Study on the Impact of Population Aging on China's Macroeconomic Development in the "14th Five-Year Plan" Period

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Abstract: In the 14th Five-Year Plan and beyond, China's population aging will continue to accelerate, the number of population aging will continue to increase, and there will be many risks and challenges to overcome for population and economic development. This paper analyzes the impact of China's population aging on macroeconomic development since 2000, and concludes that for every 1% increase in the dependency ratio of the elderly population, the GDP per capita will drop by 0.797038%, and with the deepening of population aging, its hindering effect on economic growth will become bigger and bigger.

Keywords: Population aging, Macroeconomic, VAR.

1. Introduction

Population aging is a key issue that has plagued the economic development of countries in recent decades, and the world is "getting older" at a significantly faster rate after entering the 21st century, with the world's population aging ratio reaching 9% in 2019. And with the improvement of living standards and economic development, most countries have a low birth rate, which is extremely unfavorable to alleviate the current situation of population aging. The current form of global aging is severe, and the degree of aging in China will further increase, which is extremely unfavorable to the macroeconomic development of China. China has entered the aging society in 2000, and the premature aging has a great impact on China's macro economy, which seriously hinders the economic development. Now we are in the "14th Five-Year Plan" new development stage, China's population aging is also facing a new situation. According to the relevant forecast, during the "14th Five-Year Plan" period, China's elderly population will exceed 300 million, and will move from light aging to moderate aging, which means that China's macroeconomic development will face a greater challenge. In this regard, the "14th Five-Year Plan" proposed for the first time to elevate population aging to a "national strategy", indicating the importance China attaches to the acceleration of aging. President Xi proposed to accurately grasp the new situation faced by China during the "14th Five-Year Plan", and continuously develop a new pattern and situation of the road with Chinese characteristics to actively cope with population aging. Therefore, this paper analyzes the new situation of population aging in China during the "14th Five-Year Plan" period by combining and referring to the relevant studies of existing scholars, and studies the impact of population aging on China's macroeconomy in the new development stage.

2. The New Situation of Population Aging in China during the "14th Five-Year Plan" Period

2.1 Aging Enters a New Stage of Rapid Development

A country or region is considered to have entered an aging society when the proportion of the population over 65 years old exceeds 7%. As shown in Figure 1 below, the proportion of population over 65 years old in China had reached 6.9% in 1999 and was about to enter the aging; the proportion was 7% in 2000, officially entering the aging society. Since entering the aging society, the aging rate in China has gradually accelerated, and the elderly population will increase to 190.64 million in 2020, and the aging level will rise to 13.5%. During the "14th Five-Year Plan" period, China is about to receive a more violent shock wave of population aging, and it is predicted that in 2024, China's elderly population will exceed 300 million people, accounting for more than 20% of the total population, entering a moderate aging society. Therefore, during the "14th Five-Year Plan" period, China will usher in the second strong growth peak of the elderly population and enter the stage of rapid development of aging.

![Figure 1: Percentage of population aged 65+](image)

2.2 The Spatial Distribution of Aging Shows New Features

China's aging also has large differences in geography, the national average degree of aging is 13.52%, nearly half of the city aging degree to be higher than the national average, and the northeast, Sichuan and Chongqing areas are aging seriously. From the viewpoint of sub-provinces, the aging rate in 2020 is lower than 10% in 5 provinces, including Tibet, Xinjiang, Guangdong, Qinghai and Ningxia, and only 5.67% in Tibet; between 10% and 13.5% in 13 provinces, including Hainan, Yunnan and Fujian; higher than 13.5% in 13 provinces, including Hebei, Hubei and Tianjin, among which

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Liaoning, Chongqing, Sichuan, Shanghai and Jiangsu are as high as 17.42%, 17.08%, 16.93% and 16.28% respectively, 16.93%, 16.28% and 16.2% respectively, which has reached a moderate aging society.

2.3 New Features of Aging Issues

During the "14th Five-Year Plan" period, the rapid development of aging in China has brought out different problems in various fields of economic and social development, and the correlation of various risks and contradictions related to it has increased. The overall trend of China’s aging problem shows a shift from individual and inter-family problems to group and social problems, from hidden and slow gradual development to explicit and accelerated development, and from relatively single social field problems to economic, political, social, cultural and other multi-domain problems. From this, we can see that the problems of aging in China are more diversified and diverse, and the task of dealing with population aging in China will be more arduous.

3. Model Construction and Indicator Selection

3.1 Model Construction

VAR models are mainly used to study the relationship between the changes in time series of several different variables. In this paper, the VAR model is used to study the relationship between the time series of two variables of population aging and economic development. The expression of the model is shown in equation (1):

\[ Y_t = \alpha + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \cdots + \beta_p Y_{t-p} + \varepsilon_t \]  

(1)

where \( \alpha \) is an \( n \times 1 \)-dimensional constant vector, \( \beta_i \) is an \( n \times n \)-dimensional autoregressive coefficient matrix, \( \varepsilon_t \) is an \( n \times 1 \)-dimensional vector white noise, and \( \varepsilon_i = 0; \ Y_{t-i} \) is an i-order lag variable of the \( Y \) vector, \( i = 1, 2, \ldots, p \).

3.2 Indicator Selection and Data Handling

Based on the fact that China has been an aging society since 2000, this paper selects the data from 2000-2020 to verify the impact of population aging on macroeconomic growth, and the relevant data are obtained from statistical yearbooks. Real GDP per capita (pgdp) is chosen to represent the level of economic development, and the dependency ratio of the elderly population (odep) is used as an indicator to measure population aging. For the econometric analysis, the selected indicators are logarithmically processed separately, and the logarithm of real GDP per capita (Ln(pgdp)) is used to express the level of economic development.

4. Model Construction and Index Selection

4.1 Unit Root Test

The unit root test was first performed on the data using Eviews, the two indicators are non-stationary series, so the first-order difference treatment, the ADF value after the difference is still greater than 5%, there is a unit root, so the second-order difference treatment. The ADF value after differencing is less than 5%, indicating that the data after second-order differencing is smooth, then the Johansen cointegration method can be applied to examine the long-term relationship of the indicator system.

4.2 Cointegration Test and Analysis

In order to further analyze whether there is a long-run equilibrium relationship between the variables Ln(pgdp) and odep, a cointegration test was conducted, and the results are shown in Table 3. At 95% confidence level, when the original hypothesis is "no cointegration", the trace test 21.33339 > 15.49471, and the p-value 0.0059 is less than 5%, so the original hypothesis is rejected. The original hypothesis is rejected; when the original hypothesis is "at most one", the trace test is 5.123700 > 3.841465, and the p-value is 0.3007 greater than 5%, so the original hypothesis is accepted. Therefore, there is a unique cointegration relationship between Ln(pgdp) and odep, indicating that there is a stable equilibrium relationship between them in the long run. With a long-run stable relationship between Ln(pgdp) and odep, the equation of this long-run cointegration relationship can be derived, and the standardized cointegration coefficients of the long-run equilibrium relationship are shown in Table 2. The elderly population dependency ratio is negatively correlated with GDP per capita, that is China's aging population hinders its economic growth, and for every 1% increase in the elderly population dependency ratio, the real GDP per capita will decrease by 0.797038 percent.

Table 1: Co-integration test results

<table>
<thead>
<tr>
<th>Original hypothesis</th>
<th>Eigenvalue</th>
<th>trace test</th>
<th>5%</th>
<th>P-value</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>None*</td>
<td>0.614615</td>
<td>21.33339</td>
<td>15.49471</td>
<td>0.0059</td>
<td>Reject</td>
</tr>
<tr>
<td>At most 1*</td>
<td>0.260214</td>
<td>5.123700</td>
<td>3.841465</td>
<td>0.3007</td>
<td>Accept</td>
</tr>
</tbody>
</table>

Table 2: Standardized covariance coefficient

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standardized covariance coefficient</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ln(pgdp)</td>
<td>1.0000</td>
<td>-</td>
</tr>
<tr>
<td>Ln(odep)</td>
<td>-0.797038</td>
<td>0.21422</td>
</tr>
</tbody>
</table>

4.3 Granger's Causality Test

The cointegration analysis only indicates that there is a correlation between the indicators, but whether there is a causal relationship between the indicators needs further analysis. In this paper, three different lags are selected and the test results are shown in Table 3. At 10% significant level, Ln(pgdp) cannot be rejected as the Granger cause of odep at lags 1, 2 and 3, so economic growth is not the Granger cause of population aging. Second, at 10% significant level, the case of lag 1 period rejects that odep is not the Granger cause of Ln(pgdp), so it can be considered that population aging in China is the cause of economic growth. Therefore, there is a unidirectional causality between population aging and economic variables in China, population aging is the Granger cause of economic growth, and economic growth is not the Granger cause of population aging. In order to further analyze whether there is a long-run equilibrium relationship between the variables Ln(pgdp).
5. Research Conclusions

Based on the development trend of the "14th Five-Year Plan", this paper finds that China's population aging has entered a new stage of development, the spatial distribution of aging has new characteristics, and the aging problem has new features, and the situation of population aging is more severe in the "14th Five-Year Plan" period. In this paper, the macro data of GDP per capita and old age dependency ratio from 2000 to 2020 are selected for empirical analysis to verify the impact of population aging on macroeconomic growth, and the following conclusions are drawn.

(1) According to the cointegration test, there is a long-run equilibrium relationship between China's economic growth and population aging, and population aging will have a negative impact on China's economic growth, with GDP per capita decreasing by 0.797038% for every 1% increase in the elderly dependency ratio.

(2) According to the Granger causality test, China's economic growth is not the Granger cause of population aging, but population aging is the Granger cause of economic growth. With the deepening of China's population aging, the impeding effect of China's population aging on economic growth will become bigger and bigger.

References


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Yu Wang A master student in the School of Economics and Management of Beijing University of Information Technology, majoring in applied economics.

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