Comprehensive Economic Evaluation of Our Provinces Factor-based Analysis

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Abstract. According to the different conditions of the research objects, 10 indicators of economic representation in 2018 are selected for 31 provinces and cities in the country, and the objective and reasonable data analysis of economic indicators is carried out by using factor analysis method, and the ranking of provinces and cities in the country is obtained according to the level of their comprehensive evaluation scores. According to the score of provincial and municipal indicators, the economic situation of 31 provinces and cities in China is classified and analyzed. And put forward the feasibility suggestion to the economic imbalance of each province and city.
Keywords: Comprehensive development level; Factor analysis; Economic evaluation.

1. Introduction

Over the past 40 years of reform and opening up, our country has developed rapidly in all aspects, and has made remarkable great achievements. But in the continuous development and growth also more and more realize that economic growth is the result of all aspects, multi-factor comprehensive action, China's economic comprehensive strength to enhance the need for the joint efforts of provinces and cities, and economic comprehensive competitiveness is an effective measure of scientific and healthy economic level. Now the overall development situation is still uneven, and the differences between provinces and cities are great. Therefore, the analysis of the development situation of provinces and cities in China has certain benefits for the overall development trend of our country, and is also conducive to further strategic planning adjustment to promote coordinated development and common development in different regions.

2. Factor Analysis

The idea of factor analysis is to use dimensionality reduction to study the correlation coefficient matrix between the original variables, so that some related staggered variables are classified as a few comprehensive factors. This multivariate statistical analysis method is grouped according to the correlation intensity between the original variables, so that the correlation between the variables of the same group is relatively high, and there is only a lower correlation between the groups of variables. each set of variables represents a native structure, which is called a common factor and is represented by an unpredictable synthetic variable.

3. Establishment of A System of Indicators Affecting Economic Levels

This paper takes the economic development of 31 provinces and cities in 2018 as the research object, and selects the following 10 indicators as the original index. X1 secondary industry added value (100 million yuan); X2 tertiary industry added value (100 million yuan); X3 local general budget revenue (100 million yuan); total retail sales of X4 consumer goods (100 million yuan); average annual wages of employed persons in urban units (100 million yuan); number of industrial enterprises above X6 scale (10 million people); employment of urban units (10 million people); gross X8 product (100 million yuan); X9 per capita region GDP (yuan/person); X10 local finance general budget expenditure (100 million yuan). However, the impact of the added value of primary industry on the level of urban economic development is relatively low, so this paper does not discuss it. the data were derived from the statistics bureau of china, as shown in table 1.

Table 1. Statistical tables of raw data.

region	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
Beijing	5477.35	27508.06	5785.92	11747.7	145766	3197	819.3	33105.97	153095	7471.43
Tianjin	4835.3	8352.32	2106.24	5533	100731	4292	259.99	13362.92	85757	3103.16
Hebei Province	12904.06	16251.96	3513.86	16537.1	68717	14943	550.34	32494.61	43108	7726.21
Shanxi Province	7074.46	8142.92	2292.7	7338.5	65917	3875	425.82	15958.13	43010	4283.91
Inner Mongolia	6335.38	8054.7	1857.65	7311.1	73835	2832	272.43	16140.76	63772	4831.46
LiaoningProvince	9048.96	12441.02	2616.08	14142.8	67324	6621	501.63	23510.54	53872	5337.72
Jilin Province	4051.52	6041.58	1240.89	7520.4	68533	5963	279.32	11253.81	41516	3789.59
Heilongjiang Province	3535.97	6309.34	1282.6	9317.4	60780	3740	392.66	12846.48	33977	4676.75
Shanghai	10360.78	25546.26	7108.15	12668.7	140400	8130	640.67	36011.82	148744	8351.54
Jiangsu Province	42129.37	46936.47	8630.16	33230.4	84688	45675	1472.59	93207.55	115930	11657.35
Zhejiang Province	25308.13	30718.83	6598.21	25007.9	88883	40586	1013.53	58002.84	101813	8629.53
Anhui Province	14094.44	17278.47	3048.67	12100.1	74378	19421	592.33	34010.91	54078	6572.15
Fujian Province	18847.75	17461	3007.41	14317.4	74316	17470	705.36	38687.77	98542	4832.69
Jiangxi Province	10081.16	10758.02	2373.01	7566.4	68573	11630	435.74	22716.51	49013	5667.52
Shandong Province	27523.67	34174.68	6485.4	33605	73593	38333	1128.95	66648.87	66472	10100.96
Henan Province	22038.56	23586.21	3766.02	20594.7	63174	22081	967.34	49935.9	52114	9217.73
Hubei Province	17573.87	20899.91	3307.08	18333.6	73777	15598	653.35	42021.95	71109	7258.27
Hunan Province	13904.11	19341.39	2860.84	15638.3	70221	16055	546.27	36329.68	52809	7479.61
Guangdong Province	41398.45	54710.37	12105.26	39501.1	88636	47456	1994.14	99945.22	88781	15729.26
Guangxi	6692.87	9913.85	1681.45	8291.6	70606	6058	386.78	19627.81	40012	5310.74
Hainan Province	1053.14	2871.59	752.67	1717.1	75885	337	99.58	4910.69	52801	1691.3
Chongqing	8842.23	11367.89	2265.54	7977	78928	6772	391.2	21588.8	69901	4540.95
Sichuan Province	16056.94	22417.73	3911.01	18254.5	77686	14205	780.64	42902.1	51556	9707.5
Guizhou Province	5506.24	7690.95	1726.85	3971.2	78316	5583	308.54	15353.21	42767	5029.68
Yunnan Province	7267.5	11114.46	1994.35	6826	75701	4260	427.03	20880.63	43366	6075.03
Tibet	582.72	837.33	230.35	597.6	116015	123	36.89	1548.39	45476	1970.68
Shaanxi Province	11215.27	10896.42	2243.14	8938.3	71983	6426	493.17	23941.88	62195	5302.44
Gansu Province	2761.64	4416.38	871.05	3428.3	70695	1917	246.68	8104.07	30797	3772.23
Qinghai Province	1093.72	1386.18	272.89	835.6	85379	586	62.72	2748	45739	1647.43
Ningxia	1488.13	1742.69	436.52	935.8	78384	1250	67.97	3510.21	51248	1419.06
Xinjiang	4657.16	6460.14	1531.42	3187	75457	3025	305.23	12809.39	51950	5012.45

4. Results Analysis

First, the data were KMO and Bartlett spherical, and the results were as follows:

Table 2. KMO and Bartlett checklists.

KMO and Bartlett inspections		
Kaiser-Meyer-Olkin measure of sampling adequacy		.778
Bartlett Sphericity Test	Approximate chi-square	757.323
	df	45
	Sig.	.000

KMO (Kaiser-Meyer-Olkin) test statistic is used to compare the simple correlation coefficient and partial correlation coefficient between variables. It is mainly used in factor analysis of multivariate statistics. KMO statistics are values between 0 and 1.Table 2 shows that the KMO test value is 0.778>0.5, and the Bartlett spherical test is to test whether the correlation matrix is a unit matrix. The results show that its adjoint probability value is 0.000<0.001, and the results reach a significant level. Therefore, the data collected in this study are suitable for factor analysis.

Table 3. Total variance explained

	Initial eigenvalue			Extraction squared load			Rotation squared load		
Composition	Total	Variance%	Cumulative%	Total	Variance%	Cumulative%	Total	Variance	Cumulative%
1	7.853	78.528	78.528	7.853	78.528	78.528	7.486	74.864	74.864
2	1.694	16.943	95.470	1.694	16.943	95.470	2.061	20.606	95.470
3	.208	2.078	97.549						
4	.117	1.173	98.722						
5	.041	.414	99.136						
6	.037	.374	99.510						
7	.029	.286	99.796						
8	.014	.139	99.936						
9	.006	.063	99.999						
10	.000	.001	100.000						

Extraction method: principal component analysis.

factor number is determined by the existing characteristic roots of the correlation coefficient matrix. in factor analysis, determining the number of factors is also an important work. Select the characteristic root whose value is greater than 1. From the table, it can be concluded that there are two characteristic roots greater than 1, and 95.470% of the total variance of the original variables is represented by these two common factors, so the extraction of these two common factors can well represent most of the information of the original variables, and further results can be obtained according to table 4.

Table 4. Matrix of Rotating Components

	Composition	
	1	2
X8	.986	.149
X4	.982	.059
X1	.982	.028
X7	.971	.176
X6	.961	.003
X2	.949	.306
X10	.940	.150
X3	.893	.412
X5	-.073	.970
X9	.367	.881

Extraction method: principal component analysis.
Rotary method: orthogonal rotation method with Kaiser standardization.
a. rotation converges after 3 iterations.

According to the results of factor orthogonal rotation matrix, we can see:
1. The variables with higher load on the first public factor include: the added value of the secondary industry, the added value of the tertiary industry, the local general budget revenue, the total retail sales of consumer goods, the number of industrial enterprises above scale, the number of urban units employed, the regional gross domestic product, and the general budget expenditure of local finance. Since the first public factor mainly explains these variables, this public factor is named as the level of social development, with a contribution rate of 74.864%.
2. The variables with a higher load on the second public factor include: the annual average wage of employed persons per unit of town, the per capita regional gross domestic product explained mainly by the second public factor above these variables, public factor is named as the level of economic development. Its contribution rate is 20.606%.

5. Factor Comprehensive Evaluation Score

To be able to make a reasonable comprehensive evaluation of the economic development of the provinces and cities in the whole country, we can use SPSS17.0 and EXCEL to calculate the scores of the two factors, which reflect the economic level of the provinces and cities in the whole country from the level of social development and the level of economic development, respectively. In order to carry out further comprehensive evaluation, two common factors are required to divide the contribution rate of their respective variance by the cumulative contribution rate, so that the ratio can be obtained as a weight weighted calculation of the comprehensive score, and the following formula can be obtained:

$$F = 0.7842F_1 + 0.2158F_2$$

Through certain calculation, we can get the ranking of the comprehensive evaluation score of factors in all provinces and cities in the country. As shown in table 5 below:

region	FACT-1	Ranking	FACT-2	Ranking	F	Ranking
Beijing	-0.33462	16	3.42066	1	0.47652048	7
Tianjin	-0.83213	27	0.98196	3	-0.44028656	20
Hebei Province	0.31142	9	-0.71404	29	0.08992064	13
Shanxi Province	-0.39838	20	-0.65439	27	-0.45367816	22
Inner Mongolia	-0.5342	22	-0.13507	11	-0.44798792	21
LiaoningProvince	-0.10404	12	-0.51974	22	-0.1938312	14
Jilin Province	-0.57617	24	-0.6489	26	-0.59187968	26
Heilongjiang Province	-0.44123	21	-0.97376	31	-0.55625648	25
Shanghai	-0.13511	13	3.17096	2	0.57900112	5

Jiangsu Province	2.35497	2	0.51628	6	1.95781296	2
Zhejiang Province	1.2566	4	0.54281	5	1.10242136	4
Anhui Province	0.23119	11	-0.41839	20	0.09088072	12
Fujian Province	0.24177	10	0.19829	8	0.23237832	10
Jiangxi Province	-0.1671	14	-0.57583	24	-0.25538568	16
Shandong Province	1.69709	3	-0.47966	21	1.226912	3
Henan Province	0.96123	5	-0.88081	30	0.56334936	6
Hubei Province	0.44443	7	-0.21153	14	0.30274264	9
Hunan Province	0.31756	8	-0.55764	23	0.1285168	11
Guangdong Province	3.02597	1	0.34579	7	2.44705112	1
Guangxi	-0.34439	18	-0.61931	25	-0.40377272	19
Hainan Province	-1.04646	28	-0.18387	13	-0.86014056	28
Chongqing	-0.385	19	0.07306	9	-0.28605904	17
Sichuan Province	0.58877	6	-0.34708	18	0.3866264	8
Guizhou Province	-0.55691	23	-0.31963	17	-0.50565752	23
Yunnan Province	-0.3396	17	-0.39229	19	-0.35098104	18
Tibet	-1.36273	31	0.80495	4	-0.89451112	29
Shaanxi Province	-0.21907	15	-0.27173	16	-0.23044456	15
Gansu Province	-0.75374	26	-0.6979	28	-0.74167856	27
Qinghai Province	-1.15844	30	-0.04866	10	-0.91872752	31
Ningxia	-1.10453	29	-0.16047	12	-0.90061304	30
Xinjiang	-0.63715	25	-0.24407	15	-0.55224472	24

6. Conclusions

Overall, the economy is the result of a combination of factors. The following are three categories of provinces according to the overall score ranking and a brief discussion:

Provinces and cities with strong economic strength

According to the results of comprehensive score, the provinces and cities with strong comprehensive strength are Guangdong, Jiangsu, Shandong, Zhejiang, Shanghai, Henan and Beijing. From the geographical position, these provinces and cities generally have good location advantages, land, land and air transportation is convenient, personnel mobility is also high, urbanization level is generally high, labor force is sufficient, so that economic development is full of vitality. At the same time, the industrial structure is relatively reasonable, and the tertiary industry is more developed. In terms of the public factor scores, these provinces and cities have higher scores in both public factor scores, and because of their potential advantages of geographical location and resource conditions, they are in a certain public. The co-factor score is ahead of other provinces and cities, and the development is more balanced, so the comprehensive evaluation score is also in the forefront.

Provinces with intermediate economic strength

The provinces and cities in the middle are mainly concentrated in Hunan Province, Anhui Province, Hebei Province, Liaoning Province and Shaanxi Province. Such provinces and cities are rich in resources, industry and characteristic agriculture are more developed, transportation is relatively convenient, often there is a pillar industry developed and other industries backward phenomenon, so the per capita economic level is not high. In terms of factor scores, there are few provinces and cities with a public factor score of more than 1, which shows that these provinces and cities have no outstanding performance in economic, social and trade aspects, but their overall score ranking is still in the middle and upper reaches mainly due to the comprehensive balance of the development of these provinces and cities A higher degree.

Provinces and cities with low economic strength

The provinces and cities with lower economic strength are mainly distributed in Ningxia Hui Autonomous Region, Tibet Autonomous Region, Gansu Province, Qinghai Province and Hainan Province. However, the Tibet Autonomous Region ranks higher on the second public factor, which is related to its unique geographical location and personnel distribution. But these provinces and cities are still in a relatively backward state in overall development, neither the more leading pillar industries or development industries, but also lack their own development positioning, at the same time, because of their own location, transportation and resources of the disadvantage of their economic development and competition is more difficult.

From the overall situation, there is a serious imbalance in the development level of our provinces and cities. In order to improve the overall social development level of our country and promote the overall economic development of each province and city, it is necessary to increase the support to the backward areas, increase the investment of funds, and improve the development ability of the backward areas. The local government should increase investment, introduce talents and raise the level of economic development. We should also have a reasonable economic structure, through the effective allocation of resources in the region, multi-factor and all aspects of cooperation, so as to obtain economic benefits and social development of a meso-oriented regional economy. The provinces and municipalities make full use of their own resources and give full play to their advantages Special ability, integration and coordination of the elements of the basis, to present a comparative advantage over other provinces and cities. Only in this way can all provinces be able to improve their level of economic development and China's comprehensive strength will be further strengthened.

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