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Research on the Influencing Factors of Gross Domestic Product in Jiangxi Province

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Abstract: *This paper is used the principal component analysis method to explore the relationship between 10 indicators and economic growth, including fixed investment, fiscal revenue, fiscal expenditure, total import, and export value, resident consumption level, financial investment in science and technology, the proportion of total labor resources in the population, and gender ratio. Results are indicated that all the above indicators have an impact on GDP. The first principal component is the comprehensive human level of economic development, and the second is the gender ratio. This paper analyzes the impact of different economic indicators on GDP, and it provides policy suggestions for economic development to promote the economic growth of Jiangxi Province.*

Keywords: *Jiangxi Province; Economic Development; Principal Component Analysis; Influence Factor*

1. Introduction

Based on the 19th CPC National Congress report, "We must unswervingly implement the new concept of development, resolutely correct the concept of development, change the mode of development, and constantly improve the quality and efficiency of development." Jiangxi Province actively responds to the nation, devoting major efforts to developing the economy. Meanwhile, the state-issued several Opinions of the CPC Central Committee and The State Council on Promoting the rise of the Central Region in 2006 to support the rise of the central region.

Jiangxi Province is located in the middle part of southeast China and within the radiation range of several economic belts and urban circles. It has obvious advantages in undertaking industrial transfer and carrying out production capacity cooperation. Moreover, Jiangxi is rich in natural resources and provides unique advantages in developing agriculture. This paper explores the influence factors of GDP through principal component analysis, which aims to provide policy suggestions and measures for the economic growth of Jiangxi Province.

2. Literature Review

Many domestic research scholars have investigated the influence factors of the GDP of Jiangxi. For example, Zhou Pengchao et al. [1] proposed a multiple linear regression model for Jiangxi's GDP, total retail sales of social consumer goods, total fixed assets of the whole society, and fiscal expenditure. It was shown that the growth of total retail sales of social consumer goods, total fixed assets of the whole society, and fiscal expenditure promoted the growth of Jiangxi's GDP. Tian Bin [2] used a multiple linear regression model using the data of Jiangxi Province's GDP, total retail sales of consumer goods, total fixed assets of the whole society, and fiscal expenditure from 1978 to 2011. It is concluded that the primary industry, especially the industry, plays a high role in promoting the economy. The secondary industry plays a major role in promoting economic growth, and the tertiary industry has a small impact on GDP. Chi Zixian et al. [3] introduced fiscal S&T input into the production function, and it was concluded that S&T activity personnel and fiscal S&T input had an important driving force for the economic growth of Jiangxi Province. Shi Xuefang et al. [4] proposed a time series regression model to explore the relationship between DGP and FDI data in Jiangxi Province. It is demonstrated that FDI can promote economic development to a certain extent, and stable economic development is attracting FDI. GDP and total retail sales of social consumer goods in Jiangxi Province are studied by Jan [5], including the total amount of foreign direct investment, total investment in fixed assets, the residents' consumption level, the relationship between the total exports. The results were indicated that total retail sales of social consumer goods had the most significant influence on GDP. The total fixed-asset investment to GDP

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takes second place, which influences other impacts on GDP.

In conclusion, most of the above are local analysis on the influencing factors of GDP in Jiangxi Province, and there are few studies on the overall macro-economic situation. In this paper, the principal component analysis method is used to explore the influencing factors of GDP in Jiangxi Province, which is from the economic structure, financial expenditure, foreign trade, labor level, and other dimensions,

3. Data Selection

To construct the economic development index system of Jiangxi Province and explore the relationship between various factors and economic development, based on the reading of relevant scholars' literature and the analysis of the actual situation. This paper selects 10 indicators of Jiangxi Province from 2005 to 2019, including fixed investment, fiscal revenue, fiscal expenditure, total import and export value, resident consumption level, fiscal investment in science and technology, the proportion of total labor resources in population, and gender ratio. All the data as mentioned above are from the Statistical Yearbook of Jiangxi Province from 2005 to 2019.

Table 1 and 2 is illustrated that industrial added value increases steadily year by year. With the fastest growth rate from 2019 to 2011, it reached nearly 900 billion yuan in 2019. Grain output both approached 20 million tons, which exceeded 20 million tons in 2011. The fixed investment amount increased, and the growth rate increased year by year since 2009. Fiscal revenue and expenditure increased yearly. Total import and export volume is rising, and foreign trade is expanding gradually. The level of consumption is rising year by year, and people's living conditions are getting better and better. Government departments have paid more and more attention to the development of science and technology. The proportion of the total labor resources in the population is increasing, which is remained at about 78.4% in recent years. The gender ratio mark has remained at around 105 percent in recent years.

Table 1: The main economic indicators of Jiangxi Province from 2005 to 2019 (1)

Year	GDP (100 million yuan)	Industrial added value (100 million yuan)	Grain output (10,000 tons)	Fixed investment (100 million yuan)	Fiscal revenue (100 million yuan)	Fiscal expenditure (100 million yuan)
2005	3941.23	1468.7	1853.86	2168.97	425.90	563.95
2006	4696.8	1923	1896.52	2683.57	518.61	696.44
2007	5777.62	2435.5	1904.21	3301.94	665.22	905.06
2008	6934.2	2936.9	1958.1	4345.43	816.99	1210.07
2009	7629.98	3232.5	2002.56	5693.14	928.88	1562.37
2010	9383.16	4327.3	1954.7	7164.63	1226.24	1923.26
2011	11584.52	5462.3	2052.79	8737.60	1645.00	2534.6
2012	12807.69	5889.2	2084.84	10774.16	2046.15	3019.22
2013	14300.17	6523.3	2116.1	12850.25	2358.43	3470.3
2014	15667.78	6930.7	2143.5	15079.26	2680.96	3882.7
2015	16780.89	7026.2	2148.7	17388.13	3021.83	4412.55
2016	18388.59	7349.3	2234.4	19694.21	3143.02	4617.4
2017	20210.78	7969.6	2221.73	22085.34	3447.72	5111.47
2018	22716.51	8264.2	2190.7		3795.79	5667.52
2019	24757.5	8774.2	2157.45		4001.56	6386.8

Table 2: The main economic indicators of Jiangxi Province from 2005 to 2019 (2)

Year	GDP (100 million yuan)	Total import and export value (100 million yuan)	Household consumption level (yuan)	Fiscal investment in science and technology (100 million yuan)	The proportion of total labor resources in the population (%)	Gender ratio	Fiscal investment in science and technology (100 million yuan)
2005	3941.23	406.46	3693	2.21	72.6	103.6	2.21
2006	4696.8	619.49	4052	5.70	74	104.69	5.70
2007	5777.62	944.85	4665	8.74	75.3	105.15	8.74
2008	6934.2	1361.79	5692	11.14	76.2	105.45	11.14
2009	7629.98	1277.88	6172	13.40	77	105.15	13.40
2010	9383.16	2161.92	7873	18.26	76.6	106.65	18.26
2011	11584.52	3146.88	9345	21.32	77.5	106.36	21.32
2012	12807.69	3341.38	10378	27.50	77.6	106.1	27.50
2013	14300.17	3674.66	11834	46.32	77.9	105.97	46.32
2014	15667.78	4273.08	13139	58.37	78.2	105.76	58.37
2015	16780.89	4239.96	14445	74.79	78.4	105.48	74.79
2016	18388.59	4002.84	15909	83.12	78.5	105.36	83.12
2017	20210.78	4433.90	17467	120.09	78.4	105.29	120.09
2018	22716.51	4818.76	19941	147.09	78.3	105.28	147.09
2019	24757.5	5088.98	22447	182.92	78.3	105.22	182.92

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4. Model Selection

For the 10 economic indicators selected in this paper, it is difficult to determine the main influencing factors of GDP and the secondary influencing factors by subjective analysis. Therefore, whether there is an internal connection between the indicators, principal component analysis is adopted.

Principal component analysis (PCA) is a simplified method to analyze the complex relationship among variables. The significance depends on several unrelated comprehensive indicators to represent the original indicators.

The mathematical model of principal component analysis is described in detail as follows: P index vectors of the data matrix and X are used for linear combination. The comprehensive index vectors are:

$$F_1 = u_{11}X_1 + u_{21}X_2 + \cdots + u_{p1}X_p$$

$$F_2 = u_{12}X_1 + u_{22}X_2 + \cdots + u_{p2}X_p$$

$$\cdots$$

$$F_p = u_{1p}X_1 + u_{2p}X_2 + \cdots + u_{pp}X_p$$

The above equations require that the sum of the squares of coefficients of each equation is 1, and each F component is not correlated. Its variance is the maximum variance of the stage with increasing its subscript number.

5. Empirical Analysis

(1) KMO test and Bartlett sphericity test

SPSS25.0 was used for the KMO test and Bartlett sphericity test. The KMO test value was 0.792>0.5, and the Bartlett sphericity test p-value was <0.001, which was indicated that principal component analysis could be performed. The specific results are summarized in Table 3.

Table 3: SPSS test data

KMO and Bartlett tests		
KMO sampling suitability		0.792
Bartlett sphericity test	The approximate chi-square	384.725
	degrees of freedom	55
	significance	0.000

(2) Principal component analysis

It can be obtained from Table 4 that GDP has a highly significant relationship with industrial added value, grain output, fixed asset investment, fiscal revenue, fiscal expenditure, total import and export, resident consumption level, financial investment in science and technology, and the proportion of total labor resources in the population, as well as gender ratio. The first two features account for 98.129%, and the cumulative contribution rate is greater than 85%. The eigenvalues are greater than 1, so two principal components are extracted. Meanwhile, the lithotripsy diagram is shown in Figure 1, which indicates that it is appropriate to extract two principal components.

Table 4: Analysis table of explanatory variables

Composition	Initial eigenvalue			Extract the sum of squares of loads		
	Total	Percentage of variance	Accumulation%	Total	Percentage of variance	Accumulation%
1	9.731	88.463	88.463	9.731	88.463	88.463
2	1.063	9.665	98.129	1.063	9.665	98.129
3	0.102	0.930	99.059			
4	0.078	0.706	99.765			
5	0.016	0.149	99.914			
6	0.006	0.056	99.970			
7	0.002	0.015	99.985			
8	0.001	0.010	99.995			
9	0.000	0.003	99.998			
10	0.000	0.001	99.999			
11	6.376E-5	0.001	100.000			

Extraction method: principal component analysis.

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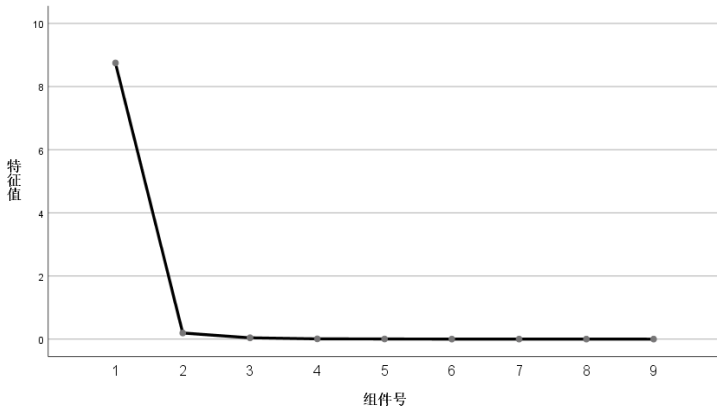

Figure 1: Lithotripsy diagram

It can be found from Table 5 that industrial output, food production, investment in fixed assets, fiscal revenue, fiscal expenditure, the total value of import and export, the residents' consumption level, the fiscal expenditure on science and technology, labor resources, the total accounted for the proportion of the population are on the first principal component with a high load. Namely, the first principal component reflects these basic index information named as "the comprehensive level of economic development." The gender ratio index has a load greater than 0.7 on the second principal component, which negatively correlated with GDP. The second principal component reflects the information of the gender ratio index, which is named "gender ratio."

Table 5: Principal component factor load matrix

Index	1	2
GDP(100 million yuan)	0.998	-0.055
Industrial added value (100 million yuan)	0.993	0.074
Grain output (10k tons)	0.984	-0.047
Fixed investment (100 million yuan)	0.983	-0.173
Fiscal revenue (100 million yuan)	0.991	-0.113
Financial expenditure (100 million yuan)	0.995	-0.087
Consumer consumption level (yuan)	0.993	-0.107
The proportion of total labor resources to population (%)	0.910	0.332
Gender ratio (%)	0.466	0.874
Total import and Export value (100 million yuan)	0.980	0.096
A total of 100 million yuan was invested in science and technology	0.922	-0.327

Extraction method: principal component analysis.

6. Conclusion

Recently, Jiangxi Province would like to develop its economy. First of all, it needs to stimulate domestic demand and stimulate the growth of resident consumption. Government departments should introduce relevant supportive policies to cultivate consumption hot spots and expand the scope of consumption. The social security system is established and improved to promote employment. Secondly, it is an inevitable trend of globalization to gradually expand the opening to the outside world. Jiangxi Province should also introduce foreign investment, undertake industrial transfer, and develop production capacity cooperation.

Meanwhile, government departments should provide relevant policy support to reduce tariffs. It also can increase subsidies and promote foreign trade. Finally, Jiangxi Province should also put financial expenditure on the sustainability of development to further develop modern agriculture, promoting rural revitalization and improving the output of agricultural products and the output value of agricultural products. Industrial manufacturing can be developed to actively build industrial parks while avoiding inflation caused by excessive financial expenditure.

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