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 ESTIMATING AND FORECASTING THE UNEMPLOYMENT RATE  
 IN THE REPUBLIC OF KAZAKHSTAN

*The article considers the current condition of the labor market in Kazakhstan which has its decisive impact on the social and economic development of the state. The authors carry out the assessment of the unemployment rate dynamic pattern and forecast its future values for a mid-term prospect.*

*Keywords: labor market; unemployment rate; moving average.*

Сауле А. Азилканова, Жанар К. Жанабаєва, Жибек Б. Рахметуліна  
 ОЦІНЮВАННЯ І ПРОГНОЗУВАННЯ РІВНЯ БЕЗРОБІТТЯ  
 В РЕСПУБЛІЦІ КАЗАХСТАН

*У статті розглянуто сучасний стан розвитку ринку праці в Республіці Казахстан, що чинять вирішальний вплив на соціально-економічний розвиток держави. Оцінено динаміку зміни рівня безробіття і розраховано її прогностичні значення на середньострокову перспективу.*

*Ключові слова: ринок праці; рівень безробіття; ковзна середня.*

*Форм. 4. Рис. 2. Табл. 5. Літ. 10.*

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 ОЦЕНКА И ПРОГНОЗИРОВАНИЕ УРОВНЯ БЕЗРАБОТИЦЫ  
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*В статье рассмотрено современное состояние рынка труда в Республике Казахстан, которое оказывает решающее воздействие на социально-экономическое развитие государства. Проведена оценка динамики изменения уровня безработицы и рассчитаны ее прогностические значения на среднесрочную перспективу.*

*Ключевые слова: рынок труда; уровень безработицы; средняя скользящая.*

**Problem statement.** The problem of population unemployment which exists at any stage of economic development is one of the most important social and economic issues of society under market conditions. Employment and unemployment rates reflect labor market environment which, in turn, characterizes the balance of workplace supply and demand. Within the social perspective, it is one of the main factors of realization of the population labor potential, wherefore unemployment is a constantly urgent problem for government regulatory agencies.

**Review of recent publications.** Current issues of labor market regulation and population employment in Kazakhstan have been studied by S. Alpysbaeva (2002), A. Baigelova (2005), Y.K. Shokamanov (2007), B.L. Tatibekov (2007), M.K. Abdrazakova (2008), A. Koshanov (2012), S. Alimbaeva (2012) and others.

**The purpose of this research** is the development of economic and statistical approaches to estimating and forecasting the unemployment rate in the Republic of Kazakhstan.

**Key research findings.** As a result of positive changes taking place in the real sector of Kazakhstan economy, national labor market is experiencing noticeable shifts.

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Population employment started forming itself by the market principle – driven by supply and demand.

During the first years of the transition period, situation at the labor market was characterized by the decrease in the number of the employed. The beginning of economic recovery gave a new impulse to population employment. Since 1996, labor market stabilization has been observed, reduction of production downtime was overcome by means of fuller involvement in production of those workers who were on forced leaves or working part-time before. Since 1999, steady increase in the number of the employed is observed along with the decrease in unemployment rate. Table 1 shows the main indicators of the labor market of the Republic of Kazakhstan for the last 5 years.

Thus, for the period of 2010–2014 the growth in economic activity of population by 4.1% was observed, the growth of employment was 4.9%, while the decrease in unemployment rate was from 5.8% to 5.0%, evidencing one of the lowest unemployment rates among the CIS countries. By comparison, according to the Eurostat agency, unemployment in the European Union in 2014 reached 11.3% on average. The data varies by countries. For example, in the countries of Eastern Europe the unemployment rate is 18%, but in Germany this indicator is lower than 5% (at the end of 2014. Traditionally, Greece is keeping the worst position, every fourth working-age Greek citizen cannot find a job (Argandykov, 2015).

*Table 1. Labor market indicators in the Republic of Kazakhstan, 2010–2014, calculated by the authors using the data (Committee on Statistics of Kazakhstan, 2014)*

Indicator name	2010	2011	2012	2013	2014	Changes in 5 years	
						absolute	relative, %
Gainfully employed population, thousand people	8610.7	8774.6	8981.9	9041.3	8962.0	351.3	4.1
Employed population, thousand people	8114.2	8301.6	8507.1	8570.6	8510.1	395.9	4.9
Wage labor, thousand people	5409.4	5581.4	5813.7	5949.7	6109.7	700.3	12.9
Self-employed population, thousand people	2704.8	2720.2	2693.4	2621.0	2400.4	-304.4	-11.3
Unemployed population, thousand people	496.5	473.0	474.8	470.7	451.9	-44.6	-9.0
Unemployment rate, %	5.8	5.4	5.3	5.2	5.0	-0.8	-13.8
Youth unemployment rate, % (at the age of 15–24)	5.2	4.6	3.9	3.9	3.8	-1.4	-26.9
Youth unemployment rate, % (at the age of 15–28)	6.6	6.3	5.4	5.5	4.2	-2.4	-36.4

However, despite the abovementioned positive changes, national labor market is still not balanced. For the purpose of dynamics analysis of change trends of the unemployment rate in Kazakhstan we use the mathematic-economic modelling methods.

In terms of methodology, the main tool of nearly any forecast is extrapolation which enables forecasting the growth rates of economic phenomena in the short term, proceeding from the trends in the previous period.

In order to form the unemployment rate forecast in Kazakhstan for the forthcoming period, we will use the data on the unemployment rate over the last 10 years as presented in Table 2.

**Table 2. Initial data for forecasting – the unemployment rate in Kazakhstan during 2005–2014, calculated by the authors using the data**  
(Committee on Statistics of Kazakhstan, 2014)

Indicators	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Unemployment rate, %	8.1	7.8	7.3	6.6	6.6	5.8	5.4	5.3	5.2	5.0

We perform the forecasting of the unemployment rate using the moving average method. To do this, first of all, we determine the size of smoothing and calculate the moving average of the unemployment rate (Table 3).

**Table 3. Determination of the unemployment rate moving averages, authors'**

Year	Unemployment rate in the region $y_t$	Moving average $m$	Average relative error calculation $ y_{(t)} - y^{i(t)}  y_{(t)} \times 100$
2005	8.1	-	
2006	7.8	7.73	0.85
2007	7.3	7.23	0.91
2008	6.6	6.83	3.54
2009	6.6	6.33	4.04
2010	5.8	5.93	2.30
2011	5.4	5.50	1.85
2012	5.3	5.30	0.00
2013	5.2	5.17	0.64
2014	5	-	-
Total			14.14
2015	5.10		
2016	5.03		
2017	5.02		

It is calculated by the authors according to the data from (Committee on Statistics of Kazakhstan, 2014).

We will calculate the predicted unemployment rate for 2015 using the formula:

$$y_{t+1} = m_{t-1} + \frac{1}{n} \times (y_t - y_{t-1}), \tag{1}$$

where  $t + 1$  is the forecast period;  $t$  is the period preceding the forecast period;  $y_{t+1}$  is the forecast indicator;  $m_{t-1}$  is the moving average for two periods prior to the forecast one;  $n$  is the number of levels included into the smoothing interval;  $y_t$  is the actual value of the studied phenomenon for the preceding period;  $y_{t-1}$  is the actual value for the two periods prior to the forecast period.

$$y_{2015} = 5.17 + \frac{1}{3} \times (5 - 5.2) = 5.1\%.$$

In order to determine the unemployment rate in 2016 we will calculate the moving average for 2014:

$$m = \frac{5.2 + 5 + 5.1}{3} = 5.1\%.$$

We will determine the unemployment rate in 2016 by the formula (1):

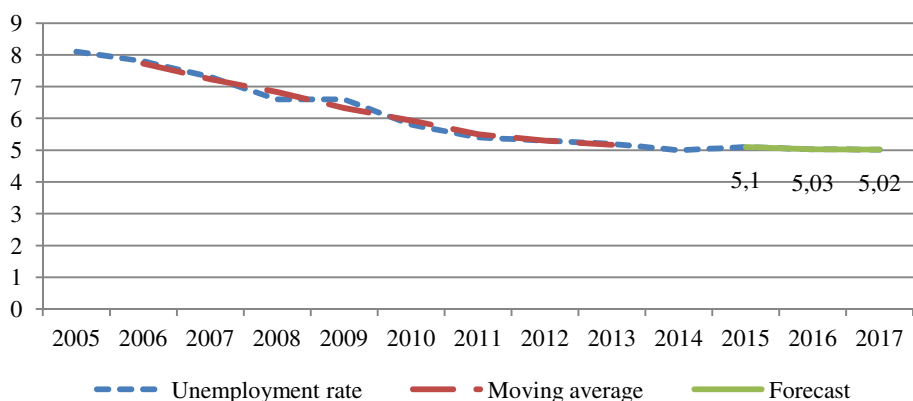
$$y_{2016} = 5.1 + \frac{1}{3} \times (5.1 - 5) = 5.03\%.$$

We will calculate the moving average for 2015:

$$m = \frac{5 + 5.1 + 5.03}{3} = 5.04\%.$$

Thus, the unemployment rate in 2017 according to the formula (1) will be:

$$y_{2017} = 5.04 + \frac{1}{3} \times (5.03 - 5.1) = 5.02\%.$$



**Figure 1. The unemployment rate forecast for the Republic of Kazakhstan until 2017 using the moving average method, calculated by the authors using the data from (Committee on Statistics of Kazakhstan, 2014)**

As it is seen from the data in Figure 1, according to the forecast calculated by the authors by means of the moving average method, the average unemployment rate in Kazakhstan will remain at the level of 5.1–5.02% in 2015–2017 with a pronounced tendency to decrease.

In order to estimate the accuracy of the executed forecast, we will calculate the average relative error by the formula:

$$e = \frac{1}{n} \times \sum_{i=1}^n \left[ \frac{|y_{(t)} - y_{(t)}^i|}{y_{(t)}} \times 100 \right]. \quad (2)$$

Therefore,  $e = 14.14 / 8 = 1.76$ .

Since the value of the calculated error does not exceed 10% (Table 4), the accuracy of the forecast can be treated as high.

For calculation of the unemployment forecast by the exponential smoothing method, we use the formula:

$$U_{t+1} = a \times y_t + (1-a) \times U_t, \quad (3)$$

where  $t$  is the period preceding the forecast period;  $t + 1$  is the forecast period;  $U_{t+1}$  is the forecast indicator;  $a$  is the smoothing parameter;  $y_t$  is the actual value of the studied phenomenon for the preceding period;  $U_t$  is the exponentially weighed average for the period preceding the forecast period.

Table 4. Interpretation of the values of the average relative error for the forecasts' accuracy estimation, based on (Malyhin, 1998)

$e, \%$	Interpretation
< 10	High forecast accuracy
10–20	Good accuracy
20–50	Satisfactory accuracy
> 50	Unsatisfactory accuracy

We will determine the parameter by the formula:

$$a = \frac{2}{n+1}, \tag{4}$$

where  $n$  is the number of observations included in a smoothing interval.

In our case, it is:

$$a = \frac{2}{10+1} = 0.18.$$

We will determine the value  $U_0$  – the exponentially weighed average of the initial by the arithmetic average formula by means of two methods:

1)  $U_0 = \frac{8.1+7.8+7.3+6.6+6.6+5.8+5.4+5.3+5.2+5}{10} = 6.31.$

2) (we accept the first value of the forecast base)  $U_0 = 8.1.$

Now we can carry out the exponential smoothing (Table 5).

Table 5. Exponential smoothing, calculated by the authors using the data (Committee on Statistics of Kazakhstan, 2014)

Period	Unemployment rate, % $y_t$	Exponentially weighted average $U_t$		Average relative error calculation	
		method 1	method 2	method 1	method 2
2005	8.1	6.31	8.1	22.10	0
2006	7.8	6.63	8.10	14.97	3.85
2007	7.3	6.84	8.05	6.27	10.22
2008	6.6	6.92	7.91	4.92	19.87
2009	6.6	6.87	7.68	4.04	16.30
2010	5.8	6.82	7.48	17.56	29.00
2011	5.4	6.64	7.18	22.87	32.95
2012	5.3	6.41	6.86	21.00	29.41
2013	5.2	6.21	6.58	19.47	26.51
2014	5	6.03	6.33	20.60	26.61
Total	63.1	65.7	74.3	153.8	194.7
Forecast					
2015		5.84	6.09		
2016		5.87	6.13		

As is calculated by authors:

- method 1:

$$U_{2005} = 8.1 \times 0.18 + (1 - 0.18) \times 6.31 = 6.63\%;$$

$$U_{2006} = 7.8 \times 0.18 + (1 - 0.18) \times 6.63 = 6.84\%;$$

...

- method 2:

$$U_{2005} = 8.1 \times 0.18 + (1 - 0.18) \times 8.1 = 8.1\%;$$

$$U_{2006} = 7.8 \times 0.18 + (1 - 0.18) \times 8.1 = 8.05\%;$$

...

We will determine the forecast values of population unemployment by the formula (3):

- for 2015:

method 1 —  $U_{2015} = 5 \times 0.18 + (1 - 0.18) \times 6.03 = 5.84\%;$

method 2 —  $U_{2015} = 5 \times 0.18 + (1 - 0.18) \times 6.33 = 6.09\%.$

The average relative error is:

method 1 —  $e = 153.8/10 = 15.38\%;$

method 2 —  $e = 194.7/10 = 19.5\%.$

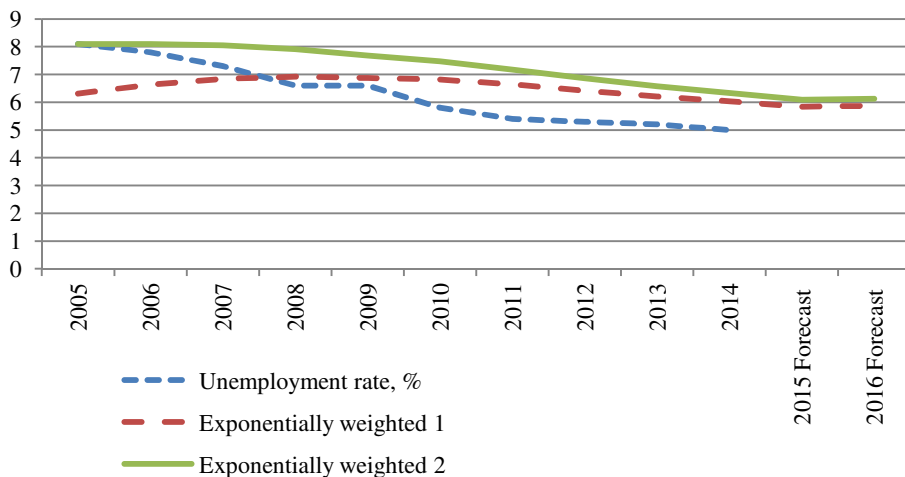


Figure 2. Graph of the exponential smoothing, calculated by the authors using the data (Committee on Statistics of Kazakhstan, 2014)

**Conclusions.** As it can be seen from the presented data, the unemployment rate in Kazakhstan in 2015 will be at the level of 5.84–6.09%, in 2016 – at the level of 5.87–6.13%. According to the estimates of the International Labor Organization, the unemployment rate within 3.5–6.5% is acceptable.

Calculations of the forecast value of unemployment rate by means of the moving average method is the most accurate one, in our opinion. The average relative error is

1.76%, evidencing high accuracy of the forecast and the efficiency of this forecasting method.

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