Analysis on Relationship between the Agriculture in Maoming with Local Economic Growth

Yan-Li XU, Ya-Xin WANG
School of Business
Lingnan Normal University
Zhanjiang, Guangdong, P. R. China, 524048
xuyanli_2010@126.com

Zhi-Xian TANG
School of Economics & Management
Guangdong University of Petrochemical Technology
Maoming, Guangdong, P. R. China, 525000

Abstract—This paper is designed to promote the development of local economy in Maoming. In order to explore the relationship between agriculture and the growth of the local economy, the local GDP and the production of city’s main agricultural products in 2000-2012 are selected to yield cointegration test. By using econometrics to set up multivariate regression, it is concluded that not only is agricultural growth positively correlated with the local economy in Maoming city, but a long-term and stable dynamic equilibrium exists in it.

Keywords—agricultural; economic; growth; relationship

I. INTRODUCTION

Since 2004, the CPC Central Committee, the State Council attached great importance to the “three rural” issue, “Food”, agriculture is a major event livelihood, but also the people's survival plan. At present, agriculture is no longer just a productive sectors, it carries more social security, environmental protection and other functions. Agricultural production situation not only related to solve the “three rural” issue, but also a direct impact on achieving macroeconomic objectives of the intrinsic link mechanism of China's agricultural production and economic growth, empirical analysis has very important significance. Currently, agricultural production and promote economic growth theory to explain the main development economics agricultural surplus theory[1]. Comparative literature representative has Chen Xi, MengJie, according to 1952-2003 data on empirical analysis of long-term fluctuations of agricultural production and macroeconomic relations, the establishment of inter-sectoral equilibrium model to analyze the link agricultural production fluctuations and macroeconomic variables other sectors and contribution, studies have shown that fluctuations in agricultural production between macroeconomic volatility and strong interactions[3].

II. CURRENT SITUATION OF AGRICULTURE AND LOCAL ECONOMY IN MAOMING

Maoming region economy maintained steady and rapid development in recent years, made a positive contribution for the promotion of the province regional harmonious development. In 2012, the city's GDP totaled 174.531 billion yuan, continue to maintain its leading position in the northwest region of Guangdong, is derived from the cities and counties in the fiscal and taxation total income of 32.716 billion yuan, in the north region forefront. GDP 5 years grew by an average of 11.4% a year, financial general budget revenue grew by an average of 20.8% a year for five years, were higher than the entire province average level. From the point of the data in table I to table II, from 2007 to 2011, Maoming region GDP and per capita GDP growth trend year by year, smooth growth. Industrial production, animal husbandry, fishery output also showed a trend of growth, stable growth; Whole society fixed assets investment in addition to the declined in 2007, 2008 - 2011 are on the rise, and was bigger. Overall, 2001 - 2011 Maoming region of the national economy development situation is good, there is a growing tendency, better progressly. The data is showed in table I.

<table>
<thead>
<tr>
<th>Year</th>
<th>Gross Domestic Product (One hundred million yuan)</th>
<th>The First Industry (One hundred million yuan)</th>
<th>The Second Industry (One hundred million yuan)</th>
<th>The Third Industry (One hundred million yuan)</th>
<th>GDP refers to the number</th>
<th>Month-on-month growth (%)</th>
<th>Month-on-month growth (%)</th>
<th>Month-on-month growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>997.08</td>
<td>198.89</td>
<td>403.29</td>
<td>367.89</td>
<td>394.9</td>
<td>13.1</td>
<td>4.5</td>
<td>16.6</td>
</tr>
<tr>
<td>2008</td>
<td>1177.84</td>
<td>230.34</td>
<td>477.95</td>
<td>442.37</td>
<td>469.5</td>
<td>9.8</td>
<td>2.9</td>
<td>7.1</td>
</tr>
<tr>
<td>2009</td>
<td>1231.25</td>
<td>240.44</td>
<td>460.79</td>
<td>426.79</td>
<td>530.0</td>
<td>10.3</td>
<td>5.3</td>
<td>5.2</td>
</tr>
<tr>
<td>2010</td>
<td>1492.09</td>
<td>274.52</td>
<td>590.76</td>
<td>550.72</td>
<td>626.8</td>
<td>14.1</td>
<td>4.2</td>
<td>14.1</td>
</tr>
<tr>
<td>2011</td>
<td>1745.31</td>
<td>319.27</td>
<td>696.66</td>
<td>645.80</td>
<td>729.3</td>
<td>10.8</td>
<td>4.2</td>
<td>13.4</td>
</tr>
</tbody>
</table>
III. MAOMING AGRICULTURE RELATIONSHIP WITH THE LOCAL ECONOMIC GROWTH

Can be seen from the figure 1 in recent years in Maoming economy unceasing development, the growth of agricultural production in Maoming industry constantly, Maoming's gross domestic product (GDP) growth from 41.736 billion yuan to 41.736 billion yuan, Maoming amount of main agricultural products are grown from 114.5726 million tons to 114.5726 million tons. Almost in both increased year by year, and from the figure shows the two possible positive correlation. Output of major agricultural products (X is Maoming, Y is Maoming gross domestic product (GDP))

![Graph](image)

Fig. 1. Economic growth in Maoming

IV. DATA COLLECTION AND MODELING

A. Data Collection

<table>
<thead>
<tr>
<th>Year</th>
<th>The first industry</th>
<th>The second industry</th>
<th>The third industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>417.36</td>
<td>125.91</td>
<td>114.72</td>
</tr>
<tr>
<td>2001</td>
<td>485.34</td>
<td>126.46</td>
<td>117.86</td>
</tr>
<tr>
<td>2002</td>
<td>537.72</td>
<td>139.25</td>
<td>121.78</td>
</tr>
<tr>
<td>2003</td>
<td>610.78</td>
<td>155.81</td>
<td>135.73</td>
</tr>
<tr>
<td>2004</td>
<td>685.16</td>
<td>174.33</td>
<td>149.15</td>
</tr>
<tr>
<td>2005</td>
<td>738.35</td>
<td>198.89</td>
<td>158.73</td>
</tr>
<tr>
<td>2006</td>
<td>827.95</td>
<td>210.25</td>
<td>167.44</td>
</tr>
<tr>
<td>2007</td>
<td>927.95</td>
<td>235.82</td>
<td>181.89</td>
</tr>
<tr>
<td>2008</td>
<td>1023.15</td>
<td>264.69</td>
<td>196.15</td>
</tr>
<tr>
<td>2009</td>
<td>1177.84</td>
<td>291.03</td>
<td>211.89</td>
</tr>
<tr>
<td>2010</td>
<td>1213.25</td>
<td>324.44</td>
<td>226.79</td>
</tr>
<tr>
<td>2011</td>
<td>1492.09</td>
<td>375.48</td>
<td>262.86</td>
</tr>
<tr>
<td>2012</td>
<td>1745.31</td>
<td>425.91</td>
<td>299.38</td>
</tr>
</tbody>
</table>

We can see the economic data in Maoming from table II to table III.

B. Model Design

With a gross domestic product (GDP) (y) of Maoming economic measure, on behalf of economic growth; Main agricultural output in Maoming (Xi) measure of agricultural growth. Using the data regression analysis.

Regression model is set as follows:

We can see the economic data in Maoming from table II to table III.
\[ Y = \beta_1 + \beta_2 X_1 + u \]

\( Y \) represents gross domestic product (GDP) of Maoming, the \( X_1 \) output of major agricultural products on behalf of Maoming, \( u \) on behalf of the random perturbation terms. Based on the regression analysis of the model, it can be concluded that variable relationship with changes in China's economic growth.

V. ESTIMATION AND TEST MODELS

A. Model Estimation

A preliminary estimate model:

\[
\begin{array}{l}
\text{TABLE V. THE PRELIMINARY ESTIMATE RESULTS} \\
\text{Dependent Variable: } Y \\
\text{Method: Least Squares} \\
\text{Date: 12/03/15 Time: 22:48} \\
\text{Sample: 2000 2012} \\
\text{Included observations: 13} \\
\end{array}
\]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-2079.036</td>
<td>407.8741</td>
<td>-5.097249</td>
<td>0.0003</td>
</tr>
<tr>
<td>X</td>
<td>0.204023</td>
<td>0.026810</td>
<td>7.610009</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

\[
\begin{array}{l}
R \text{-squared} \quad 0.840377 \quad \text{Mean dependent var} \quad 994.4162 \\
\text{Adjusted R \text{-squared}} \quad 0.825865 \quad \text{S.D. dependent var} \quad 492.6159 \\
\text{S.E. of regression} \quad 205.5658 \quad \text{Akaike info criterion} \quad 13.63005 \\
\text{Log likelihood} \quad 464830.3 \quad \text{Schwarz criterion} \quad 13.71696 \\
\text{F-statistic} \quad 57.91224 \quad \text{Durbin-Watson stat} \quad 0.491236 \\
\end{array}
\]

According to the calculation result of table IV regression analysis, the regression equation is:

\[
Y = 0.204023X - 2079.036 \\
R^2 = 0.840377, F = 57.91224 \\
\text{After the adjustment } R^2 = 0.825865, DW = 0.491236
\]

B. Text

1) Significance Testing

According to the above regression analysis, maoming agriculture and maoming local economic growth were positively correlated, and the practical significance.

2) Heteroscedasticity Inspection

Graphical method:

Can be seen from figure 2 residual squared E2 as explanatory variables log (X) the trend of the change is not obvious and there is no law, probably does not exist heteroscedastic model, but the existence of heteroscedasticity also should through the further inspection.

The ARCH inspection:

\[
\begin{array}{l}
\text{TABLE VI. THE ARCH RESULTS} \\
\text{Dependent Variable: } Y \\
\text{Method: ML-ARCH (Marquardt) - Normal distribution} \\
\text{Date: 12/04/15 Time: 15:25} \\
\text{Sample: 2000 2012} \\
\text{Included observations: 13} \\
\text{Failure to improve Likelihood after 25 iterations} \\
\text{Presample variance: backcast (parameter = 0.7)} \\
GARCH = C(3) + C(4)\cdot RESID(-1)^2 + C(5)\cdot GARCH(-1) \\
\end{array}
\]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>z-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-1597.496</td>
<td>186.2093</td>
<td>-8.579034</td>
<td>0.0000</td>
</tr>
<tr>
<td>X</td>
<td>0.164995</td>
<td>0.011876</td>
<td>13.89258</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

\[
\begin{array}{l}
\text{Variance Equation} \\
C \quad 23190.33 \quad 15900.26 \quad 1.458487 \quad 0.1447 \\
RESID(-1)^2 \quad 3.881057 \quad 7.237019 \quad 0.536278 \quad 0.5918 \\
GARCH(-1) \quad -1.063694 \quad 0.874238 \quad -1.216709 \quad 0.2237 \\
\end{array}
\]

\[
\begin{array}{l}
R \text{-squared} \quad 0.759096 \quad \text{Mean dependent var} \quad 994.4162 \\
\text{Adjusted R \text{-squared}} \quad 0.737195 \quad \text{S.D. dependent var} \quad 492.6159 \\
\text{S.E. of regression} \quad 205.5658 \quad \text{Akaike info criterion} \quad 13.63005 \\
\text{Log likelihood} \quad 464830.3 \quad \text{Schwarz criterion} \quad 13.71696 \\
\text{Durbin-Watson stat} \quad 0.287493
\end{array}
\]
From the table V can get the data: 
\[(n - p)R^2 = 9.868246\]  
Look-up table to \(\chi^2(p) = 12.88984\), \((n - p)R^2 = 9.868248 < \chi^2(p) = 12.88984\)  
Received the original assumption, there is no heteroscedasticity.

C. Autocorrelation Correction

Graphic method:

![Graph](image)

Fig. 3. Relationship between e with e(-1)

As can be seen from the figure 3 obvious residual et, show that U haven't related to the random error.

The final regression model: \(Y = 0.204023X - 2079.036\)  
\(R^2 = 0.759096, \ F = 57.91224, \ DW = 0.287493\)

Shows that in the case of other conditions unchanged, Maoming main agricultural production increase of 14.5023 million tons, Maoming local GDP increase of 100 million yuan.

VI. CONCLUSION ANALYSIS AND POLICY RECOMMENDATIONS

A. Conclusion Analysis

1. Maoming agriculture positively correlated with the local economic growth, the development of Maoming agriculture has promoted to the local economic growth, agricultural production and economic growth between the long-term stability of the dynamic equilibrium relationship. Pull function on the economic growth of agricultural production is quite large, agricultural output value of every increase of 14.5023 million tons, will promote the economic growth of 100 million yuan.

2. In the end use econometric method to eliminate the heteroscedastic model, finally get the statistical test, and high goodness of fit of the model.

3. Error correction model, the results showed that the short-term changes of agricultural production has significant positive effect on economic growth, economic growth after the interference to faster adjustment to its long-term growth path.

B. Policy Suggestion

The government should be more perfect and more benefit farming policy, attaches great importance to the development of agriculture, increasing farmers' income, improve the living standards of farmers, narrow the gap between rich and poor. The development of agriculture is the foundation of country, agriculture is the country's future and the development, as Maoming, has a unique natural resource conditions, more should vigorously develop agriculture, to better support the development of other industries, continuously improve the economic level of Maoming.

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