

Analysis and Decision of Regional Economic Vitality and Its Influencing Factors

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Keywords: Regional economic vitality; influencing factors; regression analysis; linear simulation

Abstract: Based on the problem of regional economic vitality and its influencing factors, this paper introduces how to grasp the key factors and effectively improve the regional economic vitality. We first establish a reasonable model of the influencing factors of economic vitality and study the action plan to improve the regional economic vitality. Through correlation analysis, partial correlation analysis, and conduct independence test of independent variables to exclude their mutual influence. Then we analyze the short-term and long-term impact of economic policy transformation on regional (urban or provincial) economic vitality. Next the relevant model is obtained, and through regression analysis, linear simulation, continuous fitting, error analysis to get the appropriate mathematical model, and finally get the order of the city economic vitality. At last, it provides development suggestions for the region (city or province). By observing the influence of various factors on economic vitality, we can judge its weight, change the parameters with greater influence, and enhance regional competitiveness.

1. Introduction

Regional economic vitality is an important part of regional comprehensive competitiveness. In recent years, in order to improve economic vitality, some regions have introduced a lot of preferential policies to stimulate economic vitality, such as reducing the procedures for the approval of investment, providing financial support for starting businesses, and lowering the threshold for settling down in order to attract talents[1]. However, due to the different distribution of resources, these policies have different effects in different regions. How to grasp the key factors and effectively improve the regional economic vitality is a worthy research topic.

2. Establishment and Solution of the Model of Factors Affecting Economic Vitality

2.1 Model Establishment

Regional economic vitality is affected by a variety of factors. Based on the analysis of 7 cities in the eastern region, this paper establishes a relational model to study the factors affecting the economic vitality and the action plan to improve the economic vitality in the eastern region. Analyze the impact of the action plan on changing the economic vitality of the eastern region from the perspective of demographic trends and changes in business dynamics. According to the displacement formula $x=v_0t+1/2at^2$, establish the model for the prototype:

$$F=A*E+1/2*C\Delta E^2$$

Where F represents index of economic vitality; A represents the number of enterprises; C represents growth rate of the number of enterprises; E represents resident population; ΔE represents increase in permanent population.

2.2 Correlation Test

SPASS software is used to analyze the correlation between C and ΔE , and verify that they are not related, so as to verify the rationality of the model as two separate variables.

Since the population increment of permanent residents in the whole eastern region from 2009 to 2018 is not given, the permanent residents of 10 provinces in the eastern region from 2009 to 2018 are checked from the national bureau of statistics, and the mathematical transformation is made to figure out the permanent residents of the whole eastern region from 2009 to 2018 E and the population increment of E.

Table 1 Resident population of 10 provinces in the eastern region from 2009 to 2018[2]

provinces	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Beijing	1171	1860	1962	2019	2069	2115	2152	2171	2173	2171	2154
Hebei	6989	7034	7194	7241	7288	7333	7384	7425	7470	7520	7556
Tianjin	1176	1288	1299	1355	1413	1472	1517	1574	1562	1557	1560
Shandong	9417	9470	9855	9637	9685	9733	9789	9847	9947	10006	10047
Jiangsu	7762	7810	7869	7899	7920	7939	7960	7976	7999	8029	8051
Shanghai	2141	2210	2303	2347	2380	2415	2426	2415	2420	2418	2424
Zhejiang	5212	5276	5477	5463	5477	5498	5508	5539	5590	5657	5737
Fujian	3639	3666	3693	3720	3748	3774	3806	3839	3874	3911	3941
Guangdong	9893	10130	10441	10505	10594	10644	10724	10849	10999	11169	11346
Hainan	854	864	869	877	887	895	903	911	917	926	934
eastern region E	48254	51617	52972	53074	53473	53831	54183	54561	54967	55381	55768
ΔE	3363	1355	102	399	358	352	378	415	414	387	

SPASS was used to observe the scatter plot of C and ΔE , and it can be seen that the probability of correlation between C and ΔE is relatively small. The correlation coefficient calculated by software is 0.425, indicating that the correlation coefficient is relatively small. In the allowable error range, it can be used as two separate variables to verify the model variables successfully.

2.3 Model Solution

2.3.1 The fitting of A-BD Terms

It has been known that the number of enterprises is an important indicator of regional economic vitality. The number of enterprises has a direct impact on the availability of employment opportunities and the degree of promotion to the flow of resources. Therefore, we choose the number of enterprises as an important factor to analyze its impact on economic vitality. After consulting the data, we found that the survival rate and registered capital of enterprises have an impact on the number of enterprises. Enterprise survival rate is the ratio of the number of enterprises in each region to the number of enterprises registered. Obviously, the survival rate of enterprises in a region can well reflect the number of local enterprises. When the number of registered enterprises is certain, the higher the survival rate, the higher the number of enterprises. As for the impact of registered capital on the number of enterprises, we believe there are a variety of circumstances. The higher a company's registered capital, the stronger its ability to take risks, and the easier it is to survive. Secondly, the amount of registered capital can also affect the competition between enterprises. When a company has a lot of registered capital, becoming a "unicorn" will also depress other companies, and the number of companies that survive will naturally decline. At the same time, the number of permanent residents in a region has a lot to do with the number of local businesses. For rational analysis of data, logically represent their relationship. We first constructed the relationship between the number of enterprises, the survival rate and the registered capital of enterprises. As for the impact of resident population on the number of enterprises, after several analyses, we decided to place it on the economic vitality of enterprises together with the number of enterprises, which will be explained in the following paragraphs and

will not be repeated here. First, we tested the correlation between enterprise survival rate and registered capital, and made a scatter chart.

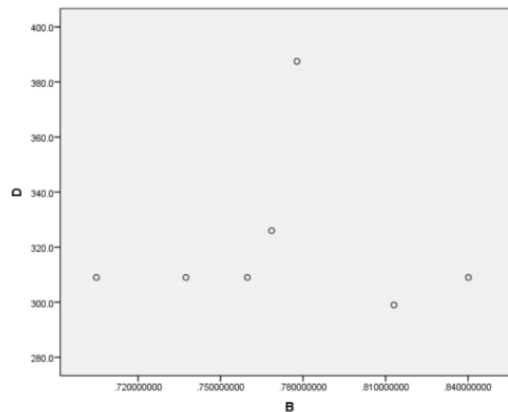


Figure 1 BD scatter plot

From the scatter diagram, it can be clearly seen that there is no significant relationship between enterprise survival rate and registered capital. Therefore, they are taken as two partial variables to reflect the number of enterprises. We continue to make the partial correlation test (ABD partial correlation test) between the number of enterprises and the survival rate of enterprises and the registered capital of enterprises, and assign weights according to the partial correlation coefficient between the number of enterprises and the survival rate of enterprises and the number of enterprises and the registered capital of enterprises, as the weight coefficient of these two variables to the number of enterprises. Then, the relationship between the number of enterprises, the survival rate and the registered capital of enterprises is constructed. We made a scatter chart (AD AB scatter chart) of the number of enterprises, the survival rate of enterprises and the registered capital of enterprises in turn, observed its possible trend through the scatter chart, and made a regression analysis to obtain its mathematical relationship. After observing the quadratic relationship between the number of enterprises and the survival rate of enterprises, and the quadratic relationship between the number of enterprises and the registered capital of enterprises, we made their regression analysis and obtained the relationship curve and equation(AD AB regression analysis) . Thus, the relationship between the number of enterprises, the survival rate and the number of enterprises registered is as follows: Through regression analysis, it is found that the difference between the two endpoint values is larger than the difference between the two real endpoint values. To make it more realistic, a correction factor is provided.

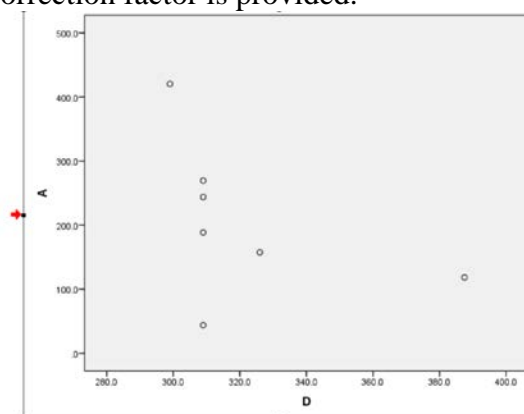


Figure 2 AD scatter plot

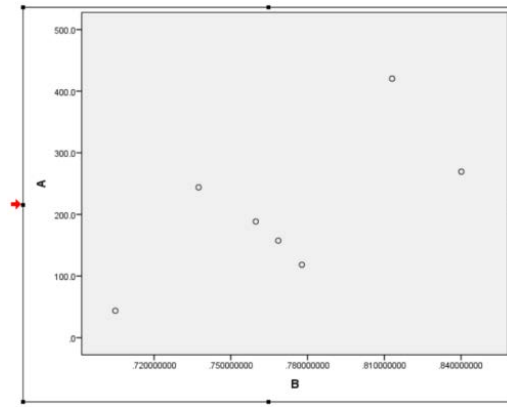


Figure 3 AB scatter plot

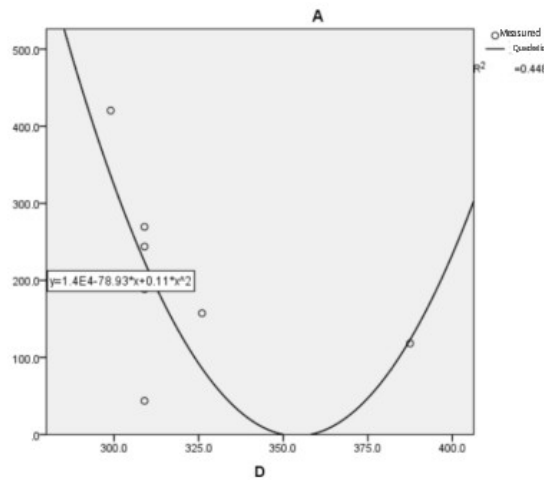


Figure 4 AD regression analysis, curve fitting

The fitting equation of A is:

$$F_{\text{fit}} = 0.445(14000 - 78.93 * D + 0.11 * D^2) + 0.555(-4060 + 9200 * B - 4750 * B^2)$$

Where B represents corporate survival rate; D represents distribution of registered capital.

Using Excel to calculate this formula, it was found that the difference value of the port was larger than the real deviation value, so the eccentricity factor under each fitting value was calculated.

Take the average value to the correction factor of 1.335, and then get the function relationship between A and BD as follows:

$$A = [0.445(14000 - 78.93 * D + 0.11 * D^2) + 0.555(-4060 + 9200 * B - 4750 * B^2)] * 1.335$$

Therefore, the model expression of F economic vitality factor is obtained:

$$F = A * E + 0.5 * C * \Delta E^2$$

That is:

$$F = 1.335[0.445(14000 - 78.93 * D + 0.11 * D^2) + 0.555(-4060 + 9200 * B - 4750 * B^2)] * E + 0.5 * C * \Delta E^2$$

2.3.2 Analysis of the Relationship between the Trend of Population Change and Economic Vitality

The population change trend is the change trend of E with the region. The average population of each region in ten years is used to represent the population of each region, and the curve is as shown in the figure.

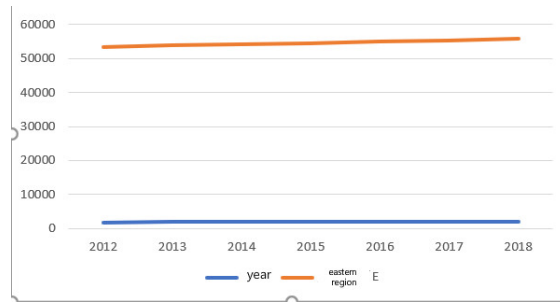


Figure 5 change trend of total resident population e over time in the eastern region

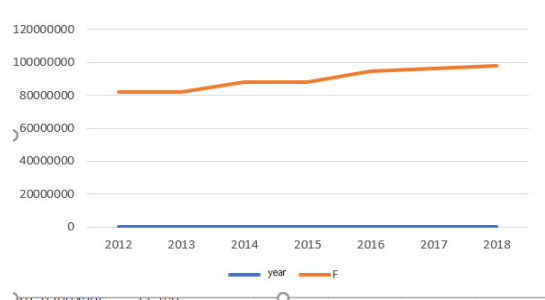


Figure 6 change of total economic vitality F of the eastern region over time

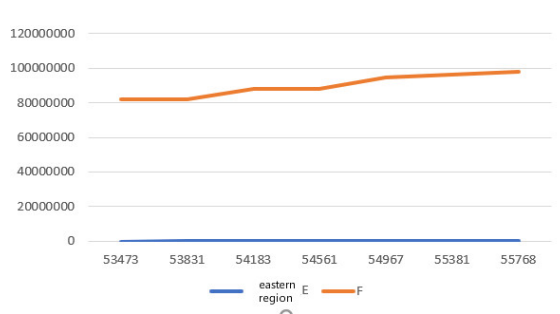


Figure 7 relationship between total economic vitality F and E in the eastern region

It can be seen in Figure 5 that with the change of time, the change of resident population E in the whole eastern region is relatively small, but the overall increase is upward. In Figure 6, it can be seen that the total economic vitality F of the whole eastern region changes significantly with time. In 2014 and 2016, the economic vitality of the whole eastern region increased greatly, but the change of resident population E in the eastern region is not obvious. In the past two years, economic vitality has changed significantly due to other factors.

2.3.3 Analysis of the Relationship between the Economic Vitality of Enterprises and the Overall Economic Vitality

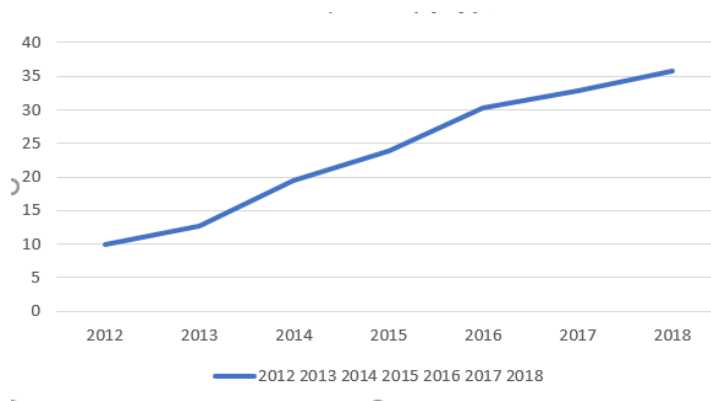


Figure 8 the relationship between economic vitality C and time

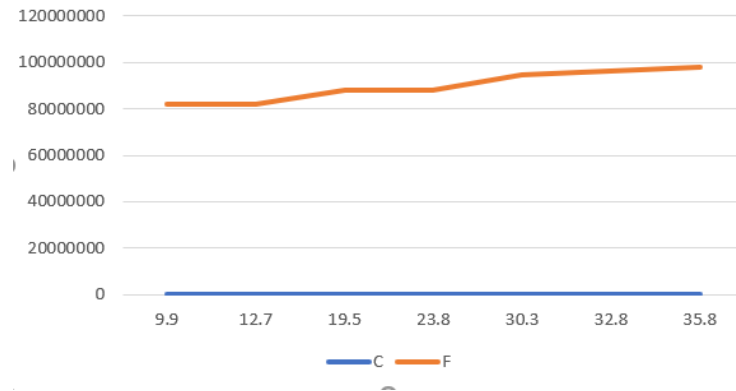


Figure 9 relationship between total economic vitality F and enterprise economic vitality C in the eastern region

It can be seen from Figure 8 that with the increase of time, the economic vitality (c) of enterprises is on the rise, and the vitality is increasing year by year. In 2014 and 2016, the growth rate of enterprise vitality is obvious. From the above, it can be seen that the total economic vitality (F) of the eastern region is also on the increase with time, and it has a good matching relationship with that of F in 2014 and 2016.

According to the analysis in Figure 9, with the increase of the economic vitality of enterprises, the economic vitality of the eastern region is also significantly enhanced, and the influence capacity is significantly higher than the population trend change.

2.4 Model Conclusion

On the basis of population control, we can increase the economic vitality of enterprises, that is to say, increase the number of enterprises to improve the economic vitality of the whole region. That is to say, the elastic increment of small and medium-sized enterprises to economic vitality is relatively obvious. The region should encourage the development of small and medium-sized enterprises to promote the progress of economic vitality of the whole region.

3. The Economic Policy Transformation Model

3.1 Model Establishment and Solution

By using the fitting formula [1] of A-BD, the enterprise survival rate B and registered capital distribution D of the eastern region can be brought in, and the economic vitality index value F of the eastern region in 2012, 2013 and 2019 can be calculated respectively, and the short-term impact of (2012-2013) policy transformation on economic vitality and the long-term impact of (2012-2018) policy transformation on economic vitality can be analyzed respectively. Due to the inability to obtain the corresponding enterprise survival rate D value and enterprise scale B value of each province, only qualitative analysis can be carried out.

$$A = [0.445(14000 - 78.93 * D + 0.11 * D^2) + 0.555(-4060 + 9200 * B - 4750 * B^2)] * 1.225 \quad [1]$$

Some regions actively advocate policy transformation and provide many preferential policies, such as reducing the approval steps of investment attraction, providing financial support for entrepreneurship, reducing the threshold of settling down to attract talents, etc. These measures mainly affect parameter B and parameter D in formula [1], and then affect the value of A and the economic vitality of the region. For different regions, the impact of the same measure on B or D will be different. Because B has a greater weight and the coefficient before the second term is larger, the change of B value has a greater impact on a value. Among these policies, B value is significantly affected by reducing the approval steps of investment promotion and capital introduction and providing financial support for entrepreneurship.

Take Beijing as an example, use the model established above to evaluate the economic vitality

index of Beijing in each year from 2012 to 2018, get the data shown in the table below, and use Excel to draw the figure.

Table 2 the economic vitality index of Beijing in each year from 2012 to 2018

	2012	2013	2014	2015	2016	2017	2018
Beijing	7421372.686	7447169.136	7841391.736	8333647.336	9242536.486	9444222.136	9006721

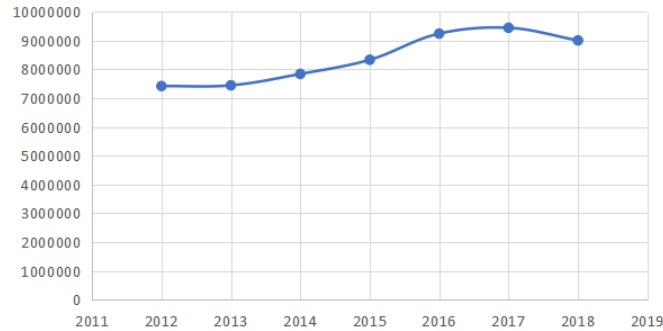


Figure 10 the economic vitality index of Beijing in each year from 2012 to 2018

It can be seen from the figure that policy transformation has a strong role in promoting economic vitality in the short term, but in the long term, when the economic vitality reaches a certain height, the role will be weakened.

3.2 Model Conclusion

After analysis, the policy transformation that is conducive to improving the survival rate of enterprises can promote the regional economic vitality; the effect of economic policy transformation on the regional economic vitality is more significant in the short term.

4. Ranking Analysis of Economic Vitality Index

Put the data into the mathematical model established above, use formula [2] to calculate, and fill the data into the table. The economic vitality index of seven provinces in 2012-2018 can be obtained.

$$F=1.335[0.445(14000-78.93*D+0.11*D^2)+0.555(-4060+9200*B-4750*B^2)]*E+0.5*C*\Delta E^2 \quad [2]$$

	2012	2013	2014	2015	2016	2017	2018	AVERAGE(F)
Beijing	7421372.686	7447169.136	7841391.736	8333647.336	9242536	9444222	9006721	8391008.645
Tianjin	7000653.589	7026450.039	3560478.7	7912928.239	8821817	9023503	5033280	6911301.542
Shandong	10113234.32	10139030.77	14423297.7	11025508.97	11934398	12136084	15896099	12238236.07
Jiangsu	17265097.88	17290894.33	15906797.4	18177372.53	19086262	19287947	17379599	17770567.09
Zhejiang	7803624.237	7829420.687	9859869.8	8715898.887	9624788	9826474	11332671	9284678.034
Shanghai	12233920.91	12259717.36	11647382.5	13146195.56	14055085	14256770	13120184	12959893.57
Guangdong	20115433.62	20141230.07	24652931.2	21027708.27	21936597	22138283	26125732	22305416.57

Figure 11 The economic vitality index of seven provinces

It can be seen that Guangdong > Jiangsu > Shanghai > Shandong > Zhejiang > Beijing > Tianjin.

5. Conclusion

From the above analysis, we can see that the number of permanent residents and the growth of enterprises have a significant role in promoting the growth of economic vitality; from the perspective of time dimension, policy support can promote the growth of economic vitality in a certain region in the short term, and the role of policy promotion in improving the survival rate of newly established enterprises is better, but in the long term, the role of policy will no longer play a decisive role from the perspective of location factors, the economic vitality of second tier cities is rising faster than that of first tier cities.

Therefore, it is suggested to take the first tier cities as the center, carry out a series of supporting policies, improve the survival rate of small and medium-sized enterprises, and then promote the economic vitality of the surrounding second tier cities in the short term, so as to attract more talents to settle in the region. In this way, the number of permanent residents around the first tier cities will increase, and the economic vitality of the region will be further enhanced, forming a virtuous circle. To avoid only in the first tier cities to enhance economic vitality, resulting in waste of resources.

References

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