The Region-Specific Variability of Economic Growth in China

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Abstract: This study uses China's quarterly GDP data from the first quarter of 2001 to the first quarter of 2018 to create a set of data that includes the mean non-linear MS (M) - AR (p) models of the "form" and "intercept form" of the Chinese macroeconomic time series. The study also finds that China's GDP is most likely to be in a "low-growth zone" and least likely to be in a "medium-growth zone". The study finds that China's GDP is most likely to be in a "low growth zone" and least likely to be in a "medium growth zone". The likelihood of China being in a "fast-growth zone" is moderate. If China succeeds in entering a high growth state, it will tend to maintain a good growth trend, but once it falls into a low growth state, it will tend to maintain a good growth trend. It will face very serious economic recovery challenges.

1. Introduction

Since 2010, China's GDP has undergone a long-term structural downward shift, since effective macroeconomic regulation must focus on nurturing long-term economic growth factors [1]. In order to effectively deal with the problem of structural factors in China's economic downturn and the major challenge of supply-side structural reform, it is necessary to review the macroeconomic In-depth investigation of the inner laws of development.As we all know, the use of linear measurement methods cannot effectively measure the characteristics of regional changes in economic growth. In order to delineate the regional changes of economic growth in different countries, scholars have proposed a variety of non-linear measurement models. On this basis, this paper sublat the previous research, and includes the important scenario that China's economic growth rate is in the "medium growth" zone system. scope of the examination and draws on Krolzig's ideas to quantitatively depict China's economic growth dynamics. [2] In this paper, quarterly data on China's GDP from Q1 2001 to Q1 2018 are selected to further calculate the Obtain quarterly growth rate data for all variables and quarterly GDP growth rate data for China, and then based on non-linear MS (M) - The AR (p) model is used to comprehensively grasp the dynamic path and transfer tendency of China's economy in different regional regimes, and to explore China's economic growth and development. The state and stage evolution of macroeconomic growth in different economic periods..

2. Non-Linear Ms (m) - Ar (P) Model Construction and Model Estimation

The novelty of this paper is that by creating a non-linear MS (M) - with both "mean form" and "intercept form," the The AR (p) model is used to accurately and carefully depict the regional variations of the mean values of time series data for each variable. The "mean-form" nonlinear model of equations (3)-equation (6) focuses on capturing the mean levels that cross the trajectory as it evolves, while the "intercept form" nonlinear model of equations (7)-equation (10) is able to track the time the dynamic path of the smooth transition of the sequence mean over time when a binshift occurs. In this paper, the Expectation Maximization (EM) algorithm [3] and the Maximum Likelihood (ML)) technique, and further to the nonlinear MS (M) - AR (p) the model is explored. Probabilistic automata can model both probabilistic and nondeterministic behavior of systems, which is a slight generalization of MDPs. The verification algorithms for MDPs can be adapted for

PAs.

3. Data Options for Measuring China's Macroeconomic Growth

Based on China's quarterly GDP data for the period Q1 2001 to Q1 2018, further calculations obtain Quarterly data on the growth rates of various variables to examine in detail the dynamic process of China's macroeconomic development. All data in this paper are from the China Economic and Trade Statistics Database (http://db.cei.gov.cn) and the China Economic and Trade Commission (CECC). China Statistical Yearbook.

The "trend component" of China's GDP growth rate, reveals that, since 2001, China's GDP growth rate has been it has shown a gradual upward momentum, declining after reaching its highest "peaks" one after another. In addition, looking at the "fluctuating components" of China's GDP growth rate depicted in Figure 6, we can see that since 2010, China's The GDP growth rates all have a relatively obvious fluctuation trend, and show some fluctuation clustering. In the subsequent period of 2012-2018, the volatility of China's GDP growth rate has weakened.

4. Identifying the Specificities of Regional Variations in China's Macroeconomic Growth

The GDP growth rate in China depicted in Figure 1 provides a preliminary visualization of the long-term dynamic characteristics of China's macroeconomy. In order to provide insight into identifying exactly at what point in time and with what probability China's macroeconomic growth is undergoing a sudden structural dynamic change.[4] The chapter then proceeds to capture the time series of China's GDP growth based on the time series of China's GDP growth rate. data to carry out the study based on the nonlinear MS (M) - AR (p) model. In performing the econometric analysis based on the nonlinear MS (M) - AR (p) model, it is necessary to first examine the selected The smoothness of the time series data is verified. For China's GDP growth rate, this paper adopts ADF test, PP test and KPSS test to verify the time series data. Measurements were taken to verify whether the time series of each variable met the requirement of smoothness. The results show that China's GDP growth rate is stable at the 5% level of significance, while the variables are stable at the 1% level of significance. The growth rates are all first order single integer. For the multiple nonlinear models created in this paper, it is necessary to follow the AIC information criterion, the HQ information criterion, and the SC information criterion the AIC, HQ, and SC values are calculated for different model setting forms. In this paper, two zone states, M=2 and M=3, are selected and examined for lag steps from 1 to 5 ($p = 1,...,5$). to investigate the calculation results of time series data for each variable under different circumstances. The study shows that when the model is set to MSM (3) - AR (3) form, China's GDP growth rate time sequence has the smallest AIC, HQ and SC values; it can be seen that using the MSM (3) - AR constructed in this chapter (p) model to investigate the dynamic evolution of China's macroeconomic growth zone system and its changing dynamics, which is more reasonable and reliable. [5-6]

The results in Table 1 show that the parameter estimates of the MSM (3) - AR (1) model, based on the time series of China's GDP growth rate, show that the mean estimates of the GDP growth rate in Zone-1 (μ_1), Zone-2 ((μ_2) and Zone-3 (μ_3) are, and, respectively.

The results show that the mean estimates of China's GDP growth rate are all within the parameter constraints. Therefore, in this paper, we take RCS1, RCS2 and RCS3 as the "low-growth", "medium-growth", and "medium-growth" growth rates of each variable, respectively. (c) "Zones" and "Fast Growth Zones".

Table 1 MSM (3) - AR (p) Estimation results for each parameter of the model

district system	GDP growth rate	
	estimated value	standard deviation
μ_1	0.0979^{***}	0.0246
μ_2	0.1363^{***}	0.0268
μ_3	0.1815^{***}	0.0279
A_1	0.8227^{***}	0.0323
Note: "***", "**" and "*" indicate significant at the 1 per cent, 5 per cent and 10 per cent levels, respectively.		

Table 2 shows the probability of shifting the dynamics of China's macroeconomic growth regime as depicted by the time series data of China's GDP growth rate. China's GDP is less likely to climb from a low-growth area system to a neighbouring area system ($p_{12}=0.0653$), and more likely to cross area systems ($p_{13}=0.0000$). However, the probability of the shift of China's GDP from the "medium growth area system" to the "fast growth area system" is($p_{23}=0.4242$), which shows that China's economy has made an unprecedented leap since the beginning of the 21st century, and as socialism with Chinese characteristics enters a new era, the modernization of China's economy has become increasingly effective. With the gradual optimization and upgrading of China's macroeconomic structure and the increasing perfection of its market economic system, China's overall national strength has been steadily improving, and based on the development achievements accumulated since the reform and opening-up, China's economic development has the potential to stabilize at a medium-to-high-speed level.[7] At different periods of economic development, China's GDP growth rate may decline to some extent, but there will not be a significant fall from the rapid growth state. China's GDP is more likely to fall when it is in a medium growth state ($p_{21}=0.5758$), while the possibility of maintaining a rapid growth state is relatively high, and the change from a rapid to a medium growth state is less likely to occur ($p_{32}=0.0800$). At the same time, the probability of the shift from the "fast-growth zone system" back to the "low-growth zone system" is zero ($p_{31}=0.0000$), which shows that the modernization and development of China's economy already possesses considerable technological advantages and institutional safeguards, and has successfully achieved transformation and upgrading in a number of key areas, with the potential to achieve long-term rapid and stable growth. The results of the maintenance probability of China's GDP being in different zone regimes indicate that, in general, China's GDP tends to remain unchanged in the zone state it is in.China's GDP has a very high probability of remaining in the "low-growth zone system" and the "fast-growth zone system", respectively reaching ($p_{11}=0.9347$) and ($p_{33}=0.9200$).[8] On the one hand, the high probability of maintaining China's GDP in the "zone of low growth" suggests that once China's economy falls into a low growth state, it will The challenges of economic recovery are daunting. Therefore, the promotion of GDP should focus on long-term strategic objectives and policy guidelines, formulate long-term guiding ideology and scientific development planning, and ensure macroeconomic stability in the medium and high level. On the other hand, the high probability of maintaining China's GDP in the "fast growth zone" system also indicates that when the economy successfully enters a high growth rate, it will be able to maintain its growth rate. The state of the economy will also tend to maintain a good growth momentum. Therefore, it is important to actively seek the fundamental impetus for macroeconomic development, seize the important strategic opportunity of economic transformation, and overcome the challenges posed by the industrial and financial crisis. To realize China's macroeconomic growth by taking advantage of the inherent advantages and stable characteristics of China's macroeconomic growth, and by taking advantage of the impeding forces of structural adjustment and resource and environmental constraints. Steady improvement in GDP over the long term.

Table 2 Transfer probability matrix for GDP growth rate zone states

	LGZS	MGZS	HGZS
L	0.9347	0.0653	0.0000
M	0.5758	0.0000	0.4242
H	0.0000	0.0800	0.9200

In order to further explore the dynamic shifting path of China's GDP growth rate time series data as shown in Table 2, and at the same time examine the cyclical characteristics of China's macroeconomic growth in detail, we give the average duration of China's GDP growth rate in each growth rate range state in Table 3, and calculate the average duration with range variables by the following formula.

$$D[s_t(i)] = E[s_t = i] = \frac{1}{1 - p_{ii}}, i = 1,2,3 \quad (1)$$

Combining the maintenance probabilities given in Table 2 and considering the average durations listed in Table 3, this paper further examines the dynamic characteristics of the variables when they are in different zonal states.

Table 3 Estimated average duration of each sectoral state

Zone system	GDP growth rate
low-growth	15.31
Medium-growth	1.00
Fast-growth	12.50

As shown in Table 3, the average duration of China's GDP being in a low growth state over the period 2001-2018 is also the average duration of each of the The highest in the "fast-growth zone" regime, with 15.31 quarters; at the same time, GDP also has a longer time horizon when it is in the "fast-growth zone" regime. Average duration; however, the average duration when GDP is in the "medium growth zone" is only 1.00 quarters, which can be seen. It is not easy to keep the GDP growth in the "medium growth zone". In other words, China's GDP is most likely to be in a "low growth zone" and least likely to be in a "medium growth zone". In this paper, the probability of China's GDP being in the "fast-growth regime" is medium.[9]

In this paper, we plot the smooth probability of China's GDP being in each growth zone regime, and identify the time series of growth rates for each variable. The dynamic path of the trajectory of the economy. In the case of a "low-growth zone system" ($s_t = 1$ probabilit $\Pr(s_t = 1 | \xi_{t|t}) > 0.5$ y), a "medium-growth zone system" ($s_t = 2$ probability $\Pr(s_t = 2 | \xi_{t|t}) > 0.5$) and a "fast-growth zone system" ($s_t = 3$ probability $\Pr(s_t = 3 | \xi_{t|t}) > 0.5$), the trajectory of the economy will change. in the smoothed probability, which refers to the set of all information based on the past period. It can be found that over the course of China's macroeconomic growth, China's GDP growth rate does occur between multiple zonal states of Frequent dynamic changes, this paper will further depict in detail the dynamic path of the growth rate of each variable in each zone state.

Finally, we find that China's GDP growth rate has increased from Q2 2001 to Q4 2003, and from Q2 2009 to Q4 2009. In the period from 1Q 2009 to 3Q 2009, 1Q 2012 to 1Q 2018, at the "low" rate Growth Area System". During the first quarter of 2004 to the first quarter of 2004, the fourth quarter of 2008 to the fourth quarter of 2008. During the periods 20094 to 20094 and 20114 to 20114, China's GDP was in the "Medium Growth Area System". During the period from the 2nd quarter of 2004 to the 3rd quarter of 2008, from the 1st quarter of 2010 to the 3rd quarter of 2011. China's GDP is in a "fast-growth zone".

5. Conclusions and Recommendations

On the basis of the above-mentioned study, reached following conclusions:

China's GDP is less likely to shift from a "low-growth area system" to a "medium-growth area system", and the shift from a "low-growth area system" to a "medium-growth area system" is less likely to shift from a "low-growth area system" to a "medium-growth area system". The probability of a shift to fast-growth zones is zero. However, the probability of a shift in China's GDP from the "medium growth zone" to the "fast growth zone" is high, while the probability of a shift from the "fast growth zone" to the "fast growth zone" is zero.[10] The probability of a shift from the "fast-growth zone regime" back to the "medium-growth zone regime" is extremely low, while the probability of a direct shift from the "fast-growth zone regime" back to the "low-growth zone regime" is extremely low. The probability of shifting from the "zone system" to the "zone system" is zero, indicating that China's economy can achieve stable growth in the long run.[11]

China's GDP has an extremely high probability of remaining in the "low-growth zone system" and "fast-growth zone system", showing a 15.31% probability of remaining in the "low-growth zone system" and "fast-growth zone system" respectively.[12] Quarter and 12.50 quarters of average duration. China's GDP is less likely to recover when it is in the "low-growth zone", but is also more likely to recover when it is in the "fast-growth zone". Maintain the probability, tend to maintain a good growth trend. Overall, China's GDP is most likely to be in a "low growth zone" and least likely to be in a "medium growth zone". The probability of being in a "fast-growth zone" is medium.

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