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Factor Analysis for Chinese Urban Employment

[1]Fangchu Xu, [2]Yuepeng Wu, [3]Zhongrui Zhang

[1] University of Shanghai for Science and Technology, Shanghai, China
[2] University of Shanghai for Science and Technology, Shanghai, China
[3] University of Shanghai for Science and Technology, Shanghai, China

Email: fangchu1027@163.com

Abstract –With the imbalance and ultrafast economic growth in China, the urban employment contradictions are becoming increasingly acute. To give some effective solutions for this issue, this paper starts from some classical employment theories, expands at the possible factors affecting employment by the angle of Chinese current conditions and gives an empirical research. The first step to the empirical research is to reduce the possible factors affecting employments to some key factors by using correlation test, collinearity Diagnostic and stepwise regression. In the next step, unite root test and cointergration test are applied to analyze time series stationarity for all the factor variables in order to obtain an effective least square regression model. The final step is to calculate the regression coefficients with a log-linear regression model and use Error Correction Model (ECM) to improve the short-run estimation accuracy. In the end of this paper, based on the empirical research result, some useful policy suggestions to remit employment issue are given.

Keywords – Employment; Economic Employment Theories; Error Correction Model; Urban employment

1. Introduction

China is facing a great challenge from employment pressure. Low employment rate breaks the social stability and harmony and consumes massive human resources. So based on domestic situation, it has realistic significance to research the main factors affecting Chinese employment.

Employment, one of the most important issues in social economy, has been concerned by the western economists for long time, which form many distinctive employment theories. Some of typical theories are classical economic employment theory, Keynesian full employment theory and Neo-classic Synthesis School employment theory etc.

Say's Law is the foundation of classical economic employment theory, which proposes supplies create demands. The representatives of this economic school are Marshall, Pigou and so on. They started from perfectly competitive market and thought the product price and money wage in the market adjust by market supply and demand spontaneously. The mutual effect between labor supply and demand decides the actual wage and employment level. The employment number in supply-demand balance is so-called ”full employment”.

Keynesian employment theory centers around effective demand principle and considers employment depends on effective demand. The reason why the unemployment can’t be eliminated is insufficient effective demands always exist in the capitalist societies. That means when total supply and total demand supply price are in balance, the total demand appears insufficiently. Therefore it causes more social unemployment which is called underemployment.

At the end of the 1960s, the main capitalism countries’ economies fell into the stagflation mire in succession. Keynes’ theory does not work this time. As a result, the Neo-classic Economy School economists represented by Tobin, DuShengbei proposed “structural unemployment” and tried to explain the coexistence of unemployment and inflation by using market structure changes. This theory concludes structural unemployment is a structure imbalance from labor supply and demand caused by economic structure changes. And this phenomenon inevitably leads to the coexistence of unemployment and job vacancy. On one hand, Powerful union forces push the wage climbing up instead of falling down, so despite unemployment existence, the wage still can’t decline. On the other hand, a great number of job vacancies also pull the wage at a high position. The result is job vacancies cause wage rise, wage rise leads to inflation and inflation with unemployment existence result in stagflation. This theory suggest to solve structural unemployment problem by the angle of employment content and structure, such as governments are supposed to introduce some income guidance policies to control the wage rise and good price; improve the labor market through enhancing job training and education; adjust unemployment compensation system to inspire the unemployed.

The New Zealand economist A W Phillips made the research connecting employment and inflation and proposed a famous" Phillips curve". According to the analysis for 90 years (1861-1957) datum, he obtained theory that wage increasing rate and unemployment rate appear to a negative correlation. He pointed out unemployment and inflation can exist at the same time and can be substituted from each other, which means inflation rises when unemployment falls and vice versa. Still, it works well before 1970s in western development market economy countries. But it is broken when the stagflation comes out.

So based on the classical economic employment theories mentioned above and connecting with China's national conditions, this paper lists some factors which may influence China's urban employment. And then the factors are analyzed by the relevant data throughout recent several decades so that these analyses can find some key factors which affect China's urban employment. Finally, some suggestions to improve China's urban employment are given.

2. Data and Empirical Research

Because of the particular urban-rural dual economic structure in China, A huge number of disguised unemployed populations from rural labor market will swarm into urban labor market, which means the urban labor supply tends to infinity. As a result, labor market demand has a critical balance effect to the urban labor market in china instead of the labor market supply. According to this conclusion, the chosen factors are supposed to be about the labor demand. Since the labor is one of the production factors determined by total social demand, the labor demand factors can be trued into some social demand factors. The social demand can be separated in two parts: gross and structure. Following the macro-economic theory, in the gross part, the factors which influent total social demand are investment, consumption and Export. In the structure part, The Economic development structure imbalance has existed for a long time, which unavoidably causes the labor structure imbalance. Moreover, continuous economic structure adjustment, constant industrial upgrade and supply shortage in some emerging fields aggravate this increasingly prominent imbalance. The chosen the factors will be show in detail blow.

2.1. Variables Determination

2.1.1. Dependent Variable----Employment status

Widely-used indexes to evaluate social employment status are unemployment rate and employment figure. Unemployment rate is a proportion index which is decided by both urban unemployment figure and urban supply labor gross. And urban supply labor gross can't be found for lack of the statistic data in China, which block the way to the research. In addition, as a gross index, employment figure is just determined by external factors and can reflect social employment status directly. So for the research feasibility, this paper choose urban employment figure as a target variable definition as.

2.1.2. Independent Variables

According to the analysis mentioned above, the labor demand depends on total social demand. Therefore in this paper these factors are chosen below:

x_1 Gross Domestic Product
x_2 Urban Capital Assets Investment
x_3 Residents Total Retail Sales
x_4 Import and Export Gross
x_5 Currency Policy
x_6 Consumer Price Index
x_7 Industrial Structure
x_8 National High-Tech Investment
x_9 National Reform

At last 9 initial factors have been decided.

2.2. Correlation Test

From the correlation test result of 9 factors relative to employment, the correlation coefficients from every factor to urban employment figure are obtained, as shown by Table1 below.

Table 1. Factors correlation to employment figure

	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9
y	0.95	0.96	-0.03	0.96	0.98	0.93	0.95	0.94	0.79

As the Table1 shows, all the 8 factors except residents total retail sales have great relations to urban employment figure and most of them are above 0.9. The result proves the strong correlation between employment figure and each factor and also shows the rationality of the chosen factors mentioned above. In addition, the residents total retail sales can't be removed for the low correlation to employment figure. Because correlation coefficients just reflect a linear relation. In the nonlinear circumstance, it doesn't work.

On the other hand, each factors affecting employment figure have high correlation to each other. So this result maybe indicates some strong linear relation in these factors, which means some factors can take over the others. As a result, the further methods to reduce these 9 factors have to be used.

The first method is a collinearity Diagnostic for all above-mentioned factors. Then the next step is to use stepwise regression and significance tests to screen the above-mentioned factors. Table2-3 show the results and specific details.

Table 2. multi-colinearity diagnostic for variables

Coefficient	Parameter Estimation	Estimation Standard Variable	VIF
β_1	0.4044	0.1086	2049.79
β_2	-0.1867	0.0973	3.8746
β_3	-0.3385	0.1126	1428.33
β_4	0.0808	0.0512	623.13
β_5	0.1241	0.0333	356.46
β_6	0.0803	0.0512	10.998
β_7	-0.1093	0.0892	1086.47
β_8	-0.1037	0.0514	651.07
β_9	-0.0823	0.0267	15.651

Table 3. minimum eigenvalue variable contribution rate

eigenvalue	φ	β_1	β_2	β_3	β_4
1.534e-5	808	0.26	0.01	0.80	0.00
	β_5	β_6	β_7	β_8	β_9
	0.02	0.57	0.31	0.39	0.01

As Table2, 3 show, These factor have a significant multicollinearity. At first, the minimum eigenvalue is 0.00001534, φ1=807.999, which decisively influence some coefficient variations. Moreover as Table3 shows, the minimum eigenvalue devotes 80.4% and 56.8% on the variations of β3 and β7 which means the estimations forβ3 andβ7 will be unstable and inaccurate. This result can also be obtained from their variance inflation factors which are 1428.329 and 533.87058, far away from 9. In conclusion, the factors mentioned above have strong collinearity.

To solve the multicollinearity factors problem, stepwise regression is taken and significant tests is used to screen the 9 factors. Finally, the ultimate indexes left are Consumer Price Index, Imports and Exports Gross, GDP and High-Tech Investment, shown below:

x_1 Gross Domestic Product

x_4 Import and Export Gross

x_6 Consumer Price Index

x_8 National High-Tech Investment

2.3. Model Establishment

So far the regression independent variables are determined. And the next step is to calculate the regression coefficients of each variable. On the other hand, considering all these variables are time series, and according to the econometrics, a regression to some non-stationary time series will result in a spurious regression. Therefore a stationary test to these time series is quite necessary. And the test method used in this paper is called ADF unit root test.

The ADF test result shows all the regression variables (y, x_1, x_4, x_6, x_8) are non-stationary and all their first difference ($\Delta y, \Delta x_1, \Delta x_4, \Delta x_6, \Delta x_8$) are passed the 10% significance test, which shows their first difference are all the stationary time series.

To the same order stationary time series, the cointegration analysis can show whether a long-run stable relation does exist between dependent and independent variables. Johansen Maximum-Likelihood Method is used here. And the result shows blow

Table 4. Cointergation test result

Cointergration Rank (H_0)	Maximum Eigenvalue	Trace Statistic	5% Threshold	Probability
$r \leq 0$	64.947	135.408	79.342	0.0000
$r \leq 1$	31.356	70.462	55.246	0.0012
$r \leq 2$	21.702	39.105	35.011	0.0172
$r \leq 3$	15.713	17.404	18.398	0.0684
$r \leq 4$	1.691	1.6906	3.842	0.1934

As Table4 shows, r is the number of cointegration relation. In 5% significance condition, assumption $r \leq 2$ is refused, which means three cointegration relation occurs in the variables.

The mentioned cointegration test proves a long-run stable relation exists in these 5 variables, which means the multiple regressions to these 5 variables is feasible and can obtain their math function. However the linear math model can't regress the function properly----all regression coefficients can't pass the significance test. To solve this problem, a widely used model in economy, log-linear regression model, is applied. The general multi-variables log-linear model shows below.

$$y = b + \sum_{i=1}^{n} k_i \cdot \ln(x_i) + u \qquad (1)$$

Where y is the dependent variable, x_i is the independent variables, b is the intercept, k_i is the slope for each independent variables, u is the estimation error.

Combining with the researched problem in this paper, formula 1 can change to:

$$\ln(y(t)) = b + k_1 \ln(x_1(t)) + k_6 \ln(x_6(t)) + k_8 \ln(x_8(t)) + k_4 \ln(x_4(t)) + u \quad (2)$$

Where $\ln(y(t))$ $\ln(x_1(t))$ $\ln(x_4(t))$ $\ln(x_6(t))$ $\ln(x_8(t))$ is the logarithm of employment figure, the GDP, national import and export gross, CPI and high-tech investment respectively.

2.4. Model Calculation

To calculate the regression coefficients, a large number of history datum (from 1978 to 2008) are necessary. And the result is:

$$\ln(y(t)) = 0.67 + 0.44 \ln(x_1(t)) - 0.5 \ln(x_6(t)) - 0.25 \ln(x_8(t)) + 0.22 \ln(x_4(t)) \quad (3)$$

The model goodness of fit, R^2, is up to 98.6%, statistical value F has passed the significant test, and All the regression coefficients have pass the *t* significant test, which verifies the model is scientific and rational. The further analysis to Equation 3 reveals some useful economic meanings:

(1)GDP has a positive influence on employment, which meets the fact in China. Because GDP growth reflects economic bloom and this bloom necessarily arouses the labor demand growth. As a result, the urban employment increases.
(2)Similar to GDP, import and export gross also has a positive influence. In addition, the coefficient of import and export gross is half of the GDP's. The result also fit Chinese current economic situation: the import and export proportion in GDP is about 50%.
(3)High-Tech investment has a negative effect on employment. This conclusion is easy to understand: high-tech investment increase brings a productivity improvement. And this improvement pushes an industry structure upgrade that capital and technology intensive economy replaces traditional labor intensive economy. In consequence, labor demand withers and unemployment increases. So High-Tech investment benefits to economic and social development, but unemployment increase turns into an obvious side-effect.
(4)CPI has a negative effect on employment. The result violates Phillips curve: a negative relation exists between inflation and unemployment. But Chinese urban-rural dual structure makes an infinite labor supply which breaks the precondition of Phillips curve. In addition, structure imbalance has been a big issue in Chinese economy for a long time. So no wonder Keynesian or Phillips theory do not work anymore in China.

The long-run stable function has obtained. Nevertheless the short-run effect has not been involved yet. Short-run disturbances deviate the employment figure from long-run balance value, which causes a large estimation error. The error correct model is necessary to compensate this estimation error. The General ECM can be written as:

$$\Delta y(t) = \sum_{i=1}^{n} \beta_i \Delta x_i(t) + \lambda(b + \sum_{i=1}^{n} k_i x_i(t-1) - y(t-1)) \quad (4)$$

Where $\Delta y(t) = y(t) - y(t-1)$, $\Delta x_i(t) = x_i(t) - x_i(t-1)$
Substitute the history datum, the result is:

$$\Delta \ln(y(t)) = 0.157754 \cdot \Delta \ln(x_4(t)) - 0.367854 \cdot \Delta \ln(x_6(t)) + 0.4544 \cdot (0.667 + 0.44 \ln(x_1(t-1)) - 0.5 \ln(x_6(t-1)) - 0.25 \ln(x_8(t-1)) + 0.22 \ln(x_4(t-1)) - \ln(y(t-1))) \quad (5)$$

As the expression 5 shows, GDP and high-tech investment have no significant short-run effects on employment. The import and export change has a positive effect and CPI has a negative effect on employment. It follows that the ECM estimation can be separated into two parts: one is short-run influence caused by import-export and CPI changes; the other is long-run balance effect. In this case, if the fluctuation deviate the value from long-run balance, the balance effect will adjust the fluctuation back at the speed of 0.4544.

3. Conclusions and Suggestions

Following the empirical research, this paper finds four main factors effecting urban employment figure in china: economic growth rate, total import and export volume, inflation rate, high-tech investment. And based on these factors, the each influence extents to urban employment figure are researched. According to the empirical research result and considering the Chinese current condition, some suggestions to improve Chinese urban employment are given below from the different angle of four factors affecting Chinese urban employment.

3.1. Economic Growth Rate

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3.2. Total Import and Export

The empirical research result shows that Chinese total import and export has a positive influence on urban employment, so government has to insist on progress while maintaining stability, proceeds with confidence, insure a steady growth, accelerate the change of foreign trade development mode, improve the quality and level of foreign trade constantly. As a result, Specific measures

can be keep stability and sustainability of the export policy, implement export rebates and trade finance effectively, reinforce credit insurance support for large complete devices export, and solve key industries and small and medium-size enterprises problems specifically. In addition government can improve trade convenience, abolish all kinds of irrational charge in order to create an excellent soft-hardware environment for foreign trade development.

3.3. Inflation Rate

Consumer price index is used to reflect inflation rate in this paper. Empirical research result shows consumer price index and urban employment have negative correlation, which doesn't fit the classical Phillips theory. The cause is Chinese dual economic structure, and this structure leads to rural population crowd into cities and results in the urban employment excess. So based on the Chinese national conditions, Chinese government is necessary to make some policies to lead a rational population migration and reduce the urban-rural gap. Meanwhile it's essential to deal with the relation between economic growth and inflation effectively and avoid the inflation caused by excess economic growth.

3.4. High-tech Investment

Regression result shows more high-tech investment result in a lower employment. In order to solve the question of the job losses from technology improvement, the government is necessary to formulate rational policies to adjust labor market structure based on employment demand structure change causing improvement technology. Specific implement can show as follow. On the one hand, the government is necessary to collect unemployment figure in each community and train the unemployment aiming at labor market structure. In that way, the unemployment can learn the skills to meet the market demand, at mean time the labors can fit the market structure. In the other hand, according to the unemployment characters, the government can create new positions which cater to abilities of the unemployment.

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