THE STUDY OF SEASONAL FLUCTUATIONS OF INVESTMENTS FIXED CAPITAL

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Time series usually contain two main elements: the trend and the variability. With the aim of obtaining the most accurate characteristics of the development process and on this basis a more accurate prediction of the studied phenomenon it is necessary to identify and measure not only trends, but also variability, and in particular the seasonal component.

The aim of this study is to identify and measure seasonal fluctuations of investments in fixed capital in the presence of trends and in its absence.

Material and methods. For analysis were used quarterly data on fixed capital investments of the Republic of Belarus in 2011-2017 years [1]. We used a method of analytical alignment of the time series with the inclusion of indices of seasonal fluctuations and how to calculate seasonal indexes by the method of constant mean.

In order to determine which method is appropriate to apply in this case, we constructed a graph reflecting the dynamics of investments in fixed capital for 2011–2017, presented on picture 1:
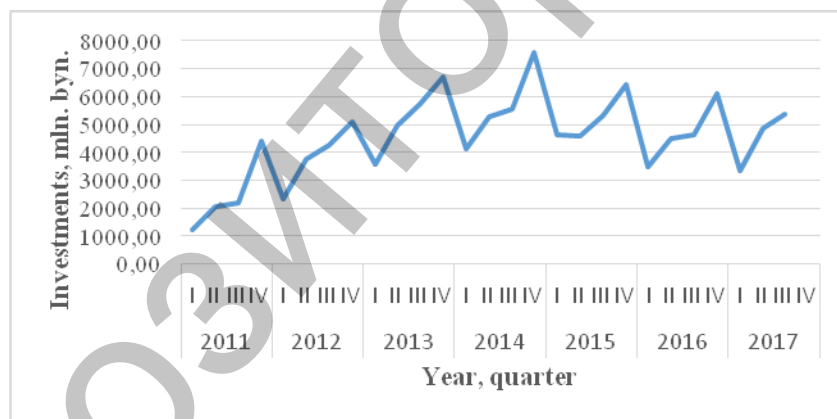
Picture 1 – Dynamics of investments into fixed capital in the Republic of Belarus in 2011-2017

Results and their discussion. According to the schedule shown in picture 1, it is seen that in the dynamics of the studied phenomena are expressed seasonal fluctuations, however, to describe the development of this phenomenon with one trend equation for the entire study period is not possible, so we need to implement a periodization data and use different methods of measuring seasonal variations at each time interval separately. Also, the graph shows that in the development of investment in fixed capital in the Republic of Belarus it is possible to allocate two periods: from 2011 to

2014 and from 2015 to 2017. Further, each of the periods was studied separately.

For the period from 2011 to 2014, the method of analytic alignment was constructed the equation of the trend: $y = 313,97x + 1363,3$. The magnitude of the accuracy of the approximation has the value $R^2 = 0,7304$, which shows that the resulting trend equation reasonably describes the trend of development of investments into fixed capital over the period of time.

In addition to trends in the development of this series contains a significant seasonal component that should be measured and taken into account when forecasting. As in this case, there is a definite trend, the seasonal index is the ratio of the actual levels to levels obtained using the equations of the trend. The seasonal index for each quarter are averaged when using the formula of average arithmetic weighed [2].

$$\bar{I}_{Si} = \frac{\sum_i I_{Si} \bar{y}_i}{\sum_i \bar{y}_i},$$

Where $\bar{I}_{Si}$ – the average seasonal index for the quarter for all time; $\bar{y}_i$ – the average quarterly level for each year; I_{Si} – the seasonal index for the quarter. Using this method, we get the results shown in table 1.

Table 1 – Dynamics of investments into fixed capital in the Republic of Belarus for the years 2011–2014

| Year	Quarter	Investments, million r.	Trend	The annual average trend	The seasonal index	Average seasonal index	Trend seasonally adjusted
2011	I	1206,61	1950,27	2421,225	0,619	0,720	1404,350
	II	2048,48	2264,24		0,905	0,777	1760,405
	III	2204,29	2578,21		0,855	0,794	2046,686
	IV	4407,11	2892,18		1,524	1,026	2968,128
2012	I	2349,74	3206,15	3677,105	0,733	0,720	2308,684
	II	3782,07	3520,12		1,074	0,777	2736,829
	III	4273,00	3834,09		1,114	0,794	3043,654
	IV	5085,13	4148,06		1,226	1,026	4256,988
2013	I	3585,17	4462,03	4932,985	0,803	0,720	3213,018
	II	4942,30	4776,00		1,035	0,777	3713,253
	III	5729,68	5089,97		1,126	0,794	4040,622
	IV	6700,29	5403,94		1,240	1,026	5545,847
2014	I	4146,98	5717,91	6188,865	0,725	0,720	4117,352
	II	5268,63	6031,88		0,873	0,777	4689,677
	III	5546,75	6345,85		0,874	0,794	5037,590
	IV	7603,53	6659,82		1,142	1,026	6834,706

A set of average seasonal indexes by quarter forms the seasonal wave.

To characterize seasonal fluctuations of investments in fixed capital in the period from 2015 to 2017 was used the method of constant mean because in this period there is practically no trend in capital investment [3]. Calculation of average seasonal indexes is as follows

$$I_S = \frac{\bar{y}_i}{\bar{y}} * 100\,\%$$

Where $\bar{y}_i$ – the average for each quarter for 3 years; $\bar{y}$ - total average quarterly level in 3 years.

Calculated with this formula the average seasonal indexes form the wave, which is shown in picture 2.
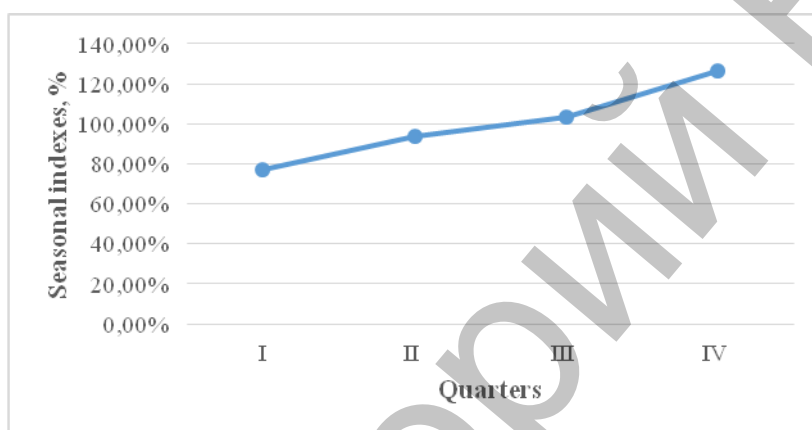
Picture 2 – Schedule of seasonal wave for 2011–2014

Conclusion. In this article we have identified and measured seasonal fluctuations of investments in fixed capital with the presence of a trend and with its absence. When using both the first and the second methods, we got similar results. Therefore, we can say that we have identified and measured steady seasonal fluctuations of investments in fixed capital in the Republic of Belarus: in the second and the third quarters investments gradually increase, in the fourth quarter there is a sharp increase, and then in the first quarter of next year - a sharp decline. Detected seasonal variations should be taken into account in the planning and forecasting of investments in fixed capital.

Reference list:
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