the opportunity to find out which other variable(s) has/have exhibited a similar stochastic trend by exploiting the cointegration property (Juselius, 2003). Because the time perspective of our study is the long historical macroeconomic movements, inflation ratio of quasi-money, as well as education, we include in our model and we treat as non-stationary variables at their levels.

Table 1

Result of Panel Unit Root Tests

Test Variables	ADF-Fisher Chi square		PP-Fisher Chi square		Breitung	
	Level	First Difference	Level	First Difference	Level	First Difference
LNLIP	51.9840 *** (0.0142)		83.2521 (0.0000)		2.67580 (0.9953)	-1.29919** (0.0969)
LGDPPC	110.1326 (0.9999)	99.1072*** (0.0000)	99.17620 (1.0000)	102.471*** (0.0000)	-0.73102 (0.2324)	-3.24156*** (0.0006)
LNPV	337.1246 (0.2446)	83.3916*** (0.0000)	82.8431*** (0.0116)	147.531 *** (0.0000)	1.493698 (0.9324)	-1.65680*** (0.0488)
LTRADE	772.0515*** (0.0001)		120.291*** (0.0000)		-1.26696 (0.1026)	-252473*** (0.0053)
RQM	434.7723*** (0.0000)		3213.262*** (0.0000)		-1.9920*** (0.0232)	
INF	924.377 *** (0.0000)		11460.63*** (0.0000)		-2.16302 *** (0.0153)	
LPD	660.6504*** (0.0016)		668.2066*** (0.0002)		-0.07931 (0.4684)	-2.52473*** (0.0058)
LEDU	445.7723 ** (0.0544)		38.3609*** (0.0203)		-2.55989 (0.0052)	
LRL	993.9665*** (0.0000)		29.6015 (0.5885)	188.699*** (0.0000)	3.77510 (0.9999)	-3.5575 ** (0.0998)

*Note: *, **and *** indicates test statistic is significant at the 10%, 5% and 1% level.*

Source: Authors' calculations.

Following the result of the unit root tests, we sought to determine the existence of cointegration relationship between the pair of the series using the Larsson *et al*. (2001) test for cointegration. From the results of individual cointegration test in Table 2 we see that we can reject the null of no cointegration and accept that there is one cointegration vector for all the cases, apart from four countries (Croatia, FYROM, Romania and Slovak Republic suggest no cointegration among their variables) and

also reject the null of only one cointegration vector for three out of the 16 cases (the Czech Republic, Latvia and Lithuania). The YLR statistic suggests that in the panel we have four cointegration vectors based on the fact that statistical values are higher than the 1.96 critical value of the normal distribution.

Table 2

Larsson *et al*. Test Results

Countries	***r=0***	***r=1***	***r=2***	***r=3***
Albania	55.519*	17.451	7.0859	0.630
Belarus	101.88*	24.108	6.2487	0.015
Bulgaria	55.217*	26.719	12.345	4.701
Croatia	49.608	19.140	6.3236	0.576
Czech Republic	97.438*	51.052*	16.640	5.277
Estonia	57.599*	25.484	12.298	2.923
Hungary	78.572*	28.667	8.6571	2.330
Latvia	100.16*	35.568*	11.189	0.775
Lithuania	74.461*	34.897*	14.054	1.009
FYROM	52.917*	21.511	3.6960	1.261
Moldova	54.252*	21.986	4.5670	0.224
Poland	59.571*	32.737	15.938	3.985
Romania	48.654	19.326	10.896	5.222
Slovak Republic	48.488	21.267	8.7430	3.398
Slovenia	71.865*	21.267	10.309	0.035
Ukraine	63.374*	31.451	8.9665	3.416
LR_{NT}	66.848	27.039	9.8723	2.236
$E(Z_K)$	27.769	14.955	6.086	1.137
$Var(Z_K)$	44.908	24.733	10.535	2.212
N	16	16	16	16
Critical values for the trace test at the 95% significance level	53.12	34.91	19.96	9.24
YLR	23.31	9.725	4.67	2.97

Source: Authors' calculations.

Next, we adopt the dynamic ordinary lest squares - DOLS. The results of DOLS are reported in Table 3. Because from the results of individual cointegration test we find the evidence of no cointegration in four countries (Croatia, FYROM, Romania and Slovak Republic), we do not report their individual DOLS-tests.

Although our preliminary model show that some of the variables (ratio of quasi-money, inflation and level of education) found to be insignificant, we will still keep them in the model, because, as we saw in section 3 many authors introduced these variables in their models and it makes logical and economic sense that these variables would have an effect on non-life insurance consumption.

Single-equation DOLS estimates are seen to display such cross-sectional variability that they are difficult to interpret. In DOLS regressions, the long-run effects - β are all positive, ranging from 0.15 (Albania) to 1.27 (Poland). From the results obtained from single-equation DOLS test, we can conclude that mostly in developing countries such as Poland, the Czech Republic, Slovenia, Hungary, and Lithuania there are strong long-run relationships among the selected variables.From the panel test estimates of long-run cointegrating vectors indicate a positive association between GDP per capita and non-life insurance consumption. GDP per capita has a positive impact on non-life insurance consumption during the period under investigation. 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. Positive impact of macroeconomic conditions on purchasing decisions of non-life insurance indicates that the good shape of the domestic economy in countries in CSEE 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, dynamically growing economy is associated with lower values of gross paid claims.

Table 3

Long-Run Coefficients of Non-Life Consumption **in Countries from Central and South-Eastern Europe**

Country	***β Coefficient for Single-equation DOLS***	***P-value***
Albania	0.15*	0.093
Belarus	0.23*	0.079
Bulgaria	0.51*	0.089
Czech Republic	1.21***	0.037
Estonia	0.78***	0.012
Hungary	0.98***	0.025
Latvia	.1.11***	0.049
Lithuania	1.02**	0.053
Moldova	0.25*	0.075
Poland	1.27***	0.027
Slovenia	1.16**	0.054
Ukraine	0.29*	0.093
Panel Results	**β panel long-run effect**	
LGDPPC	0.015	0.0311
LNPV	0.663	0.0000
LTRADE	0.172	0.0508
RQM	4.93E-06	0.9959
INF	-0.006	0.2251
LPD	0.272	0.0005
LRL	0.287	0.0086

Country	*β Coefficient for Single-equation DOLS*	*P-value*
Albania	0.15*	0.093
Belarus	0.23*	0.079
Bulgaria	0.51*	0.089
Czech Republic	1.21***	0.037
Estonia	0.78***	0.012
Hungary	0.98***	0.025
Latvia	.1.11***	0.049
Lithuania	1.02**	0.053
Moldova	0.25*	0.075
Poland	1.27***	0.027
Slovenia	1.16**	0.054
Ukraine	0.29*	0.093
LEDU	0.777	0.6347
$\overline{R}^2$	94	
Akaike information criterion	-1.110651	
F-statistic	39.365	0.0000
Jarque-Bera normality test	7.973	0.728

*Note: *,**and***indicates test statistic is significant at the 10%, 5% and 1% level.*

Source: Authors' calculations.

The number of passenger vehicles per 1,000 people and non-life insurance consumption in this study we used as a measure for risk-aversion. This variable is positively and statistically significant in our fourth model. This result means that the higher the level of vehicles, the greater the demand for insurance. This corresponds to the previous research of Esho *et al*. (2004), which confirm that risk aversion has a significant impact on non-life insurance demand.

Trade produces an expected positive sign, and is statistically significant. This suggests that that the more open countries accumulate more insurance assets.

The rule of law has also positive sign, and has statistically significant influence on non-life insurance consumption. The positive estimated coefficient on the rule of law is consistent with the idea that these variables provide individuals and firms with the right to own and sell assets, and protection against damage or devaluation of such assets by third parties. Knack and Keefer (1995) 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 and Danzon, 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 countries in CSEE, is also critically dependent upon the quality of the underlying legal and political system.

The population density was surprisingly overlooked in previous multi-country research efforts, because the results show the importance of larger clienteles, deeper risk pools and scale economies of non-life insurance demand. In this study, population density has positive sign and is statistically significant.

The coefficient of determination is high and explains 94% of the variance independent determinants. Value of the F-statistics indicates indicating that the model is well specified and can give reliable results. The model also passes the Jarque-Bera normality test, suggesting that the residuals are normally distributed.

6. Conclusions

This paper ascertains empirically the determinants of non-life insurance consumption in 16 countries in Central and South-Eastern Europe (CSEE) using time series data from 1992 to 2011 by applying Larsson *et al*. (2001) cointegration test and the dynamic ordinary least squares. After testing unit root of series, cointegration tests were applied. Larsson et al. (2001) cointegration test resulted in that there was a clear cointegration between series in the long run. The estimated long-run consumption applying dynamic ordinary least squares-DOLS, in the panel of 16 countries shows that there is long-run relationship between selected variables.

Consistent with previous research, we find that non-life insurance penetration increase with higher per-capita income and the number of passenger cars per 1,000 people, which have positively and significantly influence of non-life insurance consumption in 16 countries in the CSEE.

We also find that trade is significant, suggesting that more open countries accumulate more insurance assets. The impact of trade seems to be captured by the size of population, where are the results in our study show that these variable have positively and statistically significant influence of non-life insurance consumption reflecting the importance of external trade in small and open economies.

Also the results from other institutional factor underline the importance of rule of law in non-life insurance consumption. Therefore, it is worth noticing that protection and enforcement of property rights will facilitate the demand of non-life insurance policies. Although some of initial variables do not have statistically significant influence of non-life insurance consumption (ratio of quasi-money, level of education and inflation) we think that the ratio of quasi-money and the level of education and inflation in future research will have significant effect on non-life insurance demand. In our opinion, as bank assurance will continue growing in the CSEE and, more important, in the CSEE countries and occupy its share in the non-life insurance products, the positive effect in this relationship is expected. Although bank assurance is in its initial stage in CSEE countries, the tendency towards its growth is observed due to increase in consumers' crediting activity of the banks. Also, we think that the level of education will have a positive effect on the demand for non-life insurance. The reasoning for such statement is that elevating the education level of population would be useful to enhance the

understanding of financial products presented on the market and possible benefits from using them by potential consumers.

In this study, inflation appears to have negative influence on non-life insurance consumption. Therefore, macroeconomic stability plays an important role in the development of non-life insurance market. However, the relation between inflation with the demand proxies does not corroborate with earlier studies and does not affect significantly the non-life insurance penetration in the selected countries.

The results of this paper show that the Central and South-Eastern Europe countries are regarded to be a highly potential region with dynamic and fast-growing insurance markets. Taking into account the impact of insurance development on economic growth (Ward and Zurbruegg, 2000, Webb, Grace and Skipper, 2002, Arena, 2008) the increase in non-life insurance sector should be viewed as inevitable part of stable economic development. In the future research, when more data become available, it would be useful to consider a much bigger sample in terms of countries and periods, which would lead to a greater understanding and knowledge of 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. Economic Research Consortium, *Special Paper*, 15.

Arena, M., 2008. Does Insurance Market Activity Promote Economic Growth? A Cross-Country Study for Industrialized and Developing Countries. *Journal of Risk and Insurance*, 75(4), pp.921-946.

Asterou, D., 2005. *Applied Econometrics: A Modern Approach Using Eviews and Microfit*, London: Palgrave Macmillan

Baltagi, H.B., 2003. *Econometric Analysis of Panel Data*. New York: John Wiley&Sons Ltd.

Beck, T. and Webb, I., 2003. Determinants of Life Insurance Consumption across Countries. World Bank and International Insurance Foundation.

Beenstock, M. Dickinson, G. and Khajuria, S., 1986. The Determination of Life Premiums: An International Cross-Section Analysis 1970-1981. *Insurance: Mathematics and Economics*, 5, pp. 261-270.

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

Breitung, J., 2000. The Local Power of Some Unit Root Tests for Panel Data. In: B. Baltagi, ed., *Nonstationary Panels, Panel Cointegration, and Dynamic Panels. Advances in Econometrics*, 15, pp. 161-178.

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

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

Campbell, R.A., 1980. The Demand for Life Insurance: An Application of the Economics of Uncertainty. *Journal o f Finance*, 35, pp.1155-1172.

Chen, B., McCoskey, S. and Kao, C. 1999. Estimation and Inference of a Cointegrated Regression in Panel Data: A Monte Carlo Study, *American Journal of Mathematical and Management Sciences*, 19, pp.75-114.

Chui, A. and Kwok. C., 2008. National Culture and Life Insurance Consumption. *Journal of International Business Studies* 39: 88-101.

Chui, A. and Kwok. C., 2009. Cultural Practices and Life Insurance Consumption: An International Analysis using GLOBE Scores. *Journal of Multinational Financial Management* 19,pp. 273-290.

Cummins, D. J. and P.M. Danzon, 1997. Price, Financial Quality, and Capital Flows in Insurance Markets, *Journal of Financial Intermediation*, 6, pp. 3-38.

Engle, R.F. and Granger, C.W.T., 1987. Co–integration and error correction representation, estimation and testing. *Econometrica*, 55, pp. 215-276.

Feyen, E. Lester, R. and 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* 5572.

Fortune, P., 1973. A Theory of Optimal Life Insurance: Development and Tests. Journal of Finance, 28, pp. 587-600.

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

Hu, H. Su, M. and Lee, W., 2013. Insurance Activity and Economic Growth Nexus in 31 Regions of China: Bootstrap Panel Causality Test. *Romanian Journal of Economic Forecasting*, 16(3), pp. 182-198.

Im, K.S. M. H. Pesaran and Shin, Y., 2003. Testing for Unit Roots in Heterogeneous Panels. *Journal of Econometrics*, 115, pp. 53-74.

Jung, W.S., 1986. Financial development and economic growth: International evidence. Economic Development and Cultural Change, 34, pp. 333–346.

Juselius, K., 2003 *The Cointegrated VAR Model: Econometric Methodology and Macroeconomic Applications*.

Johansen, S., 1988 Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control*, 12, pp. 231–54.

Kejiriwal, M., and Perron P., 2008. The Limit Distribution Of The Estimates in Cointegrated Regression Models With Multiple Structural Changes. *Journal of Econometrics,* 146: 59-73.

Knack, S., & Keefer, P. 1995. Institutions and economic performance: cross- country tests using alternative institutional measures. *Economics and Politics*, 7(3), pp 207- 227.

Larsson, R, Lyhagen, J and Löthgren, M 2001. Likelihood-based Cointegration Tests in Heterogeneous Panels., *Econometrics Journal,* 4, pp. 109- 142.

Levin, A., Lin, C., and James, C. C., 2002. Unit Root Test in Panel Data: Asymptotic and Finite Sample Properties. *Journal of Econometrics* 108, pp. 1-24.

Li Donghui. et al., 2007. The Demand for Life Insurance in OECD. *The Journal of Risk and Insurance*, 74, pp.637 - 652.

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

Lester, R., 2002. Presentation: Insurance the WTO Challenge. NBFI Conference, Bangkok

Lewis, F.D., 1989. Dependents and the Demand for Life Insurance. *American Economic Review*, 79, pp. 452-466.

Lynch, M.S., 2003. Expanding the Model Capabilities: Dummy Variables, Interactions, and Nonlinear Transformations Available at: <http://www.princeton.edu?-slynch/expanding_ols.pdf>.

Lütkepohl, H. and Krätzig, M., 2004. *Applied time series econometrics*. Cambridge University Press.

Maddala, G.S. and Wu, S., 1999. A Comparative Study of Unit Root Tests with Panel Data and A New Simple Test. *Oxford Bulletin of Economics and Statistics*, 61, pp.631-52.

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

Ma Y. and Pope N., 2003. Determinants of International Insurers Participation in Foreign Non-Life Market. *Journal of Risk and Insurance, 2(2)*, pp.235-248.

Mohitosh, K. and Perron, P., 2008. The Limit Distribution Of The Estimates in Cointegrated Regression Models With Multiple Structural Changes. *Journal of Econometrics,* 146, pp. 59-73.

Nakata, H. and Sawada, Y., 2007. *The Demand for Non-Life Insurance: A Cross-Country Analysis*. University of Essex.

Outreville, J.F., 1990. The Economic Significance of Insurance Markets in Developing Countries. *Journal of Risk and Insurance*, 57, pp.487-498.

Outreville, J.F., 1996. Life Insurance Markets in Developing Countries. *Journal of Risk and Insurance*, 63.

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

Park, S. Lemaire, J. and 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, pp.S7-S27.

Schlesinger, H., 1981. The Optimal Level of Deductibility in Insurance Contracts. *Journal of Risk and Insurance*, 48, pp.465-481

Sherden, W., 1984. An Analysis of the Determinants of the Demand for Automobile Insurance. *Journal of Risk and Insurance*, 51, pp. 49-62.

Stock, J.H., and Mark, Watson K. 1993. A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems. *Econometrica* 61,pp 783-82.

Syverud, K.D. *et al*., 1994. On the Demand for Liability Insurance: Comments. *Texas Law Review*, 72, pp. 1629-1702.

Szpiro, G.G., 1985. Optimal Insurance Coverage. *Journal of Risk and Insurance*, 52, 88, pp.705-710.

Thomas, R.L., 1993. *Introductory Econometrics: Theory and Applications*. Second Edition. Harlow, Longman: London.

Verbeek, M., 2004. *A guide to modern econometrics*. John Wiley and Sons Ltd. Publishers.

Wagner M and Hlouskova J., 2006. The Performance of Panel Cointegration Methods: Results from a Large Scale Simulation Study, Wien: Institude of Advanced Studies.

Wagner, M. and Jaroslava, Hlouskova. 2010. "The performance of panel cointegration methods: Results from a large scale simulation study." *Econometric Reviews 29*(2), 182–223.

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

Webb, I. Grace, M.F. and Skipper, H., 2002. The effect of banking and insurance on the growth of capital and output. *Working Paper*, Georgia State University.