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The relation between insurance development and economic growth in Iran

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ABSTRACT

This paper empirically examines the existence of casual relation between insurance sector development and economic growth in Iran for the period 1960-2010. In this investigation we apply the Augmented Dickey-Fuller Unit Root test, the Johansen's Cointegration test and the Granger Causality Wald test based on Vector Autoregression (VAR) model. According to the obtained results, there is a unidirectional causality relation from insurance development to economic growth. Therefore, we conclude that insurance development is an important prerequisite for stimulating economic growth in Iran. These results confirm the supply-leading theory.

Introduction

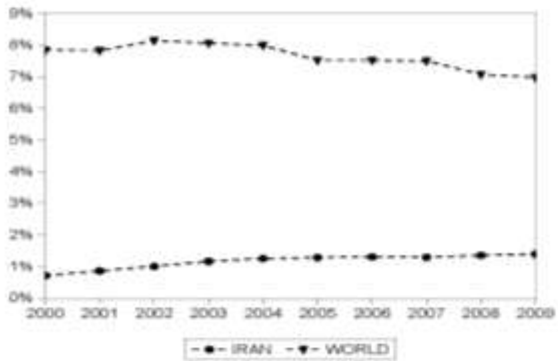
According to the finance-growth nexus theory financial development promotes economic growth through channels of marginal productivity of capital, efficiency of channeling saving to investment, saving rate and technological innovation (Levine, 1997). Affecting economic growth through the channels is realized by functions of financial intermediaries. The functions include the provision of means for clearing and settling payments to facilitate the exchange of goods, services and assets, the provision of a mechanism for pooling resources and the subdivision of shares in various enterprises, resource allocation, risk management, price information to help coordinate decentralized decision making in various sectors of the economy, and the means to deal with the incentive problems created when one party of a financial transaction has the information that the other party does not, or when one party acts as an agent of the other (Merton, & Bodie, 1995).

A numerous empirical studies confirm financial intermediation plays a growth-supporting role. Among financial intermediaries, in performing functions of financial system insurance companies play important role. They are main risk management tool for companies and individuals. Through issuing insurance policies they collect funds and transfer them to deficit economic units for financing real investment.

In analogy to other financial sectors, the link between the insurance and the real sector can be classified in terms of causality with respect to five possible hypotheses[1]: (1) no causal relation; (2) economic growth leads to a rise in demand for insurance (The demand-following theory); (3) growth in insurance smoothes short-term economic volatility and thus induces economic growth in the long run, plus growth in investment by insurance companies induces economic growth (The supply-leading theory); (4) negative causal link from insurance to growth (e.g. growing insurance causes more reckless behavior "moral hazard"), resulting in a less efficient and more volatile economy; (5) interdependence.

This paper attempts to examine the existence of casual relation between insurance development and economic growth in Iran, using time series data from 1960 to 2010. When we talk about insurance, insurance density is considered as one of the indices indicating the development of the insurance industry. Iran's insurance statistics show that real insurance density has been increased from 48 rials in 1960 to 970 rials in 2010 which indicates a 1921 percent growth. Another development index is insurance penetration (total insurance premiums in percentage of gross domestic product). This index has been increased from 0.22% in 1960 to 1.39% in 2010 (source: Iran's insurance market statistics in different years).

Figure 1: Insurance Penetration in Iran and world, 2000-2009



Source: Statistical Yearbook of the Iranian Insurance Industry, 2010.

The remainder of this paper is organized as follows. In section 2 we review the literature with regard to models on the insurance-growth nexus and on empirical studies. Section 3 discusses the data used in the empirical analysis and the econometric methodology. The results of the empirical research are given in section 4. The paper finishes with conclusions and suggestions that are outlined in section 5.

[1] Blum et al., 2002.

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Insurance-Growth Models and Empirical Evidence

In the following we summarize theoretical models that touch on the topic by investigating specific elements of the intermediation process, like focusing on the legal framework, or papers which can help to trace back performance figures to attributes of insurers that contribute to growth, such as efficiency measures. The review of some empirical analysis on the insurance-growth nexus provides information on sample coverage in time and space, methodology and variable usage and dependency.

Papers with a Theoretical Focus

Economic literatures show a strong relation between macro-economic activities (economic growth) and insurance sector.

Holsboer (1999) is concentrating on the recent changes in the external environment for insurance companies in Europe. He argues that the change of importance of insurance services in the economy is dependent on the growing amount of assets and the increasing competition between the financial sectors, but the author emphasis the prominent role in the services industry and denotes insurance sector development as a determinant for economic growth. Holsboer (1999) builds on a model based on Aaron (1966):

"Interest rate (r), growth of the working population (n), the economic growth rate (g); superior benefits of the pay-as-you-go pension system if r<n+g; superior benefits of the funded pension system if r>n+g; and both pension systems providing equal benefits if r=n+g".

As population aging and the move from a pay-as-you-go (PAYG) system to privately funded schemes favors the growth of the insurance industry and facilitates capital market development with increasing supply of long-term savings. Holsboer (1999) sees the interaction between the insurance and economic growth as bidirectional.

Catalan, Impavido, & Musalem (2000) explore the development of contractual savings and their effect on other financial intermediaries and markets. Due to the nature of contractual savings institutions these face a lower possibility of runs against their assets, but on the other hand they have to bear long-term liabilities in their model. These two factors enable them to seek long-term investments, so that the maturity of the assets can be balanced against the liabilities and an additional advantage on banks could be taken. As a second participant the policyholder (household) enters the system and his intention to keep his direct liquid assets on a specific level that this forces him to restore his liquidity position and to sell illiquid assets in favor of liquid, while maintaining his engagement for contractual savings. So contractual savings and the rigid liquidity level of the households drive the capital market development. Catalan et al. (2000) support the insurance-growth nexus by emphasizing the institution' intermediary function, either by direct channel usage (portfolio setup) or by using other channels, mainly capital market development, connected to the insurance nexus.

Ranade, & Ahuja (2001) analyse the development of the Indian insurance sector over time under the impact of softening regulatory constraints. In the initial setting, the Indian subcontinent's insurance sector was controlled by the state monopoly, hence competition was nonexistent and the price barrier thwarted access to insurance services for private households. Deregulation measures included the abolition of the insurance monopoly, promoting competition, and developing a regulatory framework defining statutes for financial supervision. The new regulatory framework was following the recommendations of Mckinnon (1973) and Show (1973) to increase savings, improve assets allocation and hence to promote growth. The authors try to validate the results of the transition by searching evidence for two estimations which are both part of Mckinnons and shaws theory: (1) an additional accessible financial service for the private households should increase asset allocation, and (2) enhanced competition on the insurance sector is facilitating efficiency. Examining a two-period model tests estimation 1 and the validation of estimation 2 is conducted by comparing the bankruptcy and insolvency characteristics of insurers and banks. In the short run, where no income or efficiency improvement have emerged yet, savings (asset allocation) decline and due to lesser credit constrains resource dissipation rises. Estimation 1 and 2 is negated and results may include implications for policymakers because the equations suggest that insurance bankruptcies cause more volatility, and funds intermediation and consumer welfare is lower than those of banks – according to their model.

The main purpose of the model by Das, Davies, & Podpiera (2003) is to identify contagious functions and properties of insurances. They further develop new financial soundness indicators for insurance companies by joining their experiences gained under the Financial Sector Assessment Program (FSAP) and from a review of recent failures in the sector. In their model, the insurances' role as a risk pass-through mechanism, the asset allocation and the insurers' ability to alter the behaviour of clients and the public contribute to economic growth. Das et al. (2003) argue that (1) financial deregulation and liberalization that allowed bank-type activities, (2) large macroeconomic fluctuations in output and price, and (3) close linkage between banks and insurers could be the main indicators for a possible insurance failure with repercussions to the economy at large.

Kong, & Singh (2005) focus on the asset allocation and management process of life insurers and their intention to match the assets against the company's liabilities. The authors suggest facilitating insurance companies' growth by providing more long-term investment possibilities, lessening regulatory constraints to help portfolio diversification and including the calculation of investment at risk into supervisory programs. They note that insurance companies are much more vulnerable to financial downturns because they have to face pressure on both the liability and the asset side of the balance sheet.

Linking of financial intermediaries' functions, and thereby functions of insurance companies too, and economic growth, was enabled by the development of endogenous growth theory. In order to show the channels through (which) financial development affects economic growth we follow Pagano (1993). According to the endogenous growth "AK" model economy produces a single good and aggregate output Y in period t is function of the aggregate capital stock K:

$$Y_t = AK_t \tag{1}$$

with A being marginal productivity of capital. The capital stock in the period t is:

$$K_t = I_{t-1} + (1-\delta)K_{t-1} \tag{2}$$

with I investment that is equal to non-consumed good that depreciate at the rate δ per period. The capital market equilibrium condition requires that gross saving equals gross investment. Since one part of saving $(1-\phi)$ is lost in the process of channeling of savings to investment, the funds available for investment are:

$$\phi S_{t-1} = I_{t-1} \tag{3}$$

The growth rate g at time t is:

$$g_t = (Y_t/Y_{t-1}) - 1 = (K_t/K_{t-1}) - 1 \tag{4}$$

Using equations (2) and (3) the steady state growth rate is:

$$g = A\frac{I}{Y} - \delta = As\phi - \delta \tag{5}$$

With s symbolizing saving rate (S/Y).

The model shows three channels from financial development to economic growth: the marginal productivity of capital (A), the proportion of saving funneled to investment (ϕ), and the savings rate (s).

The other view of the theory of endogenous growth, namely the Schumpeterian growth models, is focused on technological innovations as channel through which the growth could be affected. Therefore, we could add, to the above mentioned channels that connect financial intermediation to economic growth, another one, the rate of technological innovation. Since the insurance companies act as financial intermediaries, the same channels connect their functions with economic growth.

Empirical Studies

The studies of Beenstock, Dickinson, & Khajuria (1988), Outreville (1990 & 1996) and Browne, & Kim (1993) showed that there is a positive relation between received insurance premiums and gross domestic product (GDP), also income elasticity of demand is larger than one.

Ward, & Zurbruegg (2000) analyzed Granger causality between total real insurance premiums and real GDP for nine OECD[2] countries over the 1961 to 1996 period. For two countries (Canada, Japan) the authors found the insurance market leading GDP and for Italy they found a bidirectional relationship. The results for the other countries showed no connection. Webb, Grace & Skipper (2002) carried out another study with the aim of investigating the effects of insurance and banking sector on economic growth. They argued that both the insurance and the banking affect economic growth, furthermore results showed that a combination of one insurance type and banking has the strongest impact on growth.

Boon (2005) investigates the growth supportive role of commercial banks, stock markets and the insurance sector. The author's findings showed short and long run causality running from bank loans to GDP, and a bidirectional relationship between capital formation and loans. GDP growth seems to enhance stock market capitalization in the short run and the market capitalization enters significantly when determining the capital formation in the long run. Total insurance funds affect GDP growth in the long and capital formation in the short and the long run.

Haiss, & Sümegi (2006) applied a cross-country panel data analysis using annual insurance premium data from 29 European countries over the 1992 to 2004 period. According to the findings of these researchers, it was revealed that "life insurance" has more impact on the economic growth of European countries compared with other kinds of insurances.

Ćurak, Lončar, & Poposki (2009) empirically examined relationship between insurance sector development and economic growth in 10 transition European Union member countries, in the period from 1992 to 2007. They applied endogenous growth model and panel data estimation techniques. According to their findings, insurance sector development positively and significantly affects economic growth. The results are confirmed in terms of both life and non-life insurance, as well as, total insurance. In a paper with the title of "insurance development and economic growth" Han, Li, Moshirian & Tian (2010) showed that insurance development contributes to economic growth. They employed GMM models on a dynamic panel data set of 77 economies for the period 1994-2005. The positive relationship between insurance development and economic growth was more significant for non-life insurance than for life insurance. In next step, they divided the economies into two groups and compared the different roles of insurance in the developed and developing economies. The result indicated that insurance; including life insurance and non-life insurance business, play a much more important function in developing economies than they do in developed countries. Finally, they combined the results of Beck and Levine[3] with their own results and concluded that financial development containing stock markets, banks and insurance is significantly correlated with economic growth. Han et al. (2010) emphasized the supporting non-life insurances in order to economic growth of the developing countries [table 1 in appendix shows orderly the empirical studies of this section].

Azizi, & Pasban (1998) concentrated on the Iranian life Insurance market. They used the ordinary least squares (OLS) method in their model. The results of this study showed that there is a positive relation between insurance density and per capita GDP.

Another study was carried out by Jafari Samimi, & Kardgar (2008) in Iran for the period 1960-2005. In this study, the Unit Root test, the Cointegration test and the Causality test based on Error Correction Mechanism (ECM) and the first-order difference of VAR model were used in order to investigate the casual relation between the development of insurance various branches and economic growth in Iran. The results of this study revealed that there is a unidirectional causal relation from insurance development to economic growth while for property insurance this relation is not confirmed.

Shaygani, & Ahmadian (2010) investigated the effects of insurance development on the economic growth of 10 Middle East and North Africa (MENA) member countries including Iran. They applied a fixed-effects panel model and concluded that insurance development has positive effect on economic growth of MENA countries so that with increase in the insurance premium by 1%, the economic growth increases by 0.05%.

Data and Methodology

Data Description

In this paper, we use time series dataset over the period of 1960-2010 to evaluate the relationship between insurance development and economic growth in Iran. In our analysis the variables are transformed through the use of natural logarithm to ease interpretation of the coefficients. Our key variables are defined as follows:

Insurance Development (LINS): To measure insurance development, we use the insurance density, measured by real annual premium payments divided by population.

[2] Organization for Economic Cooperation and Development

[3] Beck, & Levine, 2004.

Since the nominal insurance premium is available[4], Consumer Price Index (CPI) has been used in order to eliminate the inflation effects.

Economic Growth (LGDP): We use the logarithm of real annual GDP[5] per capita to measure economic growth in Iran [Table 2 presents the descriptive statistics for all the variables used in the regressions].

Empirical Methodology

The econometric approach of this paper is based on the vector autoregressive (VAR) model. The chosen methodology is justified by the nature of the analysis performed in this study. Granger (1969) developed a test to check the causality between variables. Granger causality examines to what extent a change from past values of a variable affect the subsequent changes of the other variable. We can say that there is Granger causality between two variables X_t and Y_t if a forecast Y_t taken from a set of information that includes the past variability of X_t is better than a forecast that ignores the past variability X_t, with the assumption that other variables stay unchanged.

The Granger causality test involves estimating the following pair of regressions:

$$Y_t = \sum_{i=1}^{n} \alpha_i X_{t-i} + \sum_{j=1}^{n} \beta_j Y_{t-j} + \varepsilon_{1t} \quad (6)$$

$$X_t = \sum_{i=1}^{n} \lambda_i X_{t-i} + \sum_{j=1}^{n} \delta_j Y_{t-j} + \varepsilon_{2t} \quad (7)$$

With the assumption that the disturbances ε_{1t} and ε_{2t} are uncorrelated.

We distinguish four cases:

1- Unidirectional causality from X_t to Y_t is indicated if the estimated coefficients on the lagged X_t in (6) are statistically different from zero as a group $\left(\sum_{i=1}^{n} \alpha_i \neq 0\right)$ and the set of estimated coefficients on the lagged Y_t in (7) is not statistically different from zero $\left(\sum_{j=1}^{n} \delta_j = 0\right)$.

2- Unidirectional causality from Y_t to X_t is indicated if the estimated coefficients on the lagged Y_t in (7) are statistically different from zero as a group $\left(\sum_{j=1}^{n} \delta_j \neq 0\right)$ and the set of estimated coefficients on the lagged X_t in (6) is not statistically different from zero $\left(\sum_{i=1}^{n} \alpha_i = 0\right)$.

3- Feedback (bilateral Causality) is indicated when the set of X_t and Y_t coefficients are statistically different from zero in both regression equations (6) and (7).

4- Independence – occurs when the set of X_t and Y_t coefficients are not statistically significant in both regression equations (6) and (7).

In all four cases it is assumed that the two variables X_t and Y_t are stationary. In a stochastic process stationarity means that statistical characteristics of the process do not change in time. As Granger & Newbold (1974) and Cheng (1996) point out, Granger causality on non-stationary time data may lead to spurious casual relation. The stationarity of a non-stable time series can be obtained with the help of certain mathematic procedure, such as differentiation of variables (Gujarati, 2004).

First step of our analysis is to examine the stationarity of the variables. If all the variables are stationary I(0), then there is no problem to estimate the coefficients using the variables with initial specification. However, most of the main macroeconomic variables are non-stationary, integrated of order higher than zero. If the series are non-stationary but co-integrated, then the estimation as an autocorrected model is admissible. If the variables are non-stationary and are not co-integrated then the specification of variables as differences is necessary.

Most commonly used tests for the integration order of variables are Dickey-Fuller (DF) test, Augmented Dickey-Fuller test (ADF, 1979), Philips-Peron test (PP, 1988) and Kwiatkowski test (KPSS, 1992).

Next step is choosing the optimal lag length is based on synthesis results of several methods such as Akaike Information Criterion (AIC), Schwartz Bayesian information Criterion (SBC), Hannan-Quinn information criterion (HQ), Final Prediction Error (FPE) and Likelihood Ratio test (LR). As Enders (1995) suggested, the optimal lag is selected based on the lowest values of AIC, SBC, HQ criteria, and rejecting the null hypothesis in LR test that parameter values at lag k are equal to zero.

In the next stage of analysis, we examine the co-integration and causal relation between the variables of the model that all of these are presented in Section 4.

Empirical Results

In this section of the paper we outline and discuss the empirical results of our study.

Unit Root Test

Due to some practical and theoretical reasons, the Dickey-Fuller (DF) test is used for regressions which are in the following forms:

$$\Delta Y_t = \delta Y_{t-1} + u_t \quad (8)$$

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + u_t \quad (9)$$

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + u_t \quad (10)$$

where Δ is the difference operator, t is the time variable or trend and $\delta = (\rho - 1)$. In all of the above mentioned regressions, the null hypothesis is: δ =0, this means that Y has a unit root $(\rho = 1)$. Equation (8) differs from other two regressions in the intercept and trend term.

In the case that error term (u_t) is autocorrelative, equation (10) is adjusted as follows:

[4] The statistics related to insurance extracted in different years from the reports of "The Evolutions of Business Insurance in Iran from the start point to 1992", the publications of insurance researches office, and "Statistical Yearbook of the Iranian Insurance Industry".

[5] Source: http://www.cbi.ir

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t \qquad (11)$$

When the DF test is applied on models like equation (11), the test is called the Augmented Dickey-Fuller (ADF) test. Since the ADF test statistic like the DF test has an asymptotic distribution, thus the same critical values can be used for both tests (Gujarati, 2004).

According to the obtained results, there is no evidence for stationarity of the time series. In the sequel, we accept that all two variables are I(1).

Optimal Lag Length Determination

The next step is the lag length determination of ECM/VAR models in levels for the full period. Table 5, which presents all of the criteria for lag length determination in VAR models, shows that most of these criteria (AIC, SBC and HQ) suggest that the optimal lag length is 2.

Johansen Cointegration Test

Since all variables (LGDP and LINS) are integrated of order one, $I(1)$, we can apply co-integration test as a pre-test in order to avoid spurious regressions (Gujarati, 2004). Thus, in this paper we use the Johansen (1991, 1995) cointegration test. In the Johansen method, the number of non-zero eigenvalues is determined through two statistics: a) the Trace test and b) the Maximum Eigenvalue test. In a bivariate system like the system that we study, the maximum number of cointegrating vectors is one. So the null hypothesis implies that there is no cointegrating vector while the alternative hypothesis says that there is one cointegrating vector. In this test, the cointegrating equations are assumed to have an intercept, but not a trend; and the number of lagged first differences in the VAR was two.

The results are presented in tables 6 and 7. According to these results, there is no cointegrating vector between LGDP and LINS variables at the 5% level.

Causality Test Based on First-Order Difference of VAR Model

As investigated, LGDP and LINS series are not cointegrated. When both series are determined I(1) but not cointegrated, the proper model is VAR in terms of the first differences. Therefore, we can specify a VAR-model in first differences and test for Granger causality in changes of the variables (Granger, 1986). First, we determine the optimal lag length of VAR in first differences. Table 8, which presents the criteria of the AIC, SBC and HQ for lag length determination in VAR model, shows that the criteria give one lag.

Then we estimate a VAR-model assuming one lag of the differences (The results are reported in Table 9).

According to Sims, Stock, & Wilson (1990), if the time series are non-stationary and not co-integrated, then the obtained F-statistics for Granger causality test are not valid. Therefore, in order to avoid spurious results, we apply the Wald statistic that has an asymptotic χ^2 distribution. Finally, we investigated causality between our variables using the Granger causality Wald test. Table 10 gives the Granger Causality Wald Test Statistics for the entire time series (1960-2010). According to the obtained results, Insurance Development (LINS) is Granger-causing Economic Growth (GDP), while there is no causal relation from economic growth towards insurance development.

Conclusions and Suggestions

Insurance as an investor institute which obliges to compensate losses can have significant impacts on macro-economic activities and economic growth. The National wealth protect is one of these impacts. Both individuals and companies can guarantee of their property and installations through payment of a regular insurance premium are transferred to insurance companies. Another economic impact of insurance is investments guarantee. Regarding the fact that creating new investment opportunities leads to the economic growth and development of every country, the security of these capitals plays a significant role in continuing this growth as investors will act to new investments only if they make sure that no danger threats their capital. In this condition, the insurance market can affect the risk management.

Another economic impact of insurance is the investment growth and development. In general, all insurance companies receive their insurance premium beforehand; these premiums create a huge value of capitals which could be invested in various economic sections and can increase the investment level within the country.

The aim of this article was to analyze the causality between insurance development and economic growth in Iran for the period 1960 to 2010. In order to achieve this aim, at first we carried out unit root tests on the data to examine for non-stationarity in the time series using the augmented Dickey-Fuller test. There was no evidence for stationarity of the time series. In the sequel, we assumed that all two variables are I(1). Then, we applied the Johansen Cointegration test and we found that the variables are not cointegrated at the 5% level. Therefore, in order to determine causality direction, we used the Granger causality Wald test based on a VAR model. The empirical results of this study showed that within the surveyed period, the fluctuations of insurance market had significant effect on the economic changes of Iran. Thus, it was confirmed that there is a causal relation from insurance development to economic growth in Iran.

In spite of the considerable role of insurance in the growth and development of Iran, this industry unfortunately encounters different problems and it has not reached to its deserved place. In this context, we can point to the following problems:

- Information poverty about insurance value
- The most important factor in developing of the insurance market is its competitive advantage, but in our country, this market is faced with a governmental view. Therefore, we will see a slow growth in the insurance market; and the saved financial resources, due to received premiums, will not be considerable unless this market is granted to private section.
- At present time, insurance dose not cover many of sectors and investments, in addition the insurance itself is not able to create saving through received premiums for investment on the market.
- Lack of full equipments in accounting and computing methods is another defect which should be reviewed.
- Not sufficient understanding of the real dimensions of the risk. This defect causes insurers to consider fixed rates which are not proportional with the real dimensions of the risk (with respect to the risk frequency and intensity).
- In the sectors of energy, transportation and mine & industry, the insurance has not got its real place and we can clearly sense the necessity of the insurance coverage in these sectors.

Some of the ways that can lead to the development of this industry and therefore economic growth will include:

- The development of the insurance culture through promoting the awareness of people about the guarantee and security aspects of the insurance.

- Increasing the diversity of insurance coverage and decreasing the government responsibility for compensating losses.
- The development of the risk security domain in macro-economic sectors and recognizing the real dimensions of the risk.
- The development and improvement of computing and accounting methods and benefiting from the best and most effective software.
- The optimum utilization of the technical reserves (the accumulated funds due to received premiums).
- Granting the insurance industry to the private sector in line with executing the ACT 44 of the constitutional law.

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Table 1: Empirical Studies on the Insurance-Growth-Nexus

Author	Year	Sample Coverage: Region	Sample Coverage: Time	Dependent Variable	Explanatory Variable	Other Variables	Methodology
Beenstock, Dickinson, Khajuria	1988	12 countries	1970-1981	Property/ Liability Insurance Premiums	income, interest rate, GNP	unemployment	OLS on pooled time series & cross-sectional data
Outreville	1990	55 developing countries	1983 & 1984	Property/ Liability Insurance Premiums	GDP,M2/GDP, M1/M2, price of insurance	monopolism, agricultural labour force, education	OLS on cross-sectional data
Browne & Kim	1993	45 countries	1980 &1987	Life Insurance per capita	dependency, Muslim country, national income, social security expenses per capita, expected inflation rate, education, avg. life expectancy, price (only 1987)		OLS on cross-sectional data
Outreville	1996	48 developing countries	1986	Gross Life Insurance Premiums	GDP, interest rate, life expectancy, inflation, financial development, market structure variables	rural population, education level, health, Muslim population, & other country indicators	OLS on cross-sectional data
Ward & Zurbruegg	2000	9 OECD countries	1961-1996	Total real premiums, real GDP	real GDP, total real premiums	population, savings	bivariate VAR for Granger causality
Webb, Grace & Skipper	2002	55 countries, incl. 17 EU countries	1980-1996	GDP & GDI per capita	Bank Credit, Life & Property/ Liability Insurance Premiums in % of GDP	primary education	OLS on panel data and cross-country for bi-directional model
Boon	2005	Singapore	1991-2002	real GDP, real gross fixed capital formation	total insurance funds, stock market capitalization as % of nom. GDP, loans to nom. GDP		Vector error correction model on time series
Haiss & Sümegi	2006	29 EU countries	1992-2004	real GDP per employee	Physical capital stock, Human capital stock, interest rate, Inflation rate, gross premium income		OLS on panel data with cross-country and time-fixed effects
Ćurak, Lončar & Poposki	2009	10 transition EU countries	1992-2007	Economic growth (GDP growth)	Life insurance, Non-life insurance, insurance total, private credit, stock capitalization, GDP per capita, investment, education, openness, inflation		OLS & 2SLS on fixed-effects panel model
Han, Li, Moshirian & Tian	2010	77 countries	1994-2005	Real per capita GDP growth	initial income per capita, gross enrolment ratio of tertiary students, inflation rate, trade balance, gross fixed assets investment, insurance premium density		Two-step GMM model on a dynamic panel data

Table 2: Descriptive statistics

	LGDP	LINS
Mean	8.393833	5.200106
Median	8.419380	5.220356
Maximum	8.880274	6.982863
Minimum	7.642449	3.637586
Std. Dev.	0.313199	0.956923
Skewness	-0.721793	0.207066
Kurtosis	2.889342	2.160372
Jarque-Bera	4.454391	1.862523
Probability	0.107830	0.394056
Sum	428.0855	265.2054
Sum Sq. Dev.	4.904673	45.78510
Observations	51	51

Source: all estimations are calculated with Eviews 6.

Table 3: Augmented Dickey-Fuller Test Statistics (in levels)

Variable	ADF test statistic	Critical values			p-value
		The 1% level	The 5% level	The 10% level	
LGDP	-2.165801	-4.156734	-3.504330	-3.181826	0.4973
LINS	-2.268317	-4.161144	-3.506374	-3.183002	0.4424

Notes:
1. Both the intercept and trend were included in this test.
2. p-values are not significant at conventional levels ($p \le 0.10$ or less).

Table 4: Augmented Dickey-Fuller Test Statistics (in first differences)

Variable	ADF test statistic	Critical values			p-value
		The 1% level	The 5% level	The 10% level	
LGDP	-4.134830	-3.571310	-2.922449	-2.599224	0.0020
LINS	-4.547131	-3.571310	-2.922449	-2.599224	0.0006

Note:
1. The intercept was included in this test.
2. p-values are statistically significant at $p \le 0.01$.

Table 5: Lag Length determination of VAR-model in levels

Lag	LogL	LR	FPE	AIC	SBC	HQ
0	-26.68446	NA	0.011619	1.220615	1.299345	1.250242
1	82.62095	204.6569	0.000132	-3.260466	-3.024277	-3.171586
2	93.48500	19.41660*	9.84e-05*	-3.552553*	-3.158905*	-3.404421*
3	96.67484	5.429514	0.000102	-3.518078	-2.966971	-3.310693
4	97.19920	0.847894	0.000119	-3.370179	-2.661611	-3.103540

Note: *indicates the optimal lag selection

Table 6: Johansen's Cointegration Rank Test (Trace)

H_0	H_1	Eigenvalue	Trace Statistic	0.05 Critical Value	p-value
$r = 0$	$r = 1$	0.236170	13.23820	15.49471	0.1000*
$r \le 1$	$r = 2$	0.006366	0.306527	3.841466	0.5798

Notes:
1. Trace test indicates no cointegration at the 0.05 level.
2. p-values marked * are statistically significant at $p \le 0.10$ (2-tail).

Table 7: Johansen's Cointegration Rank Test (Maximum Eigenvalue)

H_0	H_1	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	p-value
$r = 0$	$r = 1$	0.236170	12.93167	14.26460	0.0803*
$r \le 1$	$r = 2$	0.006366	0.306527	3.841466	0.5798

Notes:
1. Max-eigenvalue test indicates no cointegration at the 0.05 level.
2. p-values marked * are statistically significant at $p \le 0.10$ (2-tail).

Table 8: Lag Length determination of VAR-model in first differences

Lag	LogL	LR	FPE	AIC	SBC	HQ
0	75.54610	NA	0.000140	-3.197657	-3.118150	-3.167873
1	86.00598	19.55542*	0.000106*	-3.478521*	-3.240002*	-3.389170*
2	87.46214	2.595767	0.000118	-3.367919	-2.970388	-3.219002
3	88.58562	1.905024	0.000135	-3.242853	-2.686310	-3.034369
4	90.63790	3.301501	0.000147	-3.158170	-2.442614	-2.890118

Note: *indicates the optimal lag selection

Table 9: Results of Estimated VAR Model

	D(LGDP)	D(LINS)
D(LGDP(-1))	0.201357 (0.14868) [1.35429]	0.191962 (0.44551) [0.43088]
D(LINS(-1))	0.169956 (0.05677) [2.99358]	0.344821 (0.17012) [2.02696]
C	0.006657 (0.00913) [0.72952]	0.039253 (0.02734) [1.43557]
R-squared	0.349675	0.154882
Adj. R-squared	0.321400	0.118137
F-statistic	12.36691	4.215125

Note: Standard errors in ( ) & t-statistics in [ ].

Table 10: Granger Causality Wald Test Statistics

Test	Test statistic (χ^2)	df	p-value
$\Delta(LINS) \Rightarrow \Delta(LGDP)$	8.961549	1	0.0028*
$\Delta(LGDP) \Rightarrow \Delta(LINS)$	0.185659	1	0.6666

Note: Wald test statistic marked * is statistically significant at $p \leq 0.01$.