

Analysis of Fertility Rate Prediction Based on the Data of East Asian Countries

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Abstract: With the development of social economy, the fertility rate of various countries has become one of the focuses of attention, among which the fertility rate of the three East Asian countries is one of the important research fields. Among the research results on fertility rates in the three East Asian countries, many topics focus on the analysis of low fertility rates and related policies, while relatively few studies have been conducted on the analysis of fertility trends in the three East Asian countries. Therefore, this paper intends to adopt the ARIMA model in the time series analysis model for analysis and prediction, and further explore the analysis of change trends. It is expected to promote the development of fertility research in the three East Asian countries.

Keywords: fertility rate in east Asia, fertility change, trend analysis, low fertility rate, East Asia

1. Introduction

Fertility rate reflects the population development of a country or region, and its level is affected by political, economic, cultural and other reasons. It affects the rate of population growth, and is an important indicator for population forecasting, formulating population policies and promoting balanced population development. In recent years, with the social development, the fertility rate of many countries or regions has shown a trend of decline, among which the fertility trend characteristics of the three East Asian countries show a high degree of similarity. Therefore, understanding the causes and influencing factors of fertility rate is of great significance for formulating corresponding policies and measures to achieve the goal of balanced population development.

1.1. Causes and Effects of Fertility Decline and Measures to Increase Fertility

First, the increase in female education is one of the reasons for the decline in fertility. With the expansion of the popularization of education, more and more women have improved their educational level and can obtain more opportunities and better career development, which means that women are no longer regarded as only taking care of the family, but have become an important role in promoting social and economic development. They are more able to understand and attach importance to self-realization and the pursuit of personal value, so their fertility intention is relatively low. Second, they are better able to understand and value reproductive health and safety,

and to make informed decisions based on that. However, this trend has also brought some social and economic issues, such as increasing labor shortages. Second, economic factors also contribute to the decline in fertility. With the improvement of living standards, the cost of living increases, and the cost of raising children also increases, which will increase the economic pressure on families, and many young couples choose to delay or not have children in order to balance work and family life. And big economic trends also have an impact on fertility. For example, during economic turmoil, many families will face unemployment, income loss and other problems, and the huge financial burden will affect people's willingness to have children.

In addition, changes in values are also contributing to the decline in fertility. With the development of urbanization and the change of social structure, many young people's lifestyle has converted, many values have changed, such as the traditional concept of family and fertility, and people's pursuit of freedom has become more and more intense, so many couples delay childbearing or only have one child. The decline of the fertility rate will have many impacts on the society, such as the aging of the population, the obstruction of economic growth and the increasing burden of social welfare. The decrease in population size may affect the labor and consumption markets, and thus the socio-economic development situation. Declining fertility rates will also lead to labor shortages, which will affect the stability of the labor market. In order to increase the fertility rate, the government and society should pay more attention to women's education and afford more support and opportunities to help women achieve their ideal lifestyle. Governments can take a number of measures, such as providing maternity allowances and providing appropriate parental leave, to encourage women to have children. Governments can also support educational development and vocational training to improve women's education and employability, so that women can choose whether and when to have children. Improving the occupational environment is also one of the important measures to increase the fertility rate. The government can encourage companies to provide flexible working systems, bonus systems, and support families to balance work and life, so as to improve the occupational and living environment and increase people's willingness to have children. At the same time, changes in family values should also be encouraged to promote equality between men and women in family and professional roles, and to make joint efforts for family development. In this way, couples' willingness to have children will also be improved. Increasing the fertility rate is of great significance to the balanced population advance of a country or region. The government and society should adopt such policies and measures to promote the sustainable development of society. Understanding the change of fertility rate requires multiple perspectives, and improving fertility rate cannot be achieved overnight, and needs continuous efforts and attention.

1.2. Research Motivation, Data, Models and Methods

In this context, and the fertility trend of the three East Asian countries is very similar, so it is essential to conduct an in-depth analysis of the contemporary fertility trend of the three East Asian countries. From the World Bank, the annual total fertility rate data of the three East Asian countries from 1960 to 2022 can be obtained, and then according to the time series analysis model, the future development trend can be predicted based on historical data. In this paper, ARIMA analysis is used in the time series analysis method, which can transform non-stationary time series into stationary time series and carry out model fitting, and then realize the prediction of future value.

2. Literature Review

With the development of The Times, the fertility rate of countries in the world is also undergoing unique and diverse changes. In recent years, the fertility rate of the three East Asian countries has

shown a downward trend. According to 2022 fertility data, South Korea has the lowest fertility rate in the world at 0.78. In the same year, the number of babies born in Japan fell below 800,000 for the first time, the lowest since the statistics began in 1899. China's birth rate dropped to 1.09 in 2022, making it the lowest among countries with a population of more than 100 million. It can be seen that the fertility rate of the three East Asian countries is a topic worthy of comprehensive consideration, and in-depth research on this topic has profound practical and theoretical significance. Therefore, it is necessary to analyze the trend of contemporary fertility in the three East Asian countries. The change trend of fertility rate in the three East Asian countries has attracted much attention and attention, and the relevant researches on this issue at home and abroad are relatively complete. Many scholars have conducted in-depth studies on the fertility rate in the three East Asian countries in various ways, and the contents have extended to various fields, and achieved more research results.

2.1. Various Methods of Analysis of Low Fertility

The paper analyzed the problems of low fertility rate and serious population aging in East Asian Confucian society and Chinese countries with common cultural and social structure [1]. Through the HDI index, they proved that the fertility transformation in mainland China showed certain "precocious" characteristics, and believed that the "limited rationality" and "fading passion" of human beings, as well as various reasons, caused a more serious "population reproduction crisis" in East Asian society [1]. The analysis made an in-depth analysis of the low fertility rate in major East Asian countries by using a research method combining literature research and quantitative analysis [2]. In addition, the author pointed out that compared with the developed countries in Europe and the United States, the fertility rate in the developed countries and regions in East Asia is in a low state, and the developed countries and regions in East Asia have not yet formed family and gender policies to support fertility, and conducted a typology of transnational comparative analysis to explain the reasons for the different fertility rates in the developed countries in Europe and the United States [3].

2.2. Low Fertility Rate and Related Policies

The paper conducted in-depth analysis and research on the phenomenon of "ultra-low fertility rate", and explained the correct understanding of the national population development strategy to stabilize the low fertility level [4]. Other research pointed out that the low fertility level is the inevitable result of the impact of "modernity", and made a comparative analysis with the help of the hypothesis of "low fertility trap", and discussed issues related to "policy stimulus" [5]. The paper mentioned the policies related to birth control in various regions, believed that political factors could explain the fertility rate, and put forward the view that appropriate relaxation of birth control is necessary [6]. Others analyzed the policy adjustment of some countries or regions from various perspectives and summarized the relevant factors affecting the success or failure of population policy adjustment [7]. Besides, some researchers pointed out that the improvement of fertility rate requires corresponding changes in social structure, concepts and institutions [8].

To sum up, the research on the low fertility rate in the three East Asian countries involves many aspects, but there are relatively few studies on the analysis of the changing trend of contemporary fertility rate in the three East Asian countries. Therefore, the research on this issue in this paper can make up for some aspects in this field to a certain extent, and carry out some relatively comprehensive analysis and discussion in this aspect. To a certain extent, it is significant to promote the development and perfection of this field.

3. Results

Table 1: ARIMA(0,1,0) model parameters table.

item	Symbols	Coefficient	Standard error	Z-score	P values	95% CI
Constant term	c	1.000	0.000	519113.585	0.000	1.000 ~ 1.000

AIC value: -1324.949

BIC value: -1320.694

Table1 shows that the ARIMA model requires the series to be stationary time series data. According to the model parameter table, the regression coefficient value is 1.000 and the p value is 0.000. z value is a standardized statistic, and p value is a probability value. AIC and BIC value is used to evaluate the model, the AIC and BIC value is small, model fit the data better.

Table 2: Table of model Q statistics.

item	statistic	P values
Q1	0.018	0.893
Q2	0.018	0.991
Q3	0.018	0.999
Q4	0.018	1.000
Q5	0.018	1.000
Q6	0.018	1.000
Q7	0.019	1.000
Q8	0.019	1.000
Q9	0.019	1.000
Q10	0.020	1.000
Q11	0.021	1.000
Q12	0.021	1.000
Q13	0.022	1.000
Q14	0.024	1.000
Q15	0.025	1.000
Q16	0.026	1.000
Q17	0.028	1.000

As we can see in Table2 the Q statistic table is a tool used in ARIMA model to evaluate whether the residual is white noise. The value of the Q statistic in this table is close to 0, and the residual of the model is close to white noise. If the p-value is greater than 0.1, the null hypothesis cannot be rejected at the significance level of 0.1, the residual of the model is white noise, and the model basically meets the requirements [9-10].

Table 3: LM test of the residual term.

F-statistic	24.500	P-value	1.000
T *R2 statistic	null	P-value	1.000

The result in Table3 shows that the LM test of the residual term is used to test whether there is serial correlation in the residual series of the model. If the p-value of the F-test in this table is greater than the significance level, the null hypothesis cannot be rejected and no serial correlation is considered.

4. Conclusion

The trend of declining fertility is not just in East Asia; it is a global problem. The reasons for this trend are various, including the increase in female education, the increase in the cost of living, and the change in attitudes. Declining fertility also has important implications for individuals and societies. Various measures should be taken to deal with the declining fertility rate. The government can introduce some policies to effectively improve the fertility rate, and it can also use education and publicity to make people have a more comprehensive understanding of the knowledge related to fertility and encourage people to make serious choices. Using ARIMA to analyze the data, you can better understand the data, which can facilitate a deeper understanding and research on this topic. In short, the decline of fertility rate needs the attention and discussion of the government and all sectors of society to promote the sustainable development of society.

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