

An Empirical Analysis of the Relationship between China Insurance Development and Economic Growth

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Abstract: The quarterly data of 2006-2013 premium income and GDP is used in the paper, using the ADF test and cointegration test and Granger causality test on the relationship between the development of insurance and economic growth in China by empirical analysis and test of the two. The results show that in the sample interval, China insurance development is the Granger cause of economic growth, while promoting economic growth on the development of insurance is not obvious.

Keywords: Insurance; GDP; ADF test; Co-integration test; Granger causality test

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1. Introduction

In recent years, China's insurance industry has experienced rapid hitherto unknown development, the rapid growth of insurance assets strengthen the insurance industry and its function and position dramatically. In this new situation, in-depth study of the relationship between China's insurance developments with economic growth is of theoretical and practical significance to find the original motive force of promoting the development of insurance and coordinate the relationship between the development of insurance and economic growth. Hongbin Hu [1] regardless of long term or short term, GDP has Granger causality on the insurance growth. This was verified that Economic growth in the main investment by changing the insurance market and the impact of consumer demand for development of insurance hypothesis. However, the insurance development in the long term does not have the Granger causality on economic growth, in the short is weak. So it does not support the insurance development causes economic growth point. Shutang Gao [2] makes experience empirical analysis on Gansu province insurance development and economic growth, draw the following conclusions: in the sample interval, Gansu insurance development is the Granger cause of economic growth, and promote economic growth in Gansu on the development of insurance is not obvious. Liren Xie [3] starts from the Cobb Douglas production function, establishes economic growth model, and uses relevant data in China on the relationship between insurance consumption and economic growth in the empirical analysis, found that the property insurance market consumption for the economic growth has a negative effect; personal insurance market consumption has a

positive role in promoting economic growth. Liangang Zhang [4] makes the empirical analysis shows that Chengdu City insurance growth (LNINS) is economic growth (LNGDP) reasons, but the Chengdu City economic growth has no significant effect on the growth of insurance. This conclusion is not the same as most of the research literature; this is also the significance of this thesis. In order to further develop the insurance growth to promote economic growth, Chengdu City, the insurance industry can strengthen the innovation of insurance, insurance business expansion and increase market management main body and other measures to stimulate the vitality of the insurance market. Feng Sun [5] studies the mechanism of coordination between economic growth and insurance premium income, using time series data from 1985 to 2009. With proper unit root test the data were classified in to stationary trend process, and by availing of the VAR mode, the paper analyzed the long-term correlation between the economic growth and the development of the insurance industry in China. Finally, the paper put forward suggestions on how to contribute to economic development by the insurance industry under a new economic situation.

In order to elaborate the interaction between the China's insurance market development and economic growth, based on the theoretical analysis, using quarterly data China insurance development of 2006-2013 China economic growth, using time series analysis method, empirical test of the relationship between China's insurance development and economic growth, the results show that China's Insurance Development is the Granger cause of economic growth, and promote the economic growth on the development of insurance is not obvious.

2. Variable Selection and Data Processing

2.1. Granger Causality Test

Co-integration test shows that there is a long-term equilibrium relationship between variables. But causal relationship needs further examination. If the variable X helps predict Y, according to regression of the value of Y plus the value of X can significantly enhance the capacity of the interpretation of the regression, X is the Granger cause of Y. Otherwise X is not the Granger cause of Y. The test model is:

$$y_t = C + \sum_p \alpha_i y_{t-i} + \sum_q \beta_i x_{t-i} + \varepsilon_{it} \tag{1}$$

The null hypothesis: X is not the Granger cause of Y. $H_0 : \beta_1 = \beta_2 = \dots = \beta_q = 0$. If the null hypothesis is established, there are: $y_t = C + \sum_p \alpha_i y_{t-i} + \varepsilon_{it}$

The sum of squared residuals the equation (1) is SSE1, the sum of squared residuals the equation (1) is SSE0. Then $F = \frac{(SSE_1 - SSE_0) / q}{SSE_0 / (T - q - p - 1)}$ conform to F distribution of degree of freedom of (q, T - p - q - 1). T means sample size. The p and q respectively y and x lag order. The lag order can be determined by Akaike information criterion (AIC). Compare the size of F statistic and the critical value can be inspection result. If F is greater than the critical value would reject null hypothesis H0: x is the Granger cause of y. If F is less than the critical value cannot reject null hypothesis that means x is not the Granger cause of y.

2.2. Variable Selection

We use the quarterly data of Chinese insurance company's premium income as the approximate measurement index of the development level of insurance market and each quarter real GDP data to measure the degree of economic development. Analysis uses P represent the premium income.

2.3. Data Collection and Processing

Analysis of time series based on the actual value of the variable analysis may have big deviation, in order to make the data to better performance of the macroeconomic situation, we need to make corresponding processing on the data before the data analysis. In order to eliminate the influence of seasonal fluctuation, quarterly data adjustment need first to the annual premium income collected 2006-2013 P and GDP, are not affected by seasonal factors, premium and GDP; then the premium income respectively for P and GDP take the natural logarithm of GDP by LP and LGDP, to reduce the impact of data fluctuation and while eliminating heteroscedasticity data, finally get the premium and gross domestic product to change trend (See Figure 1 and Figure 2).

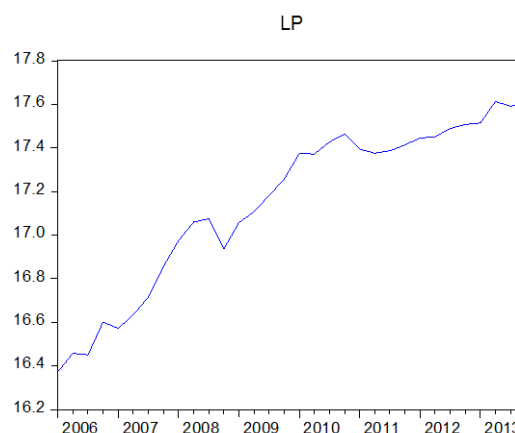


Figure 1. Premium trend graph

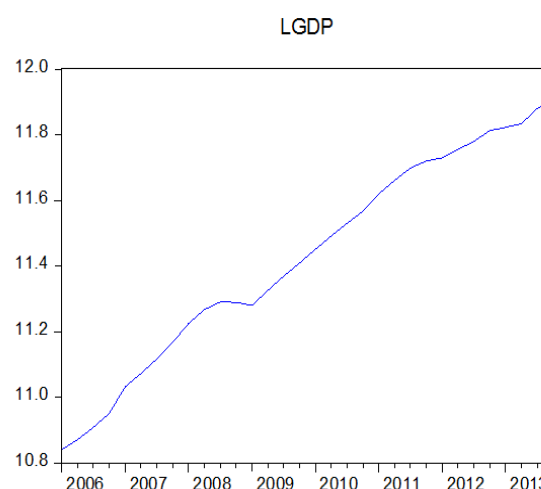


Figure 2. GDP trend graph

From Figure 1 and Figure 2 show the premium and GDP showed an upward trend, there is correlation, but the correlation is in long-term or short-term, not simply by a Meta regression judgment. Because if there is unit root, which is not stable, directly do regression will failure. Need to use co-integration test of correlation.

3. The Empirical Analysis of Insurance Development and Economic Growth

3.1. Conception of Unit Root Test

Unit root test refers to the test of the unit root test sequence's existence, because of the presence of a unit root is non-stationary time series. The unit root refers to a unit root process, we can prove that, a sequence with unit root process is not smooth and it will make the existence of spurious regression in regression analysis.

3.2. The Necessity and Inspection Process of Unit Root Test

In real life, there are only a few economic indicators of time series are stationary, but more and more evidence shows that, most of the time sequence involved in economic analysis is non-stationary, non-stationary time series often make spurious regression. This is because the relationship defined by

traditional significant test of between variables does not exist in fact. Therefore, stationary test is very necessary. In this paper, we use test method of ADF unit test for stationary of LGDP and LP to avoid the spurious regression, the results are as follows table 1.

Table 1 Stationary test sequence

Variable	Inspection form (C,T,K)	ADF Test value	5% Critical value	Differential variable	Inspection form (C,T,K)	ADF Test value	5% Critical value
LGDP	(C,T,1)	-2.362512	-3.568379	ΔLGDP	(C,T,0)	-3.707259	-3.568379
LGDP	(C,0,1)	-1.818182	-2.963972	ΔLGDP	(C,0,0)	-3.301815	-2.963972
LGDP	(0,0,1)	2.775080	-1.952473	ΔLGDP	(0,0,0)	-1.411163	-1.352473
LP	(C,T,0)	-1.595671	-3.562882	ΔLP	(C,T,0)	-5.883728	-3.568379
LP	(C,0,0)	-2.085131	-2.960411	ΔLP	(C,0,0)	-5.528407	-2.963972
LP	(0,0,0)	3.478702	-1.952473	ΔLP	(0,0,0)	-4.245130	-1.952473

Note: the test form (C, T, K) denote the unit root test equation includes constant, time trend and lag order, adding lagged term is to enable the residuals are white noise, Δrepresents difference operator, lag order is determined by the AIC principle.

ADF test results showed that LP and LGDP were markedly unstable, there is an existence of unit root, but does not show that they are unit root process, it also needs further ADF test to LP and LGDP's difference to prove that ΔLGDP, as an example, three types of equations is constructed as follows:

$$\Delta LGDP_t = \beta \sum_{i=1}^p \Delta LGDP_{t-i} + \mu_t \tag{2}$$

$$\Delta LGDP_t = u + \beta \sum_{i=1}^p \Delta LGDP_{t-i} + \mu_t \tag{3}$$

$$\Delta LGDP_t = u + at + \beta \sum_{i=1}^p \Delta LGDP_{t-i} + \mu_t \tag{4}$$

Test results show that, differential variables of LP and LGDP are both pass the ADF test, rejecting the null hypothesis that sequence are non-smooth. It states that LP and LGDP are stationary after logarithmic difference, both are unit root process, that is $LGDP \sim I(1)$, $LP \sim I(1)$. Because the two variables are of the same order, maybe there is a long-term equilibrium relationship between them, needs further co-integration test to avoid spurious regression.

3.3. Co-integration Test

We can use EG two step methods to test whether there is a co-integration relationship between the two time variables which have a unit root properties. The basic idea is to first establish regression model between

dependent variable and dependent variable, then use OLS to estimate the co-integrating vector of parameters, then make the stationary test of regression residual error, if do not exist unit root, reject co-integration null hypothesis, there is a co-integration relationship between two variables.

3.4. Co-integration Regression

Co-integration estimation is made on the sequence; construct a regression model between LP and LGDP. It takes LGDP as the explained variable, LP as the explanatory variables and using OLS method to assist the co-integration regression. Results are as follows:

$$LGDP = -2.611256 + 0.818632LP \tag{5}$$

$$R^2 = 0.938 \quad F = 454.4875 \quad DW = 0.418893$$

From the regression results, the coefficient of determination R2 is up to 93.8%, shows that the model fitting on the whole well and significant at the 0.01 significance level, in addition to parameter estimation, F statistic value of 454.4875 also shows that the equation is very significant.

3.5. Stability Test Residual

Stationary test are made to the above equation's regression residuals sequence. The residual error is E, the results are as follows table 2.

Table 2 Stability test residual

Variable	Inspection form	ADF test value	1% critical value	-2.641672
E	(C,T,K)	-1.740728	5%critical value	-1.952066
	(0,0,0)		10%critical value	-1.610400

According to the ADF test results without constant term and delay, no trend model, ADF test value is -1.740728, the absolute values greater than 10% level threshold, that residual series. Therefore refused the non co-integration null hypothesis, there is a co-integration relationship exists between LP and LGDP.

3.6. Granger Causality Test

Causality is defined by the dependence between variables, change of dependent variables influence the independent variables .From a regression relationship function we can't usually judge whether a causal relationship within it, although we sometimes say regression variables in the explanatory variables are variables to be explained by, however, this causal relationship is actually set by prior, or determined before the regression process. Granger causality test assumes the relevant Y and X each variable prediction information is all included in these time series of variables. Causality test needs to estimate the following regression.

$$y_t = \sum_{i=1} \alpha_i x_{t-i} + \sum_{j=1} \beta_j y_{t-j} - \mu_t \tag{6}$$

$$x_t = \sum_{i=1} \lambda_i x_{t-i} + \sum_{j=i} \delta_j y_{t-j} + \mu_{2t} \tag{7}$$

The supposing of white noise is uncorrelated.

For formula (6), the null hypothesis is H_{01} :

$$\alpha_1 = \alpha_2 = \dots = \alpha_k = 0 .$$

For formula (7), the null hypothesis is

$$H_{02} : \delta_1 = \delta_2 = \dots = \delta_k = 0 ..$$

There are four cases to be discussed: (1) X is a cause of Y 's changes; (2) Y is a cause of X 's changes;(3) X and Y are both cause and effect;(4)There is no causal relationship between X and Y ; If the test rejects the null hypothesis H_{01} is that the variable X is Y 's Granger-causes, that is to say variable X has the ability to explain and predict Y . Similarly, if the test rejects the null hypothesis H_{02} is that the variable Y is X 's granger-causes, variable Y has X can explain and predict. The causal relationship between LGDP and LP by Eviews 6.0, the results is in Table 3.

Table 3 Causality test between economic growth and premium

Lags: 2 (2 period lag)			
Null Hypothesis:	Obs	F-Statistic	Prob.
LP does not Granger Cause LGDP	30	7.67981	0.0025
LGDP does not Granger Cause LP	30	0.34141	0.7140

From table 3, during the sample interval for 2006-2013 years, at the 95% confidence level, there is a unidirectional Granger causality relationship between the development of insurance and economic growth in China. The development of insurance is the Granger cause of economic growth, and China's economic growth is not significant effect on the development of insurance.

4. Conclusion

In this paper, we use the method of co-integration test and Granger causality test the premium and GDP data from 2006 to 2013 quarter to quantitative analysis, demonstrated the relationship between the insurance development and economic growth once again from an empirical point of view. Analysis shows that, there is a long-term equilibrium relationship between the development of insurance and economic growth in China, the development of insurance is the Granger cause of economic growth, but economic growth is not significant effect on the development of insurance. In recent years, the insurance market showed a good, fast and coordinated and sustainable momentum of development, industry strength, capability of the insurance industry to serve the local economic development greatly, which plays an important role in

ensuring the smooth functioning of the economy, the healthy development. Although the economy has a certain development, but the economic structure is not reasonable, the insurance industry lacks a fast growing soil. The development of insurance industry is the result of comprehensive factors, it is subject to government policy, population, family factors, and the insurance awareness and other factors, China's economic growth in the insurance growth Co., did not play its due role [5] .Can be seen that the insurance development is the Granger cause of economic growth, but not vice versa.

From the above conclusion shows the current insurance business growth space is still very great, in order to further play the role of promoting the insurance on the economy, the insurance industry can expand the insurance business, continue to strengthen the insurance product innovation according to market demand to cultivate new growth points; further strengthen the insurance service innovation and the management innovation to ensure the healthy development of the insurance industry. We should promote economic growth at the same time to speed up the development of insurance market, more attention should be paid to the improvement of our country's economic structure, raise the level of economic development, to provide a good macro environment for

the development of insurance, promote the insurance market development, the relationship between the development of insurance and economic growth finally realizes the benign interaction.

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