Does Insurance Promote Economic Growth? Evidence from the UK

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Abstract

The first conference of UNCTAD in 1964 acknowledged the development of national insurance and reinsurance markets as essential aspects of economic growth. Yet, evidence from cointegration analysis by Ward and Zurbruegg (2000) showed there was no long run relationship between growth in the insurance industry and economic growth for some OECD countries, including the UK and the US, by using the *total* value of written insurance premia. However, it is surprising that an industry which in the case of the UK is the largest in Europe, and the third largest in the world, had no effect on the economic activity. As Granger (1990) claimed, it is possible to have cointegration at the aggregate level and not at the disaggregate level and vice versa. We use the components of insurance premia to find a long run relationship between development in insurance market size and economic growth for most components by using Johansen's λ_{Trace} and $\lambda_{\max}$ cointegration tests. This evidence implies there is a possibility that Ward and Zurbruegg*'s* results were affected by the aggregation problem. In addition, because cointegration analysis does not provide information about possible patterns (Demand-following and Supply-leading), we used causality tests. Results show for most cases, we have a long run relationship between insurance market size and economic growth rather than a cyclical effect.

Keywords: Insurance, risk sharing, economic growth, aggregation problem

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1. Introduction

The importance of insurance in economic activities has been recognized for many years. The impact of insurance on economy even was mentioned in the first conference of UNCTAD in 1964 where acknowledged "a sound national insurance and reinsurance market is an essential characteristic of economic growth."[1]

It seems Insurance not only facilitates economic transactions through risk transfer and indemnification but is also seen to promote financial intermediation (Ward and Zurbruegg, 2000). More specifically, insurance can have effects such as promote financial stability, mobilize savings, facilitate trade and commerce, enable risk to be managed more efficiently, encourage loss mitigation, foster efficient capital allocation and also can be a substitute for and complement government security programs (Skipper, 2001).

In view of importance of insurance in the economic literature, one might have expected several researches on relationship between insurance market size, which is the most accepted measure for insurance activities and defined as gross direct premia written (Skipper, 1998), and economic growth. But based on author's knowledge, almost there has been nothing done except few studies which focused on this relationship by considering property-liability insurance premia (for example Beenstock, Dickinson and Khajuria (1988) and Outreville(1990)) or total insurance premia (Ward and Zurbruegg, 2000) as insurance activities indicator.

Beenstock *et al* and Outreville studies by considering property-liability premia ignored other parts of insurance industry (such as long term

[1]Proceeding of the United Nations Conference on Trade and Development, first act and report, p.55, Vol. I, annex A.IV.23

insurance). On the other hand, Ward and Zurbruegg use aggregate variable of total insurance premia in their study. Although Ward and Zurbruegg acknowledged Brown and Kim(1993) suggestion that total premia fail to account for different market forces in various countries and make comparisons difficult and fail for account for regulatory effects on pricing, but availability of data for longer period was stated as a reason for using total premia. In addition authors claimed:

> If one views the key economic benefits of insurance as risk transfer, indemnification and financial intermediation, then the benefits of risk transfer and indemnification are likely to be the major characteristics of non-life and health insurance, while financial intermediation is a part of life insurance. Thus an aggregate approach will embrace all of these ideas within the same analysis.

Although this interpretation seems correct and logical, but some studies which have been done in the economic literature about aggregation problem, showed it may causes unreliable results. An example of aggregation is cross-sectional aggregation which occurs when a number of micro variables are aggregated to get a macro variable (Maddala and Kim, 1998). Granger (1990) showed it is possible to have cointegration at the aggregate level and not at the disaggregate level and vice versa. If it is true, one might be expected Ward and Zurbruegg *'s* finding about no long run relationship between economic growth and insurance market size in some countries such as Austria, Switzerland, the United Kingdom and the United States arose because of using aggregated data.

The objective of this study is evaluating long run relationship between insurance market size and economic growth for the United Kingdom by using disaggregated data. An important feature which distinguishes my analysis from Ward and Zurbruegg *'s* study is my measure of market size.

We use net written premia for each market in insurance industry in the UK as the market size for that market (the reason for using net instead of gross written premia is that the former is available for longer period). Disaggregated data for Long-Term insurance includes yearly and single premia (including life insurance, annuities, individual pensions and other pensions) and for General Business insurance, includes Motor, Accident and health, liability, property, pecuniary loss, reinsurance and MAT (Marin, Aviation and Transport).

In addition, causality relationship will be tested. By disaggregating total insurance premia, we will try to find whether the results of Ward and Zurbruegg study about no relationship between insurance market size and economic growth for the United Kingdom will be changed. Using Granger and Lin's (1995) approach to find strength of causality is another feature of this paper related to Ward and Zurbruegg *'s* study. Section 2 provides a literature review. In Section 3, we describe the variables which are used in the estimation and then review some facts about the UK insurance markets. In Section 4, we provide the estimation framework. We test variables for existence of unit root. After that, the nature of the long run relationship between growth in GDP and insurance market size will be estimated. Then, we test whether development in insurance market size causes GDP and vice versa. Finally, in Table 6, we offer concluding remarks.

2. Literature review

Beenstock, Dickinson and Khajuria(1988) in the first part of their paper, tried to obtain a demand function for property-liability insurance. They assumed an individual in two-period model with insurable assets (value G) and wealth (W). If a loss occurs and no insurance has been purchased, it causes a reduction in wealth by the amount of value of insurable assets. If insurance has been purchased and no loss occurs, the initial wealth is reduced by the premium paid and if loss takes place, wealth is reduced by the amount of value of insurable assets minus the sum insured. By considering these assumptions, some equations arranged and they concluded demand for insurance was a function of income, probability of a loss occurring (accident), return on wealth (interest rate) and relative price of insurance. The supply of insurance assumed as a function of probability of a loss occurring (accident), return on wealth (interest rate) and relative price of insurance. Premia determined by interaction of demand and supply as a function of income, accident and interest rates.

Then an equation for premia including a first order dynamic adjustment was estimated by using pooled-data method for 12 largest property-liability insurance markets2 for period 1970-1981. Based on the results, higher interest rates tended to raise premia. The short run marginal propensity to insure varied from 0.0059 for Japan to 0.0314 for the United States and the United Kingdom. The long run marginal propensity to insure varied from 0.0132 to 0.0701. Calculations showed marginal propensity to insure was grater than average propensity to insure. In the second part, data for 45 countries (included countries which have been mentioned above) was used to estimate a non-linear equation. Premia considered as a function on income and square of income. Another equation between logarithm of premia and logarithm of income was estimated. Results showed MPI was not constant and rose with income per capita.

The relationship between property-liability insurance premia written and economic and financial development was evaluated with a cross-section of 55 developing countries by Outreville (1990). A positive relationship between logarithm of property-liability premia per capita and GDP per capita was founded. Based on results, One percent increase in GDP causes more than one percent increase in demand for insurance. In the next step, a positive relationship between insurance development (defined as insurance penetration or ratio of Insurance premia to GDP) and financial development (ratio of M2 to GDP) was reported by using OLS method.

[2] Countries included: The United States, The United Kingdom, West Germany, Japan, France, Canada, Italy, Australia, Netherlands, Sweden, Switzerland and Belgium.

Finally, demand for property-liability insurance premia per capita considered as a function of GDP per capita, financial development and price of insurance (defined as inverse of the loss ratio). He reported that the income elasticity was grater than one and a positive relationship between demand for insurance and financial development, but the coefficient for price was not statistically significant.

To consider differences in institutional environment and financial structures between countries, an alternative measure for financial development (M1/M2) is tested in the model. A negative relation ship between this measure of financial development and demand for insurance was estimated which again confirmed a positive relationship between these variables. In the end, he concluded financial development is an important factor for insurance demand. Furthermore, by assuming a supply-leading causality (which means the expansion of the financial system, precedes the demand for its services) for developing countries, he suggested more attention to supply forces in insurance markets.

Browne and Kim (1993) considered some factors which may affect demand for life insurance for countries around the world. They studied previous research which had been done about this aspect and provided a list of these factors included: life expectancy, national income, dependency ratio, the portion of the young adult population pursuing third-level education, religion, social security payments by the government, expected rate of inflation and policy loading charge or the price of insurance. Before estimating the model, a schedule was provided by the author's for their expectations about sign of each factor on the demand for life insurance. Income, dependency ratio and education were expected a positive while life expectancy, religion, inflation and price of insurance considered with a negative effect. The sign of social security payments was ambiguous. For each factor's sign expectation, an explanation was provided. For example, about the sign of life expectancy they stated:

> Average life expectancy is the number of years the average individual in a country is expected to live. This is used as a proxy for the probability of death. Because the probability of death is hypothesized to be positively related to the amount of life insurance consumed, average life expectancy is hypothesized to be negatively related to life insurance consumption.

Three versions of a log linear equation were estimated. Premia were used in the first version whereas life insurance in force were used in the second and third versions. For the first and second models data for year 1987 and for the third model data for 1980 were considered. Base on the results, the income, inflation, dependency ratio were statistically significant and had the expected sign in all versions. Education and religion also had the expected sign, but significant in some versions. Social security (with a positive sign) and price were statistically significant in the models which they had been appeared. Life expectancy was not significant in any of the models.

Potential relationship between growth in insurance industry and economic growth was examined by Ward and Zurbruegg(2000) for OECD countries. Real Gross National Product and total written premia were considered as measures for economic and insurance activity, respectively. This study tried to answer issues which had not been considered in Outreville's study, such as whether financial development was supply-leading or demand following, to cover developed countries and remove problems arises by using cross-section data, which did not accommodate the potential for causal relationships to differ in size and direction across countries. Philips-perron unit root test showed real premia and real GDP were non-stationary in levels but stationary in their first difference. Based on Johansen cointegration trace test, there was no cointegrative relationship for Austria, Switzerland, the UK and the US. For Australia, Canada, France, Italy and Japan the null hypothesis of no cointegration relationship was rejected. Causality test from vector autoregressions in level showed real premia did cause real GDP for Canada, Italy and Japan, while real GDP was Granger cause for real premia just for Italy. However, this relationship was weak for Italy and significant at 90 percent confidence interval. Results for causality test from the error-correction models were not so different from results where have been mentioned above. Finally, it was concluded that the causal relationships between economic growth and insurance market development may vary across countries.

3. Description of the data

It is worth to consider definitions about different types of insurance. Here We use the definitions which have been provided by Association of British Insurers website[3]. Long-term Insurance includes life insurances and pension plans, that can last for many years. General Insurance covers insurance of (non-life) risks where the policy offers cover for a limited period, usually one year. Motor policies cover the legal liabilities arising from the use of a motor vehicle. Private car, motorcycle, commercial vehicles and fleets are all included within this category. Comprehensive policies also cover damage to the vehicle. Accident and Health covers - including two main types of business - personal accident and medical expenses. Personal accident policies will pay a lump sum or weekly benefits in the event of accidental death or a specified injury e.g. loss of arm. Medical expenses insurance will pay the costs of treatment for acute conditions. Liability insurance covers legal responsibility for causing loss to someone else by injuring them or damaging their property. Property policies cover specified property that may be damaged or destroyed by events or perils such as fire, storm or theft. Pecuniary Loss relates to financial losses that may have occurred, e.g. Consequential Loss and Mortgage Indemnity policies. Reinsurance is the cover insurance companies can purchase to protect themselves against large losses or an unexpected aggregation of losses. Marine, Aviation & Transport (MAT) covers damage to both the hull and cargo of ships or aeroplanes, along with the liability for property damage, injury and death to passengers and others. Indemnities are also provided for the goods that may be lost or damaged whilst in transit.

[3] The address of website is: http://www.abi.org.uk

The data for insurance premia come from Association of British Insurers (ABI) publications. These data are available on an annual basis and cover period 1971 to 2003 for general insurance (for reinsurance and MAT it covers 1971 to 1997). For Long-Term insurance premia, they extend to 2003 and start back in 1966. Data for GDP comes from Economic and Social Data Service (ESDS) and World Bank data set.

4. The UK insurance industry facts

Here We mention some information for the UK insurance industry which has been published by Association of British Insurers. In 2003, the UK insurance industry was the largest in Europe and the third largest in the world, accounting for 8.4% of total worldwide premium income. Both the UK life and general insurance markets are the largest in the Europe. Penetration rate (Premia as a percentage of GDP) is the highest in the Europe and second in the world. About 348,000 people were working directly and indirectly among 772 insurance companies in the UK which is a third of all financial services jobs. Almost 568 of these companies were active in general insurance, 159 are permitted for long term insurance and 45 have authorization to do both. The largest ten motor and long term insurers handle 82% and 72% of the business, respectively. Total net premia on general insurance were 30 billion pounds while total premia for long term insurance were about 90 billion pounds. It accounts for 17% of investment in the stock market. General insurance investment amounted to £106.5 billion, while long term investments were £1032.5 billion. The pay out was almost £222 million per working day in pension and life insurance and £74 million per working day in general insurance. Figures show percentage of households who bought some kind of insurance were varied from 1% for income protection to 78% for home contents. Percentages for motor, life insurance, mortgage protection, personal pension and medical insurance were 71%, 50%, 20%, 15% and 10%, respectively. Meanwhile, personal protection with £2379 and home contents with £149 had highest and lowest average annual expenditure, respectively. This amount for motor and life insurance was £605 and £828. Each day in 2003, pensioners and long term savers were paid £139 million by insurance companies which are comparable with the UK government paid £126 million in state pension provision. The UK insurance exports (premia minus claims) amount to just under £6.4 billion. It is about a third of total UK food, beverage and tobacco exports and almost a half of the value of UK oil exports.

5. Estimation Framework

The importance of the stationary variable has been well recognized in the field of estimate an econometric model. To estimate an econometrics model, it is important to know whether data generating process (DGP) of 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 be cause problem of spurious regression (Verbeek, 2004). In this case, two independent variable are spuriously related which causes unreliable t and F tests. To avoid the problem which may arise because of existence of non stationary variables, one might have to identify the order of integration of variables. There is some evidence which shows most of the economic variables are non stationary. For example Nelson and Plosser (1982) investigated whether macroeconomic time series are better characterized as stationary fluctuations around a deterministic trend or as non-stationary processes that have no tendency to return to a deterministic path. Using long historical time series for the U.S., they claimed that they were unable to reject the hypothesis that these series are non-stationary stochastic processes with no tendency to return to a trend line.

In the first step, We check order of the variables by using unit root tests. Although several methods have been proposed by considering different assumptions, but there is no uniformly powerful test for unit root. Nevertheless, it seems there are three approaches more popular than the rest. The first approach was provided by Dickey and Fuller (1979) which has been developed by Said and Dickey (1984). The second was presented by Philips and Perron (1988) which sometimes is known as nonparametric method. The last one is Elliot, Rothenberg and Stock's (1996) approach. They proposed a modified version of Dickey-Fuller test which is known as DF-GLS test in the econometric literature. In the following paragraphs, We will consider assumptions of each approach and their advantage and disadvantages.

Dickey and Fuller (1979) Considered a first order autoregressive model with an independent and identically distributed errors term with mean zero and variance σ^2. In the model $y_t = \rho y_{t-1} + \varepsilon_t$, If $|\rho| \prec 1$, the y_t is stationary, otherwise it is non stationary. By assuming non stationary as the null hypothesis, they drove representations for the limiting distribution of $\hat{\rho}$ and $\hat{\tau}$. By using representations, tables of the percentage points for statistics were provided by fuller (1976). After the distributions had been generalized to models with intercept and trend, the tables were provided in Dickey and Fuller (1981). Said and Dickey (1984) extend Dickey and Fuller unit root test by using an autoregressive model from order ρ. They allowed some heterogeneity and serial correlations in errors. They showed using least squares to estimate coefficients in their autoregression model produces statistics whose limit distribution and percentiles had been tabulated for DF tests. In addition, They claimed that it is possible to approximate an

ARIMA(p,1,d) by an autoregression whose order is a function of the number of observations.

Phillips and Perron (1984) proposed a non parametric approach with respect to nuisance parameters and thereby allowed for a very wide class of time series models in which there is a unit root. Their model seems to have significant advantage when there are moving average components in the time series. They replaced standard errors of regression which measures scale effects in the conventional t ratios by the general standard errors estimates which had allowed for serial covariance as well as variance. By using this method, they allowed for some heterogeneity and serial correlations in errors. Each statistic also involved an additive correction term shows magnitude had depended on the difference between the corresponding variance estimates. It was mentioned that the limit distribution of the test statistics are the same as those had been tabulated by Fuller (1976).

A family of tests whose asymptotic power function were tangent to the power envelop a one point and were never far below the envelop, were proposed by Elliot, Rothenberg and Stock (1996). They showed that in the series with no deterministic component, some different tests (such as Dickey-Fuller and Phillips-Perron tests) were asymptotically equivalent to members of the family which have been mentioned above. But in the presence of an unknown mean or linear trend, these tests were found to be dominated by members of the family of point-optimal invariant tests. So, they proposed a modified version of Dickey-Fuller test by considering a regression which had been performed with locally detrended variables for y_t. They claimed the test had substantially improved power when an unknown mean or trend was present.

It has been shown by several studies that Phillips-Perron non parametric test has serious size distortion in finite samples when the data generating process has a predominance of negative autocorrelation in first difference. On the other hand, if moving average components important in the structure of the series, the Said and Dickey approach may have substantially lower power (Maddala and Kim, 1996). Monte Carlo studies do not show a clear ranking of the two tests regarding their power (probability to reject the null if it is false) in finite samples (Verbeek, 2004).

In the second step, we test for cointegration. When linear combination of some integrated of order one variables is integrated of order zero, these variables are cointegrated. The most important application on cointegration in economic estimations is that it shows there is a long run relationship between variables which are cointegrated.

The cointegration test which has been proposed by Johansen(1988) is the most popular test. He presented the likelihood methods for the analysis of cointegration in VAR models without constant and trend. He tried to answer three questions in his article: To find the number of cointegrating relations in non stationary data, estimating these relations and testing economic hupothesis. He claimed the advantage of his approach was the inference could be based entirely on the eigen values. The extended test which includes trends, has been provided by Johansen (1992) and Perron and Campbell (1993).

Nine tests for cointegration were considered by Haug(1996) includes single equation based tests and system based test to compare their power and size distortions. By using Monte Carlo method, he concluded Stock and Watson's test had fairly high and stable power across all cases which had been considered. On the other hand, Engle-Granger and Johansen's test had the least size distortions. In this article, We will use Johansen's cointegration test.

Finally, cointegration analysis does not provide information about two possible patterns which were identified by Patrick (1966) in the causal relationship between financial development and economic growth. In demand-following pattern, growth in GDP causes an increase in demand for financial services. In supply-leading pattern, expansion of financial services causes an increase in demand for its services. In demand following pattern, increasing in demand causes an increase in price of insurance. On the other hand, supply leading pattern causes an increase in supply following by decreasing in price of insurance. If we had data for price of insurance, we would conclude whether expanding in insurance activities cause price increasing or decreasing which could help us to understand which of above patterns was applicable.

Unfortunately no completely satisfactory national measure for price of insurance exist (Skipper, 1998), so we will try to evaluate pattern by using causality test. Because cointegration test is used to find evidence for long-Run relationship and Granger's causality test is concerned with short-Run relationship, we consider both of these different concepts in an error correction model (Maddala and Kim, 1998). In addition, failure to include the error correction term when modelling cointegrated I(1) processes will result in models which are miss-specified in which case causality testing can lead to erroneous conclusions. We will use Demetriades and Hussein (1996) and Arestis and Demetriades (1997) approach for causality test. In their method, Traditional Granger's equations are re-parameterised to achieve an error correction (ECM) model as follows:

$$\Delta x_{1t} = \mu_1 + \gamma_{11}(L)\Delta x_{1t-1} + \gamma_{12}(L)\Delta x_{2t-1} + (\Pi_{11}(1) - 1)x_{1t-1} + \Pi_{12}(1)x_{2t-1} + \varepsilon_{1t} \qquad (1)$$

$$\Delta x_{2t} = \mu_2 + \gamma_{21}(L)\Delta x_{1t-1} + \gamma_{22}(L)\Delta x_{2t-1} + \Pi_{21}(1)x_{1t-1} + (\Pi_{22}(1) - 1)x_{2t-1} + \varepsilon_{2t} \qquad (2)$$

Which can be written as:

$$\Delta X_t = \mu + \Gamma(L)\Delta X_{t-1} + P_0 X_{t-1} + \varepsilon_t \qquad (3)$$

When variables are integrated of order one, but there exist a linear combination which is stationary, P_0 equals $\alpha\beta$ (Matrix of error correction terms and cointegarting vectors, respectively).

$$\Delta X_t = \mu + \Gamma(L)\Delta X_{t-1} + \alpha(\beta X_{t-1}) + \varepsilon_t \qquad (4)$$

Based on the equation above, there are two sources of causal relationship between variables, either through lagged dynamic terms (Short-Run), or through the lagged cointegrating vector (Long-Run). In addition, joint significance of both short-run and long-run can be tested. The second and third tests are known as weak exogeneity and strong exogeneity, respectively (Charemza and Deadman, 1997). In each case, null hypothesis of no-causal relationship can be tested by using exclusion tests.

We also calculate strength of causality by using Granger and Lin (1995) approach. With some little differences, their error correction model is similar to Demetriades and Hussein (1996). Granger and Lin proposed strength of causality from the second to the first variable by considering the below definition:

$$M_{2\to 1} = \ln\left(1 + \frac{\alpha_1^2(1-\rho^2)}{(\alpha_1\rho - \alpha_2)^2}\right) \qquad (5)$$

Where α_1 and α_2 are coefficients of lagged cointegrating vector model and ρ is the correlation coefficient between the two innovations of the error correction model. $M_{2\to 1}$ measures the long-run predictive content of the second series with respect to the first one (Neusser and Kugler, 1998).

5. Empirical results

We investigated the hypothesis of non stationary data by using three tests which have been mentioned in previous section. For the level of variables, number of lags determined by using Ng and Perron (1995) suggestion , Ng and Perron's MIC criterion (2001) and Newey and West (1994) for augmented Dickey-Fuller, DF-GLS and Phillips and Perron unit root test, respectively. Ng and Perron (1995) analyzed the choice of the lag for augmented Dickey-Fuller test in a general autoregressive moving average model. They concluded some information-based rules such as Akaike information criteria (AIC) and Schwartz, do not focus on lower-bound condition on t and tend to select truncation lag that are too small for some parameter values. They suggested Hall's (1994) general to specific modelling strategy which starts with a most general model with $k$max lags and tests whether of the coefficients of the last lags are significant and repeat the procedure until a rejection occurs or the sequential testing leads to the boundary zero, is preferable to other methods.

We take up Ng and Perron (2001) suggestion for the optimal lag lengths in DF-GLS test by considering a class of Modified Information Criteria (MIC) with a penalty factor that is sample dependent. They argued that when there are errors with a moving-average root close to -1, a high order augmented autoregression is necessary for unit root tests to have good size, but information criteria such as AIC and BIC tend to select a small truncation lag. Their method takes into account the fact that the bias in the sum of the autoregressive coefiicients is highly dependent on k and adapts to the type of deterministic components present. Based on Monte Carlo experiments, they found that MIC yield huge size improvements to the DF-GLS test. To test the unit root test on the first difference of variables, We used additional criteria, such as AIC and Schwarz criterion (SC) for ADF and DF-GLS tests, respectively.

In the computation of the Phillips-Perron test, We used Newey and Kenneth (1994) method for determining the truncation lag. They mentioned their method and Andrews and Andrews-Monahan (1992) method were similar to each other. Both of them select a data-dependent bandwidth for a given kernel and sample so as to satisfy an asymptotic mean squared error criterion. But they claimed their method was preferred to Andrews-Monahan method in three ways. Firstly, they showed how to select the bandwidth optimally when the form of autocorrelation was unknown. Secondly, by performing Monte Carlo studies, they concluded their method was complementary to Andrews-Monahan. Finally, in their opinion it is more convenient computationally.

The results for unit root tests are reported in tables 1 and 2. The null hypothesis of unit root test on the level of variables can not be rejected in almost all cases. The only exception is liability insurance. In this case, ADF and DF-GLS tests show we can reject null hypothesis of unit root at the 5%, but another test (PP) imply that we can not reject it. Evidence in table 2 which shows tests for unit root test on the first difference of variables, suggests that variables are best characterized as being integrated of order one. This table shows in all cases all three tests imply that we can reject null hypothesis of unit root test. Only exception is reinsurance premia which is stationary based on PP test and non stationary based on ADF and DF-GLS tests.

By considering that all of the variables are best characterized as being integrated of order one, We evaluated the long run relationship between components of insurance premia and GDP. For this reason, We used Johansen's procedure to find whether there exists a cointegration vector.

Although Johansen and Juselius (1990) argued that the maximum eigenvalue test may be better than trace test, we used both tests. Table 3 reports the cointegration test results for each insurance market and GDP. Based on the trace test results, we can see evidence in rejection of no long run relationship and in favour of cointegration at 1% level for most of the cases. Eigenvalue test results imply this relationship significant at 1%, 5% and 10% for four, two and one cases, respectively. Results for this test imply there is no cointegration between property and MAT insurance and GDP.

In Table 4, we report two F-tests and one t- test relating to the exclusion of relevant variables from ECM for the null hypothesis of no causal relationship for short-run, long-run and joint significance of both short-run and long-run. The results show there is evidence in favour of long run (weak exogeneity) causal relationship from real GDP to just three components of insurance. Finally, there is evidence for strong exogeneity (joint significance of short run and long run) for motor, pecuniary loss and reinsurance premia.

In order to summarise the results, we report in Table 5 the test results from the cointegration and causality test for each case. Again, there is evidence in favour of long run causality from growth in insurance market size to growth in GDP for eight out of nine (the exception is pecuniary loss insurance). Short run causality exists from life (both yearly and single premia), liability and pecuniary loss insurance. Also, strong exogeneity exist for all components of insurance, with exception to liability and MAT insurance.

Although results indicate a bi-directional causal relationship in the long run between GDP and insurance market size for three cases, however Granger and Lin's measure shows strength of causality from GDP to components of insurance in these cases is more powerful.

6. Summary and Conclusion

In the first conference of UNCTAD in 1964 acknowledged national insurance and reinsurance market is an essential characteristic of economic growth. In addition, almost in all text books which have been written about insurance, we can see author suggested insurance has a positive effect on economy through risk transfer and indemnification and also promote financial intermediation. Nevertheless, except a few papers which have considered relationship between some parts of insurance industry and economic growth, nothing has been done to evaluate this claim empirically.

Potential relationship between growth in insurance industry and economic growth was examined by Ward and Zurbruegg (2000) for OECD countries. Based on the results, cointegration analysis showed there was no long-run relationship between growth in insurance industry and economic growth for some OECD countries, including the UK. They used total written insurance premia as insurance activities in their paper. However, it is strange to say that an industry in the UK which is the largest in Europe and the third largest in the world, had no effect on the economy. Granger (1990) showed it is possible to have cointegration at the aggregate level and not at the disaggregate level and vice versa. So it might be possible Ward and Zurbruegg *'s* results were affected by this fact that they used an aggregate variable in their estimations. To avoid problems of aggregation, We used component of insurance premia such as long-term, motor, property and etc.

The results are somewhat surprising, because we find a long run relationship between development in insurance market size and economic growth for all components by using Johansen's λ_{Trace} and $\lambda_{\max}$ cointegration tests. For most of variables, this relationship has been confirmed at least at 5% level of significance. This evidence implies there is a possibility that Ward and

Zurbruegg *'s* results were affected by the aggregation problem. In addition, because cointegration analysis does not provide information about possible patterns (Demand-following and Supply-leading), we used causality tests. Results show for most cases, we have a long run (weak exogeneity) relationship between insurance market size development and economic growth rather than a cyclical effect. There is evidence of strong exogeneity from insurance market size to economic growth for seven out of nine markets, while this is true just for three cases for GDP growth to insurance market size. Also it is noticeable that GDP growth only causes in pecuniary loss insurance market size in the short run, but growth in 4 out of 9 markets in insurance causes economic growth in the short run. The author's analysis does not permit to make a conclusion about these results and also about why when there is a bilateral long run relationship, causality from GDP growth to insurance market size development is more powerful than the causality from the other side. One reason might be that the structure of the UK's insurance industry is demand following rather than supply leading for these markets. Other markets follow a supply-leading pattern

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Table 1- Unit Root Test on levels

Variable	Period	ADF	DF-GLS	PP
Logarithm of real GDP	1966-2003	-3.169(1)	-2.132(2)	-2.338
Logarithm of life insurance-Yearly premia	1966-2003	-3.185(5)	-2.073(1)	-1.573
Logarithm of life insurance-Single premia	1966-2003	-3.036(2)	-1.746(1)	-2.671
Logarithm motor insurance premia	1971-2003	-2.298(5)	-1.73 (2)	-2.3
Logarithm of accident and health insurance premia	1971-2003	-1.058(0)	-0.76(1)	-1.02
Logarithm of property insurance premia	1971-2003	-1.639 (1)	-0.84(2)	-1.29
Logarithm of liability insurance premia	1971-2003	-3.727**(1)	-3.45**(1)	-2.47
Logarithm of Pecuniary loss insurance premia	1971-2003	-1.623(0)	-2.84(1)	-1.79
Logarithm of reinsurance premia	1971-1997	-0.5601(3)	-0.467(1)	0.069
Logarithm of Marine-Aviation-Transport premia	1971-1997	-3.213(0)	-1.409(2)	-3.173

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

The order of the autoregressive polynomial is in parenthesis. Lag length selection as suggested by Ng and Perron (1995), Ng and Perron's MIC criterion (2001) and Newey and West (1994) for augmented Dickey-Fuller, ADF-GLS and Phillips and Perron unit root test, respectively.

All regressions include a constant and linear time trend.

Table 2- Unit Root Test on differences

Variable	Period	ADF		DF-GLS		PP
		Ng perron	AIC	MIC	SC	
Logarithm of real GDP	1966-2003	-4.662***(1)	-4.386***(1)	-3.800***(1)	-3.800***(1)	-4.113***
Logarithm of life insurance-Yearly premia	1966-2003	-3.881***(0)	-1.72(4)	-1.243(4)	-1.828*(1)	-4.035***
Logarithm of life insurance-Single premia	1966-2003	-6.77***(1)	-6.36***(0)	-3.555***(1)	-3.555***(1)	-6.786***
Logarithm motor insurance premia	1971-2003	-4.66***(1)	-3.832***(1)	-0.939(6)	-2.644**(1)	-3.294**
Logarithm of accident and health insurance premia	1971-2003	-5.58***(0)	-3.858***(1)	-1.465(3)	-2.278**(1)	-5.587***
Logarithm of property insurance premia	1971-2003	-4.372***(1)	-3.648**(1)	-0.73(6)	-2.917***(1)	-3.4893**
Logarithm of liability insurance premia	1971-2003	-4.351***(5)	-4.351***(5)	-1.162(7)	-3.065***(1)	-3.343**
Logarithm of Pecuniary loss insurance premia	1971-2003	-4.554***(0)	-4.153***(0)	-2.279**(1)	-2.279**(1)	-4.574***
Logarithm of reinsurance premia	1971-1997	-1.073(2)	-1.443(3)	-1.219(2)	-1.219(2)	-4.718***
Logarithm of Marine-Aviation-Transport premia	1971-1997	-5.596*** (1)	-5.038***(1)	-2.579**(2)	-4.811***(1)	-7.875***

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

The order of the autoregressive polynomial is in parenthesis. Lag length selection as suggested by Ng and Perron (1995), Ng and Perron's MIC criterion (2001) and Newey and West (1994) for augmented Dickey-Fuller, ADF-GLS and Phillips and Perron unit root test, respectively.

Table 3 - Cointegration tests

Variable	Johansen λ_{Trace}	Johansen $\lambda_{\max}$
	$H_0 : r = 0$	$H_0 : r = 0$
Logarithm of life insurance-Yearly premia	25.15***(2)	20.23***
Logarithm of life insurance-Single premia	28.66***(5)	18.75***
Logarithm motor insurance premia	25.43***(2)	19.23***
Logarithm of accident and health insurance premia	16.30**(2)	13.36*
Logarithm of property insurance premia	14.78*(2)	11.59
Logarithm of liability insurance premia	31.02***(5)	24.40***
Logarithm of Pecuniary loss insurance premia	26.11***(5)	17.68**
Logarithm of reinsurance premia	22.80***(2)	17.82**
Logarithm of Marine-Aviation-Transport premia	16.92**(2)	11.95

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

The order of the autoregressive polynomial is in parenthesis. Lag length selection as suggested by Ng and Perron (1995).

Critical values are taken from Osterwald-Lenum (1992). All regressions include a constant and linear time trend.

Table 4 – Causality test

Variable	GDP does not cause insurance premium			Insurance premium does not cause GDP		
	Short-Run $\gamma_{12}(L)=0$ $F(k,n)$	Long-Run $\alpha_1=0$ $t(n)$	Both $\gamma_{12}(L)=\alpha_1=0$ $F(k+1,n)$	Short-Run $\gamma_{21}(L)=0$ $F(k,n)$	Long-Run $\alpha_2=0$ $t(n)$	Both $\gamma_{12}(L)=\alpha_2=0$ $F(k+1,n)$
Logarithm of life insurance-Yearly premiums	2.48	1.46 1.23	1.77	5.52***	3.1*** 0.2	6.17***
Logarithm of life insurance-Single premiums	0.7	0.84 0.19	1.49	2.87**	2.72** 0.58	4.21***
Logarithm motor insurance premiums	1.32	1.03 0.93	2.56*	1.47	2.04* 0.1	3.52**
Logarithm of accident and health insurance premiums	0.31	1.2 2.04	1.98	1.82	4*** 0.04	6.82***
Logarithm of property insurance premiums	0.23	1.92 1.32	1.36	0.32	2.66** 0.07	2.65**
Logarithm of liability insurance premiums	0.35	2.29** 0.13	1.43	2.42*	2.59** 0.004	2.03
Logarithm of Pecuniary loss insurance premiums	3.74**	4.65*** 0.75	5.16***	4.42**	0.42 0.0002	3.96**
Logarithm of reinsurance premiums	1.92	2.23** 0.87	3.43**	2.1	2.96*** 0.03	5.14**
Logarithm of Marine-Aviation-Transport premiums	0.28	0.85 2.44	0.24	0.67	2.16** 0.003	1.63

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

The order of VAR and sample periods as indicated in table three. The values on the first lines are F and t statistic. The values on the second line for long-run columns are strength of causality (Granger and Lin, 1995).

Table 5 – Summary of results

Variable	Cointegration	GDP causes insurance premium			Insurance premium causes GDP		
		Short run	Long run	Both	Short run	Long run	Both
Logarithm of life insurance-Yearly premia	Yes	No	No	No	Yes	Yes	Yes
Logarithm of life insurance-Single premia	Yes	No	No	No	Yes	Yes	Yes
Logarithm motor insurance premia	Yes	No	No	Yes	No	Yes	Yes
Logarithm of accident and health insurance premia	Yes	No	No	No	No	Yes	Yes
Logarithm of property insurance premia	Yes	No	No	No	No	Yes	Yes
Logarithm of liability insurance premia	Yes	No	Yes	No	Yes	Yes	No
Logarithm of Pecuniary loss insurance premia	Yes	Yes	Yes	Yes	Yes	No	Yes
Logarithm of reinsurance premia	Yes	No	Yes	Yes	No	Yes	Yes
Logarithm of Marine-Aviation-Transport premia	Yes	No	No	No	No	Yes	No