

UDC 338.27

FORECASTING THE UNEMPLOYMENT RATE IN KYRGYZSTAN BASED ON ECONOMIC AND STATISTICAL ANALYSIS

T. SUBANOV

Osh Humanitarian and Pedagogical Institute, Kyrgyzstan

As practice shows, unemployment has a greater negative impact on the socio-economic situation of the country, since it leads to underutilization of human capital, which leads to social differentiation, a significant decrease in the social situation of the country. The problems of unemployment have increased especially during the coronavirus pandemic. In many countries, businesses and institutions have been forced to reduce the number of employees due to the pandemic. This, in turn, increased the army of the unemployed and led to social conflicts between the government and the people. In order to stabilize the situation, there is a need to forecast the unemployment rate and take appropriate measures.

According to historical facts, we know that unemployment is one of the problems that has a negative impact on the socio-economic situation. It is especially confirmed by the historical events during the "Great Depression" in Europe. Unemployment is a fact of underutilization of the country's human capital, which in turn leads to social differentiation, a significant decrease in the social situation of the country. Despite various studies on the problems of unemployment, nowadays reducing it is a difficult task.

Indeed, the problems associated with unemployment have been studied by many leading foreign and Russian scientists: J. M. Keynes, M. Spence, M. Friedman, K. Clark, A. Philips, E. Phelps, A. S. Bulatov, V. P. Borovikov etc. The issues of labor market forecasting were considered in the scientific works of R. E. Quandt, D. Hamermesh, E. R. Berndt, A. N. Ananyev, R. P. Kolosova, T. O. Razumova, etc. Despite the research on the problems of the labor market, the issues of forecasting the level of berabotitsa remain insufficiently studied. In this regard, forecasting based on statistical data describing the problems of unemployment should take one of the main places in economic practice, since only on the basis of the results of the forecast can measures be taken to reduce unemployment in the region or country.

In the 90s of the twentieth century, the critical economic situation in the newly created independent states on the territory of the former USSR affected their socio-economic situation. Kyrgyzstan, as one of the former socialist republics of the USSR after gaining independence, failed to respond to the market situation in a timely manner. The country's leadership was not ready to adopt real plans to prevent negative socio-economic phenomena. In our opinion, it was the unpreparedness of the country's leadership, the crisis and its severe consequences in the first years of the country's independence that did not allow us to achieve full market independence. Although, there was an attempt to balance the situation in the country by reforming the management structures of the economic system.

Unfortunately, the second decade of independence, one of these steps was the National Strategic Program of the Kyrgyz Republic on the Integrated Development Framework (CDF) for 2001-2010. (adopted on 29.05.2001). Despite the measures taken, in the conditions of poorly regulated state market relations and the decline in production in the country, the problem of employment and income of the population has sharply worsened; unemployment has exceeded the permissible level.

In those years, due to the lack of new jobs in the country, a significant part of the working-age population was forced to work in low-income personal subsidiary farms, in which employment borders on unemployment. For the period from 2001 to 2005, according to the statistical data of the National Statistical Committee of the Kyrgyz Republic, the number of employed people (2001 - 1787,000 people, and in 2005 - 1934400 people) was about 20% in state organizations, and 80% in the private sector [2, p. - 67-72]. At the same time, 16.5% of the employed population had higher education, 14.7% had secondary vocational education, and 9.9% had primary vocational education. This means that of the employed population, only 41.1% had a vocational education, and the rest had only a general education. In our opinion, this fact proves the employment of people with general education in low-income personal subsidiary farms. So, the reforms carried out in the second decade of independence did not lead to positive results. As a result, the country found itself in a quagmire of socio-economic problems.

And, the third decade of the country's independence, the situation in the country's economy continued to deteriorate. However, some changes in the situation of small businesses in agriculture, the processing of agricultural products, small wholesale trade and construction have led to a certain shift in the economy. For example, by 2019, the number of people employed in agriculture, forestry, and fish farming amounted to 443.2 thousand people, trade - 395.2 thousand people, and manufacturing - 289.2 thousand people and in construction - 287.4 thousand people [2, p. 67-72]. But these shifts in the country's economy could not solve the problem of employment in the country.

Economics

Table 1. – Employment indicators of the Kyrgyz population from 2011 to 2019

| Name | 2011 | 2015 | 2019 |
|---|---------|---------|----------|
| The number of permanent residents of the country, people. | 2703686 | 2916971 | 31699634 |
| Of these, the able-bodied part of the population, people. | 2490100 | 2544300 | 2583600 |
| Of these, the number of employees, people | 2277700 | 2352100 | 2442700 |
| With higher professional education | 410600 | 465600 | 526300 |
| With secondary vocational education | 292700 | 229100 | 275500 |
| With primary vocational education | 223100 | 177700 | 193400 |
| those who do not have a professional education, people. | 1351300 | 1479700 | 1447500 |
| Of these, officially registered unemployed, people. | 212400 | 192200 | 140900 |

According to the National Statistical Committee of the Kyrgyz Republic, from 2011 to 2019, the indicators of the employed population in terms of the level of education in the objects of the Kyrgyz economy also changed slightly. For example, the number of employed people in 2011 was 2277700 people, of which 40.67% are specialists with qualifications, while 59.33% of the employed do not have specialties. The same figures in 2015 were 37.09% and 62.91%, and in 2019 – 40.74% and 59.26%. In our case, these indicators mean that in recent years, the majority of the employed population in the economic sectors is unskilled labor [2, p. 67-72].

Two years have passed since 2019. Since then, the lack of an effective system of employment regulation in the regions still has a negative impact on the demographic situation, working conditions and social status of the country's population. In our opinion, in this situation, we can propose the measures considered in the works of A. S. Bulatov. According to the scientific works of Doctor of Economics, Professor A. S. Bulatov, among the main directions of state regulation of the labor force " we can distinguish: 1) programs to stimulate employment growth and increase the number of jobs in the public sector; 2) programs for training and retraining of personnel; 3) programs for promoting the employment of labor; 4) programs for social insurance of unemployment" [1].

Especially the problem of employment is felt among the rural population. Despite the fact that rural poverty in Kyrgyzstan is recognized by society as a critical point of national development, so far only partially developed a generally recognized strategy for its solution. This situation is transmitted along the chain to all aspects of economic life, in particular, to the income of the population and its standard of living. According to many scientists, this can be generally reflected in the form of a strategy in the context of three planes: 1) growth of rural income from agricultural employment, 2) growth of income from non-agricultural employment, and 3) migration of rural population to cities. The first strategy assumes the growth of demand for agro-food products at a pace that outstrips the growth of labor productivity in the agricultural sector.

Theoretically F. Engel explained that this is possible only through agricultural protectionism, i.e., protecting the domestic market from imported products and maximizing the promotion of their own products to world markets, as well as maintaining labor-intensive technologies in agriculture [4]. As practice shows, violation of this rule leads to increased migration, as a result of which the number of employed people will decrease. In addition, in our opinion, if the rural population cannot compete in the urban labor market, it will lead to the movement of rural poverty to large cities, regions, and countries. This is confirmed by the history of many countries of the world.

The problems of unemployment increased especially during the coronavirus pandemic (March, 2020). In many countries, enterprises and institutions were forced to reduce the number of employees due to the pandemic. The Kyrgyz industries were in the same situation. This situation, in turn, increased the army of unemployed and led to social conflicts between the government and the people. In such cases, in order to stabilize the situation in the country, it becomes necessary to predict the unemployment rate by the relevant government bodies and take appropriate measures. In our example, based on the statistical data of Kyrgyzstan, we can make a forecast of the unemployment rate for the period from 2010 to 2020 [2].

Table 2. – The unemployment rate in the Kyrgyz Republic from 2010 to 2020, in %.

| A country | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|------------|------|------|------|------|------|------|------|------|------|------|------|
| Kyrgyzstan | 8,6 | 8,6 | 8,4 | 8,3 | 8,0 | 7,6 | 7,2 | 6,9 | 6,2 | 5,5 | 7,5 |

According to the theory, the unemployment rate of the country, in particular, in Kyrgyzstan (or by region) can be predicted by such a method of scientific research as extrapolation. In practice, we know such extrapolation methods as moving average, exponential smoothing, and least squares [3].

Method 1. Forecasting the unemployment rate in Kyrgyzstan using the moving average method. Theoretically, the moving average method is one of the widely known methods of smoothing time series. In practice, using the moving average method, you can eliminate random fluctuations and get values that correspond to the influence of the main factors.

The calculation is performed according to the following scheme:

1. First, we determine the value of the smoothing interval. In our case, we take $n=3$;

2. Next, calculate the moving average for the periods using the formula

$$M = (Y_{t1} + Y_{t2} + Y_{t3}) / n.$$

As a result, we get: $M_{2011}=8,53$; $M_{2012}=8,43$; $M_{2013}=8,23$; $M_{2014}=7,96$; $M_{2015}=7,6$; $M_{2016}=7,23$; $M_{2017}=6,76$; $M_{2018}=6,2$; $M_{2019}=6,4$.

3. Next, we first calculate the average relative error using the formula

$$\frac{|Y_{\phi} - Y_p|}{Y_{\phi}} \cdot 100, \%$$

As a result, we get the following digital information: For 2011: -0,81; For 2012: -0,357; For 2013: 0,84; For 2014: 0,5; For 2015: 0; For 2016: -0,41; For 2017: 2,02; For 2018: 0; For 2019: -16,3.

Next, we build a forecast for the next years using the formula:

$$Y_{t+1} = M_{t-1} + \frac{1}{n}(Y_t - Y_{t-1})$$

$$Y_{2021} = 6,4 + 1/3(7,5 - 5,5) = 7,06.$$

Determining the moving average:

$$M = (6,2 + 5,5 + 7,5) / 3 = 6,25$$

$$Y_{2022} = 6,25 + 1/3(7,06 - 7,5) = 6,11.$$

Determining the moving average

$$M = (7,5 + 7,06 + 6,11) / 3 = 6,89$$

$$Y_{2023} = 6,89 + 1/3(6,11 - 7,06) = 6,57.$$

All the results are entered in table 3:

Table 3. – Calculation of the average relative error by the method MA, %

| Years | The unemployment rate, Y_t , в % | The moving average, M , в % | Calculation of the average relative error, $\frac{ Y_{\phi} - Y_p }{Y_{\phi}} \cdot 100, \%$ |
|----------|--|-------------------------------------|--|
| 2010 | 8,6 | - | - |
| 2011 | 8,6 | 8,53 | 0,81 |
| 2012 | 8,4 | 8,43 | -0,357 |
| 2013 | 8,3 | 8,23 | 0,84 |
| 2014 | 8,0 | 7,96 | 0,5 |
| 2015 | 7,6 | 7,6 | 0 |
| 2016 | 7,2 | 7,23 | -0,41 |
| 2017 | 6,9 | 6,76 | 2,02 |
| 2018 | 6,2 | 6,2 | 0 |
| 2019 | 5,5 | 6,4 | -16,3 |
| 2020 | 5,5 | - | - |
| Total | | | -12,89 |
| Forecast | | | |
| 2021 | 7,06 | | |
| 2022 | 6,11 | | |
| 2023 | 6,57 | | |

As a result, we get the following output

$$\epsilon = -12,89 / 9 = -1,43 < 10\%.$$

So, according to the results of the calculation, the accuracy of the forecast is high. Next, we make a prediction using the exponential smoothing method.

Economics

Method II. Forecasting the unemployment rate in Kyrgyzstan by the exponential smoothing method. In practice, this method is most effective when developing short-term (for a year) forecasts based on statistical data for the last ten years.

When predicting the unemployment rate in Kyrgyzstan using the exponential smoothing method, it is necessary to:

1. First, we define the smoothing parameter using the following formula

$$\alpha = \frac{2}{n+1}$$

2. After determining the initial value of U_0 in two ways:

I. $U_0 = (8,6+8,6+8,4+8,3+8,0+7,6+7,2+6,9+6,2+5,5+7,5)/11 = 7,52$

II. $U_0 = 8,6$

3. Our next step is to calculate an exponentially weighted average for each period using the formula

$$U_{t+1} = \alpha * y_t + (1 - \alpha)U_t$$

First, we make the calculation according to method I: $U_{2011} = 7,68$; $U_{2012} = 7,82$; $U_{2013} = 7,86$; $U_{2014} = 7,92$; $U_{2015} = 7,93$; $U_{2016} = 7,87$; $U_{2017} = 7,76$; $U_{2018} = 7,6$; $U_{2019} = 7,37$; $U_{2020} = 7,0$. Using the same formula, we calculate the forecast value: $U_{2021} = 7,08$.

Then we make the calculation according to method II: $U_{2011} = 8,59$; $U_{2012} = 8,58$; $U_{2013} = 8,5$; $U_{2014} = 8,46$; $U_{2015} = 8,38$; $U_{2016} = 8,21$; $U_{2017} = 8,0$; $U_{2018} = 7,82$; $U_{2019} = 7,46$; $U_{2020} = 7,14$. Then we calculate the forecast value: $U_{2021} = 7,19$.

The results of the calculations for the two methods are entered in table 4:

Table 4. – Calculation of the average relative error by the method

| Years | Unemployment rate, Y_t , % | Exponentially weighted average, U_t | | Calculation of the average relative error, $\frac{ y_{\phi} - y_p}{y_{\phi}} * 100$, % | |
|---------------|------------------------------|---------------------------------------|-----------|---|-----------|
| | | I method | II method | I method | II method |
| 2010 | 8,6 | 7,52 | 8,6 | 12,5 | 0 |
| 2011 | 8,6 | 7,68 | 8,59 | 10,6 | 0,11 |
| 2012 | 8,4 | 7,82 | 8,58 | 6,9 | -2,14 |
| 2013 | 8,3 | 7,86 | 8,5 | 5,3 | -2,4 |
| 2014 | 8,0 | 7,92 | 8,46 | 1 | -5,75 |
| 2015 | 7,6 | 7,93 | 8,38 | -4,34 | -10,26 |
| 2016 | 7,2 | 7,87 | 8,21 | -9,3 | -14,0 |
| 2017 | 6,9 | 7,76 | 8,0 | -12,4 | -15,9 |
| 2018 | 6,2 | 7,6 | 7,82 | -22,5 | -26,12 |
| 2019 | 5,5 | 7,37 | 7,46 | -34 | -35,6 |
| 2020 | 7,5 | 7,0 | 7,14 | 6,6 | 4,8 |
| Total | - | - | - | -39,69 | -107,26 |
| Forecast 2021 | - | 7,08 | 7,19 | - | - |

Based on the results of calculating the average relative error, we determine:

$$\varepsilon = \frac{1}{n} \sum_{i=1}^n \frac{|y_{\phi} - y_p|}{y_{\phi}} * 100$$

; по способу I: $\varepsilon = -3,60$; по способу II: $\varepsilon = -9,75$

In all variants, the accuracy of the forecast is appropriate, since the value of the average relative error is less than the standard, i.e. less than 10 %.

Method III. Forecasting the unemployment rate in Kyrgyzstan using the least squares method. According to the theory, the essence of the least squares method is to minimize the sum of the square deviations between the observed and calculated values. Theoretically, the calculated values are found according to the selected equation, i.e. the regression equation. At the same time, the smaller the difference between the actual values and the calculated ones, the more accurate the forecast calculated on the basis of the regression equation is obtained. To make a calculation based on certain data on the unemployment rate in Kyrgyzstan from 2010 to 2020, we will define the time symbol as a sequential numbering of the forecast base periods. In this case, the calculated values of the U_r series are determined by the formula:

$$Y_{t+1} = a * X + b,$$

$$b = \frac{\sum_{i=1}^n Y_{\Phi}}{n} - \frac{a * \sum_{i=1}^n X}{n} :$$

$$a = -0,25; b = 9,02$$

The results of the unemployment rate in Kyrgyzstan are presented in the following table.

Table 5. – Calculation of the average relative error by the method LS, %

| Years | Unemployment rate, y_{ϕ} % | Time symbol, X | $y_{\phi} * X$ | X^2 | $y_p = a * 1 + b$ | Calculation of the average relative error, $\frac{ y_{\phi} - y_p }{y_{\phi}} * 100, \%$ |
|---------------|------------------------------------|---------------------|----------------|-------|-------------------|---|
| in fact 2010 | 8,6 | 1 | 8,6 | 1 | 8,77 | -1,97 |
| in fact 2011 | 8,6 | 2 | 17,2 | 4 | 8,52 | 0,9 |
| in fact 2012 | 8,4 | 3 | 25,2 | 9 | 8,27 | 1,54 |
| in fact 2013 | 8,3 | 4 | 33,2 | 16 | 8,02 | 3,3 |
| in fact 2014 | 8,0 | 5 | 40 | 25 | 7,77 | 3,5 |
| in fact 2015 | 7,6 | 6 | 45,6 | 36 | 7,52 | 1,0 |
| in fact 2016 | 7,2 | 7 | 50,4 | 49 | 7,27 | -0,97 |
| in fact 2017 | 6,9 | 8 | 55,2 | 64 | 7,02 | -1,73 |
| in fact 2018 | 6,2 | 9 | 55,8 | 81 | 6,77 | -9,19 |
| in fact 2019 | 5,5 | 10 | 55 | 100 | 6,52 | -18,5 |
| in fact 2020 | 7,5 | 11 | 82,5 | 121 | 6,27 | 16,4 |
| Total | 82,8 | 66 | 468,7 | 506 | - | -5,72 |
| Forecast 2021 | 6,02 | 12 | | | | |
| Forecast 2022 | 5,77 | 13 | | | | |
| Forecast 2023 | 5,52 | 14 | | | | |

Then we determine the forecast value: $y_{2021} = 6,02$; $y_{2022} = 5,77$; $y_{2023} = 5,52$

Next, we calculate the average relative error using the following formula:

$$\varepsilon = \frac{1}{n} * \sum_{i=1}^n \frac{|y_{\phi} - y_p|}{y_{\phi}} * 100, \quad \varepsilon = -5,72 / 11 = -0,52 \% < 10\%.$$

As a result, the accuracy is high.

As a result, the analysis showed that in order to eliminate the qualitative imbalance between the demand and supply of labor, it became necessary to take the following measures: monitoring the labor market situation, the professional composition of the unemployed and the structure of vacant jobs, which allows us to determine the main areas in which training and retraining of specialists should be carried out; the participation of employers in training; the state order for specialists of certain categories.

REFERENCES

1. Bulatov A. S. *Ekonomika*. – M., 2001. – 894 p.
2. *Kyrgyzstan in numbers*. NSK KR – B., 2020. – 334 p.
3. Novikova N. V., Pozdeyeva O. G. *Forecasting of the national economy*. – Yekaterinburg, 2007. – 138 p.
4. Serova E., *Alternative employment in rural areas of Russia*. – M., 2006. – 72 p.