

AVERAGE WAGE DYNAMICS MODELING IN VIEW OF THRESHOLD EFFECTS

One of the main indicators of the country's economy condition and the well-being of the population is the indicator of the average wage in the country. Modeling the dynamics of this indicator allows to assess trends and predict further downturns and rising of the population purchasing power, changes in the level and quality of the population life.

The dynamics of changes in the average wage in the country reflects the situation in the economy and is formed by the market laws of supply and demand. The direct influence of the state on the formation of wages in the country occurs through the payment of wages in state-owned enterprises and institute of minimum wage. According to the International Labor Organization Convention No 131, the minimum wage is a tool to deal with poverty and inequity in wages of the least qualified personnel [1]. By increasing the statutory minimum wage, the state influences the type of distribution of wages in the country, compressing the first quartile of wages. The interesting question regarding the significance of changes in the average wage level to the minimum wage. Empirical studies for individual countries are quite contradictory.

The change in the minimum wage in Ukraine in recent years suggests a moderate state policy with its traditional cyclical increase several times a year. Significant jumps in the minimum wage for the period from 2000 to 2018 were absent, except doubling the minimum wage in January 2017. The government's decision to double the minimum wage from January 1, 2017 has caused a lot of discussion among economists and political elites. Such a decision is not unprecedented, in the 1990s, the minimum wage in Ukraine was one-time more than tripled. However, since 1999, changes in its size occurred gradually.

Due to the significant jump in the minimum wage in 2017, it can be assumed that there are various modes of formation of the average wage under the influence of the minimum wage. The study was based on the hypothesis about the significant influence of the minimum wage on the average wage and the presence in the study period 2000-2018 of the switch mode dependence of the average wage from the minimumvone.

Thus, the purpose of this article is to simulate the dynamics of the average wage, taking into account the impact on its formation of the minimum wage and the availability of different modes of the indicators ratio.

Fig. 1 presents the correlation field of the dependence of the average and minimum wages in Ukraine for the period from 2000 to 2018. Based on the graphical representation of the dependence, it is possible

to assume the presence of several indicators ratio modes (marked by transverse lines in the figure). One of the possible moments of the mode change may be associated with an increase in the minimum wage in January 2017 to 3200 UAH. It can also be assumed that there are differences in the functional dependence of the average wage on the minimum for the period up to the end of 2013 and from the beginning of 2013 (the first label in Fig. 1).

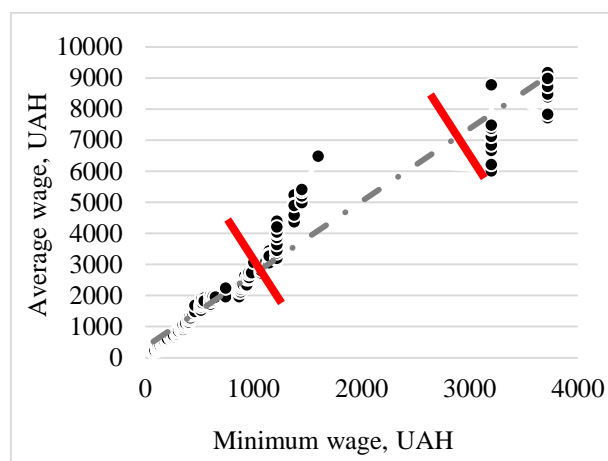


Fig. 1. The ratio of the minimum and average wages, 2000-2018

Traditionally, for modeling time series in the presence of turning points in them that lead to dramatic changes in trends, piecewise regression models are used. The periods before and after the change of the trend are marked by the researcher manually using auxiliary variables ($dummy = \begin{cases} 1, & t < T^* \\ 0, & t \geq T^* \end{cases}$, where T^* - moment of transition to another mode of system operation). Based on the context of the study and preliminary data analysis, the researcher puts forward a hypothesis about the presence of a change in the type of dependence exactly at the moment of time T^* . Refutation or confirmation of the hypothesis is carried out by comparing the quality of regression models with and without a turning point.

When regressing from several independent variables, the moment of mode change is not visible graphically. In addition, the mode change is not necessarily associated with the complex effect on the dependent variable of all regressors or the time factor as such. Switching the mode can be caused by the change of only one of the regressors that is critical for the system under study.

Threshold regression models allow to investigate the effect of switching system operation modes associated with the achievement of the critical value by a separate regressor. There is no need for pre-marking periods. The critical value of the threshold variable is calculated in the process of building the model [2].

The general view of the threshold regression model for the two modes is similar to the system of the form:

$$y_t = \begin{cases} f_{1t}(X_t) + e_{1t}, & q_t < \gamma \\ f_{2t}(X_t) + e_{2t}, & q_t \geq \gamma \end{cases}$$

where y_t – dependent variable at time t ;

q_t – threshold variable at time t ;

γ – critical value of threshold variable;

$f_{1t}(X_t)$ – regression for the first mode from a set of independent variables X ;

$f_{2t}(X_t)$ – regression for the second mode from a set of independent variables X ;

X_t – independent variables at time t ;

e_{1t}, e_{2t} – residues at time t .

Threshold regression models can also, as models with dumm variables, describe various options for mode change. The step and hinge models describe a non-step change in the dependent variable from the regressors that occurs without discontinuities. Models segmented and stegmented - spasmodic behavior when changing modes.

To describe the process of forming the average wage indicator, the threshold model was built, where the minimum wage indicator was considered as the threshold variable (the rationale for the choice of specification is presented in [3]):

$$meanZP = a_0 + a_1 * t + a_2 * t^2 + a_3 * minZP,$$

where $meanZP$ – the average wage in Ukraine;

$minZP$ – minimum wage in Ukraine;

t – time indicator.

An independent variable $minZP$ was used as a threshold. The study was based on the null hypothesis of the presence in the study period 2000-2018 in Ukraine, the moment of switching the mode for the functional dependence of the average wage on the minimum wage and time trend.

Comparison of the constructed regression models with different versions of the threshold effects and the usual regression without switching modes allowed us to confirm the hypothesis about the presence of regime changes in the formation of the average wage. So the best forecast quality was given by the model with threshold effects hinge (m.a.p.e.=6.72%) and step (m.a.p.e.=6.64%). For comparison, a model without threshold effects showed the quality of the forecast 8,84%. The hinge model is a model where, at the mode change point, the conditional “slope” of the regression line changes without a sharp jump in the values of the dependent variable. Model step involves a sharp jump, without changing the “angle of inclination”.

However, the threshold values of the minimum wage for which there was a regime change for the models built were differed. The hinge, segmented, stegmented model group for both model specifications indicated the minimum wage threshold value of UAH 1218, corresponding to the period of December 2013. This regime change can be easily explained by the events in Ukraine connected with dignity revolution and the subsequent violation of the territorial integrity of the state. While step model identified the end of 2016 as the mode change. That was the period before the highest in 2000-2018 jump in the value of the minimum wage (from January 2017 the minimum wage has doubled).

Thus, we can draw the following conclusions. The quality of threshold models for predicting the values of average wages in Ukraine is generally higher than models without threshold effects. The simulation results suggest that there are more than two modes in the functioning of the average wage formation system in Ukraine during the study period.

It can also be concluded that the switchings of the modes in the period under study are of a substantially different nature. The first variant of regime change is associated with a political and territorial changes in the country’s functioning. The second variant of regime change, connected with the regulatory actions of the state on the labor market, expressed in a sharp increase in the minimum wage, causes only an adaptation of the functional dependence to the new conditions without a significant impact on the growth of the average wage. The impact of sharp one-time changes in the minimum wage (twice in January 2017) has virtually no effect on the overall picture of the average wage formation.

References

1. Minimum Wage Fixing Convention, 1970 (No. 131): Convention concerning Minimum Wage Fixing, with Special Reference to Developing Countries (Entry into force: 29 Apr 1972). URL: <http://www.ilo.org/>
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