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Research on Influencing Factors of Auto Insurance Premium under the Background of Marketization Reform

—Empirical Analysis Based on VAR Model

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Abstract

In recent years, my country's economy has grown steadily, and the insurance industry and the automotive industry have a good development trend in the macro environment. Since 2015, the China Insurance Regulatory Commission has carried out a series of auto insurance rate reforms for different stages of the market to promote its standardized development. In this paper, four explanatory variables are selected by multidimensional analysis method. Based on panel data, econometrics is used to establish VAR model and fixed benefit model to analyze the impact of China's motor vehicle insurance premium income. Finally, variables and regression equations with significant impact are determined, and provide policy advice.

Keywords

Auto Insurance Premiums, Market Reform, Multiple Regression, VAR

1. Introduction

The continuous economic and social development has provided a good macro environment for various industries. The increase in per capita income level and the enhancement of residents' insurance awareness have also greatly promoted the development of my country's insurance market. In the process of market development, new insurance companies have been established. The original monopoly of China People's Insurance has been broken. Various companies have actively competed to squeeze market share. The original market concentration

has continued to decrease, gradually forming a monopoly competition situation. In addition, the increasing number of insurance companies and the continuous improvement of the market supervision mechanism have also attracted the entry of foreign companies, and the market has ushered in greater opportunities while facing a crisis. In addition, since 2015, the market has undergone four stages of market-oriented reform of auto insurance rates, and it has gradually matured, and its protection capabilities have continued to expand, with good prospects.

With the increase in car ownership, the premium income of motor vehicle insurance has been increasing. In the 10-year period from 2009 to 2018, it increased by 876.27 billion Yuan, with a growth rate of 392.77%. In addition, motor vehicle insurance has the largest market size in the property business, with a market share of over 60%. This shows that my country's motor vehicle insurance plays an important role in property insurance. However, although there are many auto insurance companies in the market and their development is relatively stable, the motor vehicle insurance products on the market are very limited. China's property insurance business is mainly auto insurance and non-auto insurance business. The insurance companies in the existing market are basically only staying in the original products, reform and innovation need to be further improved.

This paper explores the influencing factors of motor vehicle insurance premium income in the context of market reform, and on the basis of promoting the innovation of product positioning of auto insurance companies and promoting good business development of enterprises, puts forward policy recommendations that are conducive to the planning of the auto insurance market and the healthy and sustainable development of the insurance industry.

2. Literature Review

The empirical research on auto insurance rates has a good impetus to the insurance market. Li Yan (Li, 2007) used the analytic hierarchy process and the modeling ideas to quantify various factors to construct a structural framework of factors affecting premium income. Wu Hongxian (Wu, 2012) select influencing factors from different perspectives of economy, transportation and risk to establish a fixed benefit model to carry out regression analysis to explore the influencing factors of the auto insurance market demand. Luo Ditao (Luo, 2015) added provincial panel data for multi-dimensional analysis on the basis of time series and is exploring While influencing factors, he proposed ways to promote the healthy and orderly development of the market. Ren Han (Ren, 2016) used principal component analysis to extract four factors from many theoretical analyses, conducted cointegration analysis and error correction, and analyzed different aspects from different time dimensions. The degree of influence has improved the exploration of new ideas. At the same time, some scholars combined the demand theory of insurance economics with quantitative analysis of panel data and measured auto insurance demand from premium income and insurance density

depth, selected five explanatory variables from economic, transportation, risk and other factors to build a model for multidimensional analysis, Research shows that the obvious influencing factors are car ownership, per capita income and traffic accidents. Some scholars have added provincial panel data for multi-dimensional analysis on the basis of time series, and empirically studied the factors that affect my country's auto insurance premium income. From micro and macro perspectives, variable selection and model assumptions, the research results show that regional GDP, consumer price index, education level, and private car ownership have a significant impact on motor vehicle insurance premium income. The highway mileage and urban population ratio have no significant effect on motor vehicle insurance premium income.

However, most of the existing studies are based on the demand theory of insurance economics and establish a linear model for analysis through econometrics. This study will add VAR model on the basis of insurance econometric economy, and use the existing research results to explore the selected panel data. First of all, through market surveys, data collection and other methods, a special survey on the influencing factors of auto insurance premiums in the context of market reform. Secondly, using quantitative analysis, based on economic theory and statistical data, choose appropriate analysis methods, establish models for quantitative analysis, and achieve market prediction (Liu, 2016).

3. Theoretical Analysis

Faced with the current situation and background research on the development of the insurance market, this article raised the following questions during the research. First, how to determine some of the core influencing factors among many economic, transportation, and risk factors? Second, can we use the model to forecast the current auto insurance market and make policy analysis? Therefore, while initially selecting some factors in combination with the multi-dimensional analysis of market benefits, it is also combined with relevant paper studies and theoretical knowledge for analysis (Zhu, 2008).

3.1. Economic Factors

Economic growth is closely related to the improvement of people's living standards. Nowadays, residents' incomes continue to increase, and the scope of daily life is gradually expanding. While vehicles as a means of transportation meet the needs of normal life, they provide great convenience as a tool for pursuing quality of life. Sex and well-being. In addition, due to the increase in entertainment projects, uncertainties have also increased. Insurance provides a basis for protection against risks and losses (Wang, 2018). Therefore, the development of the automotive industry has further affected the demand for insurance. At the same time, using gross national product and urban per capita disposable income as indicators, while reflecting economic strength, it further quantifies the market size and has greater practical significance.

3.2. Traffic Factors

For motor vehicle insurance, insurance protects the rights of policyholders, and the number of vehicles as the subject of insurance is the most direct objective influencing factor on premium income. In recent years, China's economy has developed rapidly, the quality of life of residents has continued to improve, and the ownership of private cars. The volume is also increasing. In addition, the development and improvement of highway construction in my country, the improvement of road safety and the improvement of relevant laws and regulations have also indirectly affected residents' purchase needs (Suo, 2016).

3.3. Risk Factors

Losses caused by risks are the fundamental performance of insurance to protect residents. The types and uncertainties of risks objectively stimulate consumers' insurance needs. Since vehicles are in working condition for a long time after purchase, road safety and driver's driving habits exist Uncertainty risk (Qian, 2008). Therefore, insurance as a basis to reduce the existence of loss risk is necessary.

3.4. Education Level

Economic development, traffic conditions and risk uncertainty are all objective and cannot be interfered by humans, but insurance purchases are ultimately implemented as transactions between individuals and insurance companies. Therefore, the judgment and subjective choice of purchase demand is also one of the main factors that affect, According to social research and literature research, in addition to risk preference, residents have different levels of education, and their perceptions of insurance products are also different. Often, the higher the education level, the higher the ability to plan and purchase risk aversion, the demand the higher (Zhang & Wan, 2019).

Based on theoretical analysis, this paper considers the feasibility of practical empirical research and quantifies the feasibility of selecting four explanatory variables to build a model. GDP is a comprehensive statistical indicator to measure economic strength in the accounting system. Per capita disposable income of urban residents reflects the total cash of households. The amount of income used to arrange family daily life can be a good quantification of residents' living standards, private car ownership and mileage mileage as influencing factors for further empirical analysis.

4. Empirical Analysis

This paper introduces four explained variables to analyze the impact of my country's motor vehicle insurance premium income, as shown in the following **Table 1**.

4.1. Unit Root Inspection

In this paper, the ADF unit root test is used to test each variable, and the infor-

mation content of AIC and SC is used to select lag items and identify the advantages and disadvantages of the model. According to the information criterion of AIC and SC, it is most appropriate to choose the ADF model with relatively small values. When the lag period is 2, the results of some unit root tests are shown in the following Table 2, and the stationary series is selected by the test results.

4.2. Co-Integration Test

Based on the principle of SC statistic minimization, the test determines the best lag order, compares three feasible cases, and discards the SC statistic maximum model, which is 58.4736 (Y, X1, X2, X4). Due to the influence of the amount of data, the maximum lag order is only selected to the 4th lag, and the VAR model is established on the basis of the test results, and further analysis is performed through the impulse response function.

4.3. VAR Model

Determine the variables with cointegration relationship, and establish a VAR model, through the impulse response function (IRF) and variance decomposition, we have the motor vehicle insurance premium income, gross domestic product GDP, per capita disposable income of urban residents, highway mileage The mutual impact response is measured.

The key factor of the VAR model is the selection of the lag order. Two test methods are used here: one is Lag Length Creteria and the other is ArRootsGragh.

Table 1. Variables of the model.

Variable nature	Table column subhead Subhead	Subhead
Explained variable	Motor vehicle insurance premium income (100 million yuan)	Y
copy	Gross Domestic Product GDP (100 million yuan)	X1
Explanatory Varia-bles	Per capita disposable income of urban residents (yuan)	X2
	Private car ownership (ten thousand)	X3
	Highway mileage (ten thousand kilometers)	X4

Table 2. Unit root test of variables.

Variable	AIC	SC	AR root test
Y, X1, X2, X3, X4	64.3085	67,0291	Non-stationary
Y, X1, X2, X3	55.3649	57.1456	Non-stationary
Y, X1, X2, X4	56.6928	58.4736	Stationary
Y, X2, X3, X4	47.1315[a]	48.9123	Non-stationary

Both can be used to test whether the lag order is appropriate. We found that in the first-order to fourth-order cases, both models are stable only when the lag period is 2. In other cases, there is a unit root outside the circle, and the impulse response function cannot be made. The obtained function is very unstable. Combined with the information criteria of AIC and SC, we finally select the model of Y, X2, X4, and the lag period of the VAR model is 2, and the corresponding VAR(2) model is obtained. At this time, the AR root distribution diagram of the model is shown in **Figure 1**.

4.4. Impulse Response Function

Through the analysis of the above cointegration test, it can be seen that the variable is affected by random interference in a short period of time and appears to deviate from the equilibrium value temporarily, but in the long run, the variable will eventually return to the equilibrium state, and there is an equilibrium relationship between the variables. In order to measure random disturbance The impulse response function is selected by the impact of a standard deviation impact of the term. The dynamic interaction and effect between the variables are subjectively shown. From the test results of the VAR(2) model, the model structure is stable and meets the prerequisites for analysis. Therefore, the impulse response function is constructed and the analysis results are shown in the **Figure 2** (Hu, 2007).

The horizontal axis represents the number of years of impact (years), the vertical axis represents the degree of change in premium income, and the dashed lines on both sides indicate the possible range of shock response.

Combined with the analysis of the number of impact periods and the possible range, a shock of a standard deviation is added to the per capita disposable income of urban residents in this period, which affects the growth of premium income. It begins to fall after the peak in the third period and converges after

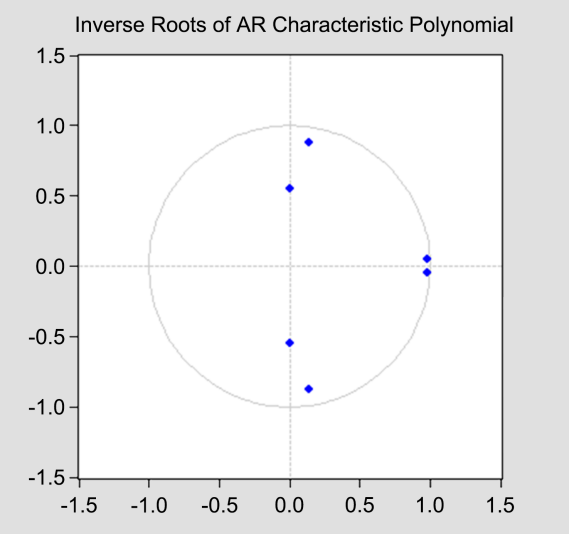


Figure 1. AR roots graph with a lag period of 2.

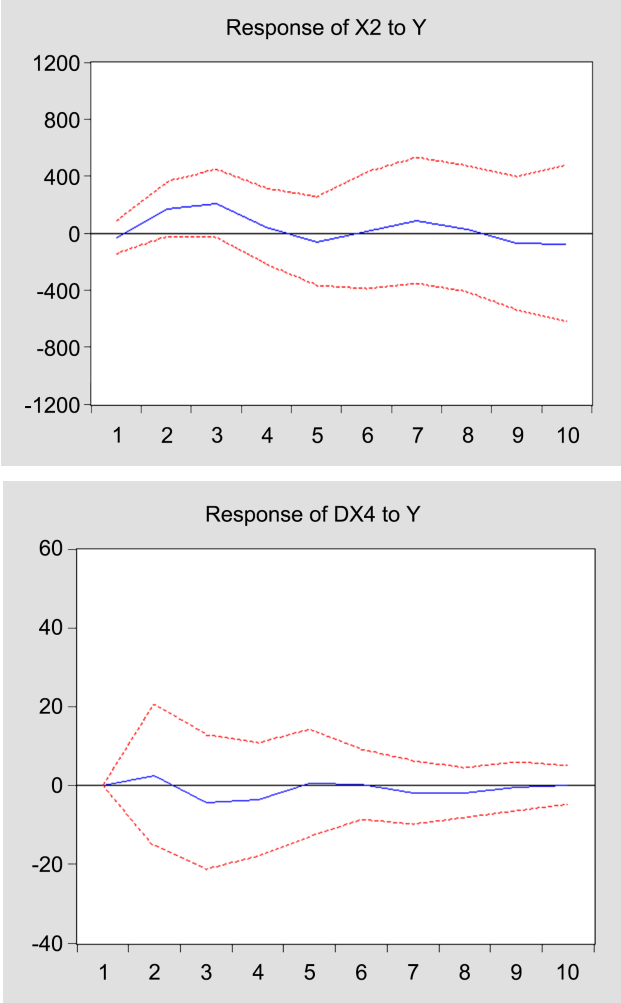


Figure 2. The degree of impact of X2 and X4's respective impact on motor vehicle insurance premium income.

the fourth year. At 0, it shows that the impact of per capita disposable income of urban and rural residents on the insurance industry lasts about 3 years. In addition, the premium income began to increase in the sixth year, and reached another small peak in the seventh year, and then converged to 0 again, indicating that the per capita disposable income of urban residents has a positive impact on the insurance market, but this There is a certain hysteresis effect.

The impact of highway mileage X4 on the premium income is negative, and there is also a certain lag effect. The impulse response function of X4 on Y is not obvious enough, so consider using the variance decomposition method for further analysis to understand the relative changes of X4 to Y Importance, the degree of the impact of DX4 on DY can be seen, after a short positive effect in the second year, DX4 shows a continuous negative effect on DY in the third and fourth years, and then converges to 0, and over time, Continue to show a small and stable negative effectin **Figure 3**.

In summary, the impact of per capita disposable income of urban residents on

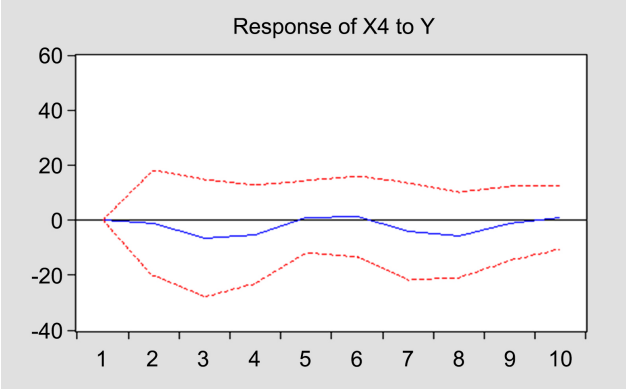


Figure 3. DX4's impact on DY.

premium income is positive, and the degree of impact reaches the largest in the third year; the impact of highway mileage on premium income is negative, and reaches in the third and fourth years The peak is relatively stable. In addition, there is a certain lag in the influence of both. For further research, we consider making another multiple linear regression model for analysis.

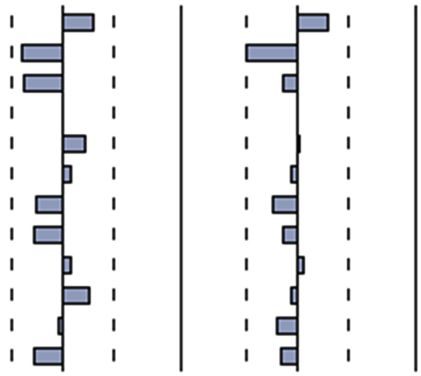
4.5. Multiple Linear Regression Model

Before the establishment of the fixed benefit model, the research based on the time series also needs to carry out the stabilization test on the variables. Therefore, combined with the unit root and cointegration test, Y, X2 and X4 are selected as variables for multiple regression.

The model established is Y = b0 + b1X2 + b2X4 + $\mathbf{u_t}$, where $\mathbf{u_t}$ is a random disturbance term, and the regression results are cut from the panel data to obtain the fitting equation Y = −926.1385 + 0.2801 * X2 − 3.9819X4. The determination coefficient R2 is 0.999420, which is approximately 1, indicating that the model fits the sample data to a high degree. After further testing, the straight squares of the partial correlation coefficients of each period of the model do not exceed the dotted line, and R2 = 4.3068 meets the test, so the original The model does not have autocorrelation and heteroscedasticity, and further recognizes the expression, that is, assuming that other variables remain unchanged, for every increase of 1 yuan per capita disposable income of China's urban residents, China's motor vehicle insurance premium income will increase by 208.1 billion yuan ; For every 10,000 kilometers of private car ownership in China, China's motor vehicle insurance premium income will decrease by 398.9 billion yuan. And the interpretation ability is 99.49%.

Although the model is analyzed from the macro and micro levels, it can be seen from different literatures that there are certain limitations in this article, because premium income is related to demand and has a certain relationship with its pricing and supply, so I hope it can be absorbed More opinions, analyze and select variables from more angles, and broaden the data timeline to make the study more comprehensive and true in **Figure 4**.

Data: 0./26/20
Sample: 1999 2018
Included observations: 20



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.264	0.264	1.6082	0.205
		2	-0.354	-0.455	4.6769	0.096
		3	-0.345	-0.121	7.7624	0.051
		4	-0.002	-0.002	7.6425	0.101
		5	0.200	0.023	8.9365	0.112
		6	0.074	-0.056	9.1084	0.168
		7	-0.230	-0.213	10.895	0.143
		8	-0.260	-0.126	13.380	0.099
		9	0.078	0.065	13.622	0.136
		10	0.223	-0.049	15.815	0.105
		11	-0.032	-0.183	15.864	0.146
		12	-0.252	-0.145	19.352	0.080

Figure 4. Partial correlation coefficient test illustration.

5. Policy Recommendations

The government should take the initiative to assume the functions of macro-control, improve the market mechanism, establish a good market credit system, improve industry self-discipline, standardize operations, maintain market stability, and drive stable economic development. In addition, the stable development of the market's macro environment is also conducive to further promoting the continuous development of the automotive industry, maintaining the growth trend of sales volume, and driving the increase of private car ownership, which is an important factor affecting the growth of premiums. At the same time, for the insurance market, continue to promote market-oriented reforms, timely summarize the problems of the previous stage, improve market rules, establish and improve laws and regulations, and improve market requirements. The market players should clarify their responsibilities in a timely manner and maintain the liquidity of market operations. The rapid economic development, the increase in living standards, and the continuous increase in automobile consumption in rural areas are also conducive to the increase in demand for motor vehicle insurance, thereby increasing income. Therefore, the government promotes the urbanization process, reduces urban-rural differences, and promotes the quality of rural life closer to urban areas.

The insurance market has been growing and the overall quality has been continuously improved, but there are still gaps between different insurance companies. The reform of auto insurance rates continues to advance under the macro market background at different stages. Insurance companies should adhere to the principle of fair competition and always observe. Market rules are constantly improved in the supervision and management of the market. In addition, insurance companies should also pay attention to product upgrades and technological reforms. In the context of the Internet era, insurance companies cannot only fo-

cus on competition for market share, and vigorously promote personalized services and user portrait systems for different customers to improve their own strength and a higher degree. To consider for customers, break the market without differentiation, refine insurance classification, absorb foreign premium designation models, improve customer purchasing power, renewal rate, and establish a unique car insurance system suitable for national conditions. At the same time, we must strengthen cooperation with the government, give better play to product advantages under the guidance of policies, and promote green and healthy development of the market.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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