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ARMA Model Based Income of Urban and Rural Residents in Hunan, China Gap Analysis and Prediction

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Abstract: With the increase of residents' income level, the income gap between urban and rural areas is also expanding. This problem has aroused great concern from all walks of life. This paper takes Hunan Province as an example, uses Eviews software to fit the data, and analyzes and predicts the data from the fourth quarter of 2013 to the first quarter of 2018 in Hunan Province of China, and puts forward reasonable countermeasures and suggestions on this basis [1].
Keywords: urban-rural income gap; ARMA model; forecast.

INTRODUCTION

With the development of the economy, the income levels of urban and rural residents in our country have been continuously increasing, but at the same time, the income difference between urban residents and rural residents has continuously increased. From 1991 to 2016, except for 1996 and 1997. The absolute income gap between urban and rural residents in Hunan Province in China has been continuously expanding. The difference between 1991 and 2015 was 1094.3 yuan, and the difference between 2016 and 2016 was 1,9353.5 yuan. The deterioration of the income of urban and rural residents has led to an increasingly severe problem of "agriculture, rural areas and farmers". The phenomenon of urban-rural imbalance has affected the process of social development in an all-round well-to-do society.

Based on this, this paper uses the ARMA time series model to analyze and predict the income disparity between urban and rural residents in Hunan Province of China from the 4th quarter of 2013 to the first quarter of 2018. It explores the internal laws of its changes and proposes The proposal to narrow the income gap between urban and rural residents is of great significance in promoting the healthy and sustainable economic development of Hunan Province in China and building an overall well-to-do society.

ARMA theoretical model

ARMA Model Introduction: The ARMA model is called the Auto-Regressive and Moving Average Model and is an important method for studying time series. The basic idea is that some time series are a family of random variables that depend on time T. Although there are uncertainties in the individual sequence values that make up the time series, the whole sequence changes have certain regularities. The corresponding mathematical model can be used. To approximate description. The general expression of the ARMA model is: [2].

$$y_t = \phi_1 y_{t-1} + \phi_2 y_{t-2} + \ldots + \phi_p y_{t-p} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + \ldots + \theta_q \varepsilon_{t-q} \quad (1)$$

Model empirical

(I) Sources of data

This paper selects the disposable income of urban residents and the disposable income of rural residents in Hunan Province from the fourth quarter of 2013 to the first quarter of 2018 as the original data, sorts out their income ratios, and uses the ARMA time series model to compare the income ratio of urban and rural residents in Hunan Province, China. Conduct analysis and forecasting. The data comes from the National Bureau of Statistics and Hunan Statistics Bureau. The specific data are as follow s

Table-*1*As shown.

Table-1: Income Ratio of Urban and Rural Residents

index	First quarter of 2018	Fourth quarter of 2017	Third quarter of 2017	Second quarter of 2017	First quarter of 2017	Fourth quarter of 2016	Third quarter of 2016	Second quarter of 2016	First quarter of 2016
Revenue Ratio (PCDIB)	2.55111 2163	2.70964 86	2.80527 7153	2.79213 6544	2.57371 134	2.71908 1129	2.81584 7966	2.80280 9917	2.58664 0581
index	Fourth quarter of 2015	Third quarter of 2015	Second quarter of 2015	First quarter of 2015	Fourth quarter of 2014	Third quarter of 2014	Second quarter of 2014	First quarter of 2014	Fourth quarter of 2013
Revenue Ratio (PCDIB)	2.73113 2901	2.83379 5348	2.82661 1451	2.61421 165	2.74992 8497	2.86466 8603	2.73113 2901	2.86221 1709	2.65503 3557

(B) Stationary test

According to Table 1, using the Eviews software to obtain the trend of the sequence PCDIB, a preliminary judgment of the sequence is a stationary sequence. At the same time, the ADF test was performed on the sequence PCDIB and the test results were as follows:

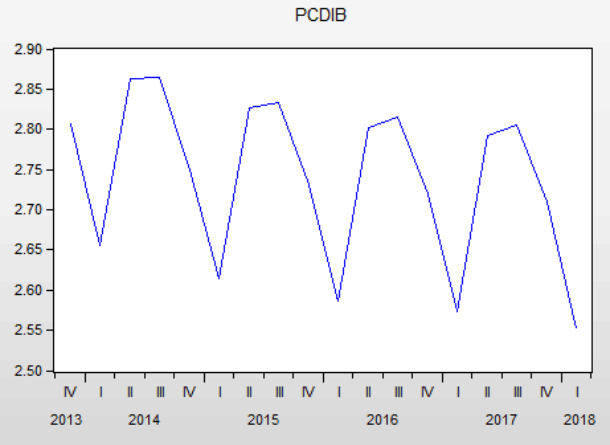


Diagram-1: The trend of income disparity between urban and rural residents

Table-2: ADF Test of Sequence PCDIB

ADF statistics	T statistic value: -5.373420		P value
Significant level	1%	-2.740613	0
	5%	-1.96843	
	10%	-1.604392	

From the test results in Table 2, it can be seen that the T statistic -73434682 is less than the critical value corresponding to each significance level, so we reject the original assumption that there is no unit root and the sequence is stable. We can create an ARMA model for the sequence.

(III) Model Establishment

1) Model identification. The sequence PCDIB has been confirmed as a stationary sequence. Self-Correlation and Partial Self-Phase Results of Sequence PCDIB is obtained using the software as follows

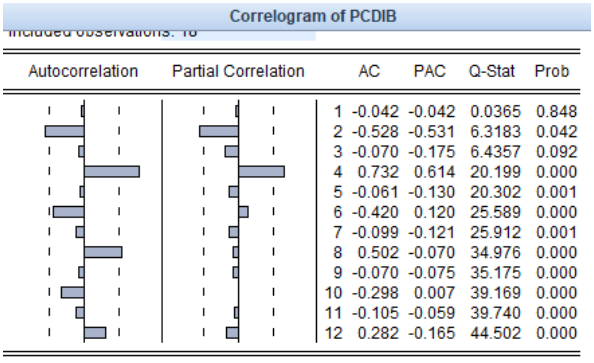


Diagram-2: Self-Correlation and Partial Self-Phase Results of Sequence PCDIB

According to Self-Correlation and Partial Self-Phase Results of Sequence PCDIB in the model have tailing features that apply to the ARMA (p,q) model. Observing Figure 2 shows that p4 and q4 are more appropriate.

2) Model selection. In order to make the established model more accurate, appropriately widen the range of p, q, select ARMA(1,1), ARMA(1,2), ARMA(2,1), ARMA(2,2), ARMA(4,4))Comparative analysis of the five models, in Table 3.

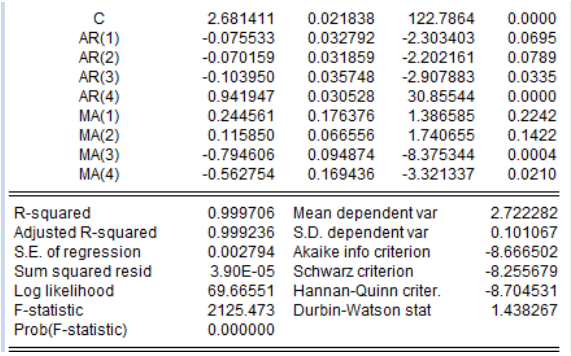
Table-3: Model Comparison

model	AIC	SC	HQ	R^2
ARMA(1，1)	-1.692411	-1.545373	-1.677795	0.121056
ARMA(1，2)	-1.634337	-1.438286	-1.614849	0.304724
ARMA(2，1)	-2.25333	-2.060183	-2.24344	0.643998
ARMA(2，2)	-2.933132	-2.691698	-2.20769	0.840804
ARMA(4，4)	-8.666502	-8.255679	-8.704531	0.997060

by

Table-3It can be seen that R2 is the largest after ARMA (4,4) adjustment and the AIC, SC, and HQ values are the smallest. It can be considered that the time series model of PCDIB is suitable for ARMA (4,4).

3) Model regression and testing. The ARMA (4,4) model was established and regression was performed, and the residual correlation test and heteroscedasticity test were performed[3].



C	2.681411	0.021838	122.7864	0.0000
AR(1)	-0.075533	0.032792	-2.303403	0.0695
AR(2)	-0.070159	0.031859	-2.202161	0.0789
AR(3)	-0.103950	0.035748	-2.907883	0.0335
AR(4)	0.941947	0.030528	30.85544	0.0000
MA(1)	0.244561	0.176376	1.386585	0.2242
MA(2)	0.115850	0.066556	1.740655	0.1422
MA(3)	-0.794606	0.094874	-8.375344	0.0004
MA(4)	-0.562754	0.169436	-3.321337	0.0210

R-squared	0.999706	Mean dependent var	2.722282
Adjusted R-squared	0.999236	S.D. dependent var	0.101067
S.E. of regression	0.002794	Akaike info criterion	-8.666502
Sum squared resid	3.90E-05	Schwarz criterion	-8.255679
Log likelihood	69.66551	Hannan-Quinn criter.	-8.704531
F-statistic	2125.473	Durbin-Watson stat	1.438267
Prob(F-statistic)	0.000000		

Diagram-3: ARMA (4.4) Model

In the residual sequence correlation test (starting from the third-order lag of the lag to the first-order lag), the residual LS test is performed with the least-order AIC, SC, and HQ information criteria to determine the residual correlation test. The P value of the LM test statistic Obs*R-squared is 1.0000. Under the 5% significance level, the original hypothesis is not rejected, and there is no serial correlation between the tested residuals. Therefore, it is reasonable to choose the first order lag. Test the heteroskedasticity (ARCH test) in a similar way. Observe AIC, SC and HQ and other information to comprehensively judge the best lag of ARCH test, and finally select ARCH (1). At the 5%

level, if the original hypothesis is not rejected, it means that there is no ARCH effect. Explain that there is no ARCH form of heteroskedasticity. So the expression of the ARMA (4,4) model is:

$$y_t = 2.681411 - 0.075533\ y_{t-1} - 0.070159\ y_{t-2} - 0.10395\ y_{t-3} + 0.941947\ y_{t-4} + \varepsilon_t + 0.244561\ \varepsilon_{t-1} + 0.11585\ \varepsilon_{t-2} - 0.794606\ \varepsilon_{t-3} - 0.562754\ \varepsilon_{t-4} \quad (2)$$

4) Model prediction and analysis

Comparing the predicted value and the real value of the ARMA model found that the difference between the two is very small. Within the acceptable range, the prediction accuracy is very high. From the forecast results, we can see that the income gap between urban and rural residents in Hunan Province has further expanded. Therefore, there is still a long way to go to realize the goal of building a well-to-do society. It is necessary to narrow the income gap and achieve a common living standard for urban and rural residents.

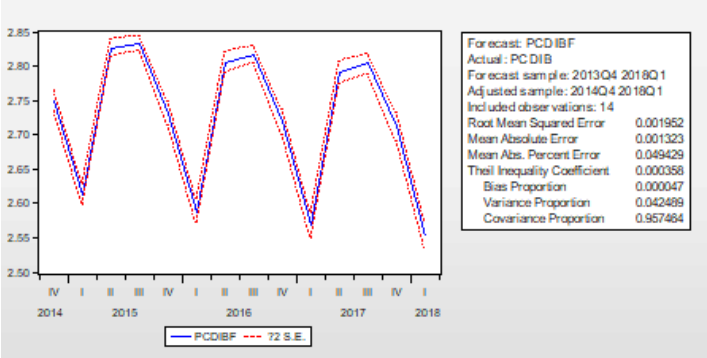


Diagram-4: Model Prediction

Related suggestions

This paper uses the time series ARMA model to analyze the income gap between urban and rural residents in Hunan Province. As a result, the income gap continues to widen, which will inevitably affect the process of urbanization in China. According to the data, the main cause of the gap is not the high income of urban residents in China, but rural residents. The income is too low. Therefore, we must fundamentally solve the income gap between urban and rural residents in China, mainly from the perspective of improving rural residents' income levels[4].

(1) Increase investment in rural education and improve the quality of rural residents. Research shows that the level of education, personal quality, directly affects people's income levels. In order to maximize the income level of rural residents and narrow the income gap between urban and rural areas, it is necessary to increase education investment in rural areas and improve the quality and productivity of rural residents. Technical training can be conducted on productivity so that good technologies and knowledge can be expanded and applied.

(B) Improve the rural social security system. Establishing and perfecting social security systems such as rural endowment insurance and cooperative medical care, raising the level of social security in rural areas, and increasing rural residents' transfer payments can effectively increase the disposable income of rural residents and narrow the income gap between urban and rural residents.

(3) Optimize the rural industrial structure and develop characteristic agriculture. Relying on mountains, relying on water to eat water, making full use of local advantageous resources in the countryside, developing characteristic projects adapted to local conditions, driving economic development in rural areas and realizing higher income levels.

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