

# **PECULIARITIES TO CHOOSE SALES POLICY TOOLS AT THE UKRAINIAN INNOVATIVELY ACTIVE MACHINE BUILDING ENTERPRISES AT THE ECONOMIC CYCLE STAGE**

**ILLIASHENKO SERGII, OLEFIRENKO OLEG**

## **Introduction**

Economy development is described by the cyclic continuous swing, which consists in speeding or great slowing of its growth tempus. Active interconnection of enterprises with environment needs to identify scientific and technical, organizational, social, political identification of its changes to form proper reaction like managerial decisions. Taking into account mentioned above, these processes of strategic planning are constantly changes at the enterprises at every economic cycle (long or short) phase. Sales policy is not exception. In general, it determines directions of collaboration with economic contractors, forms proper responses on consumers' current needs and provides to receive profit by enterprise. Under these conditions the problem to control enterprise sales policy is updated, considering cyclic changes in economy management macro- and microenvironment.

Fundamental bases to study cyclicity problems in economy are put in works of classical economic thought scientists (M. I. Tugan-Baranovsky, 1997; M.D. Kondratyev, 2002; J. Schumpeter, 1982). Problems to provide correspondences of sales policy and its economy current state tools are investigated in works of native and foreign scientists (V. P. Kolesov, 2002; I. Ansoff, 2001; J. Bolt, 1998; P. Drucker, 2004; F. Kotler, 2012; M. Porter, 1993; T. Skripko, 2011; N. Chukhray, R. Pator, 2006; S. Illiashenko, 2005; S. Illiashenko, 2010) and others.

However, in spite of existing works concerning sales policy improvement within quick changes in environment, the problem to form efficient tools for sales policy management at various cyclic economic development stages has not been solved yet. Determination of sales policy tools for innovatively active enterprises at the fall, depression and crisis stages is of special attention for Ukraine.

Thus, the object of the article is to investigate formalized methodic approach to choose sales policy tools of the innovatively active machine building enterprises considering native economy cyclic development.

## 1. Formalized model of the real GDP change

Current state in economy development is described by its cyclical changes tempus quickening. It increases level of demands to higher management at the enterprises, managerial decisions of which have to provide maximum fast and adequate adaptation to the constant market conditions. Efficient sales policy of the innovatively active enterprises becomes of special attention, because innovation is a change, which is observed as profit source. Accordingly, it is necessary to prognosticate and consider these changes (S.M. Illiashenko, O.M. Olefirenko, 2015). Rational decisions making in sales policy consists in identification of the most effective tools to realize it depending on economic cycle stage.

To identify cyclical changes in native economy, one suggests to use real GDP change factor (in % to the proper period of the previous year). Identification of this factor is preconditioned by its ability to describe efficiency of all economic processes in state.

It provides to suggest methodic approach to formalize sales policy tools choice of the innovatively active machine building enterprises, based on analysis and comparison of the economy development cyclicity factor changes for several period of time with changes in innovative production selling profitability factor.

It foresees stage-by-stage implementation of the following procedures:

1. Analysis of real GDP factor changes dynamics (changes of real GDP), also its mathematic formalization.
2. Comparison of real GDP change factors and innovative production selling profitability of the analyzed enterprises.
3. Formation of innovatively active machine building enterprises sales policy considering its tools efficiency level at various stages in economic development.

Within realization of the suggested methodic first stage to choose tools in sales policy of innovatively active machine building enterprises, real GDP change factor dynamics is investigated for period during 2001 - 2014. Mathematic interpretation of works in the given stage foresees to conduct time series decomposition, based on regressive analysis use and cyclicity indexes building. Real GDP decomposition is preconditioned by necessity to search for cyclical component in time series and its further formalization with purpose to distinguish cycle duration and its cycle.

Thus, firstly, let's conduct graphical interpretation of real GDP change time series during 2001-2014. (fig. 1) and detailed analysis of the proper series variation in order to determine trend and systematic (cyclical) components.

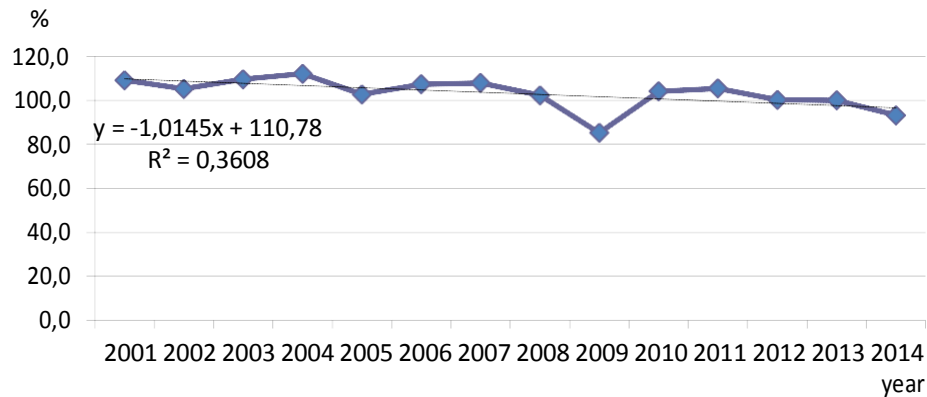
Analysis in fig. 1 allows to conclude about clear trend lineal component existing, which is characterized by constant fall in current period of time in comparison with the previous period. One can also observe clear cyclicity of real GDP change with period 4 years and with peak in every cycle. Besides mentioned tendencies it is necessary to point out abnormal series level, which differs greatly from general regularity and observed factor change in 2009, which is connected with world financial and economic crisis.

Having grounded trend and cyclic components in the real GDP change factor during 2001 - 2014, we conduct decomposition of the given time series.

First of all, to formalize trend description, shown in fig. 1 we will build (using ordinary least squares) linear regression equation, which characterizes dependence of

real GDP change on time indicator. According to results of analysis in the fig. 1 one may confirm:

- Real GDP change variation under time factor variation impact to 36,08%;
- Conformity of linear double regression equation, which characterizes real GDP change dependence on time indicator, based on Fisher's criterion at the level 6,77 units, which increases table level (4,75 units);
- Statistic significance of real GDP change trend equation free coefficient and parameters non-significance near management variable.



**Fig. 1. Dynamics of real GDP change factor (in % to the proper period in previous year) during 2001 - 2014.**

(it is built, based on data [State])

Thus, econometric model of the trend component in the investigated time series concerning real GDP change will be:

$$\Delta GDP = 110,7802 - 1,0145 \cdot t, \quad (1)$$

where  $\Delta GDP$  – change of the real GDP;  $t$  – indicator of time ( $t=1$  for 2001,  $t=2$  for 2002,  $t=3$  for 2003,  $t=4$  for 2004,  $t=5$  for 2005,  $t=6$  for 2006,  $t=7$  for 2007,  $t=8$  for 2008,  $t=9$  for 2009,  $t=10$  for 2010,  $t=11$  for 2011,  $t=12$  for 2012,  $t=13$  for 2013,  $t=14$  for 2014).

Analysis of the equation (1) testifies the real GDP change mid-year level at the rate of 110,78 % and the given factor annual decrease for 1,01 % in comparison with previous one. In spite of GDP absolute growth with each year, its increase tempus will be declined during following periods. It confirms not economy development, but inflationary component in the proper factor.

Secondly, we have to mention that in order to reveal cyclic component of real GDP change time series, it is necessary to conduct the following actions:

- Filtration of the cyclical component;
- Calculation of cyclicity indexes.

Thirdly, it is necessary to build trend-cyclic model of real GDP change (formula 2):

$$\Delta GDP = 110,7802 - 1,0145 \cdot t - 0,5990 \cdot I_1 + 3,5698 \cdot I_2 + 1,8177 \cdot I_3 - 4,7885 \cdot I_4, \quad (2)$$

where  $I_1$  – indicator of the real GDP change factor first year swings cycle, which is equal to "1" for the cycle first year in observed factor and to "0" for the second, third, fourth cycle years.  $I_1=1$  for 2002, 2006, 2010, 2014;

$I_2$  – indicator of the swings cycle second year concerning real GDP change factor, which is equal to "1" for the cycle second year of the observed factor and equal to "0" for the first, third, fourth years in the cycle.  $I_2=1$  for 2003, 2007, 2011;

$I_3$  – indicator of the swings cycle third year concerning real GDP change factor, which is equal to "1" for third cycle year of the observed factor and equal to "0" for the first, second, fourth years in cycle.  $I_3=1$  for 2004, 2008, 2012;

$I_4$  – indicator of the swings cycle fourth year concerning real GDP change factor, which is equal to "1" for fourth year of the observed factor and to "0" for first, second, third years in the cycle.  $I_4=1$  for 2001, 2005, 2009, 2013.

Analysis of equation (2) allows to make the following conclusions: cyclicity indexes of the second and third years in the 4-years swings cycle of the real GDP change have positive values. It is indicative of this factor levels increase on 3,57 % and 1,82 % in comparison with average level during 2001 - 2014. Time series of the real GDP change levels fall is observed in the first and fourth years in the 4-years swing cycle of the investigated factor change accordingly to 0,60 % and 4,79 %.

Thus, within realization of the first stage in scientific and methodic approach to determine sales policy strategies at the innovatively active machine building enterprises, there are peaks and falls in development of the native economy during 2001-2014 and formalized trend-cyclical model to change real GDP is built. It will allow to establish reasonability and efficiency in future to use sales policy tools depending on economy cycle.

## **2. Research of the cyclical changes impact in external macro-environment on innovative production profitability changes**

Let's compare cyclicity of GDP changes and enterprise innovative production selling profitability. It will allow to find cross points between trend-cyclical models of two factors, to set presence or absence time lags, and to define the most efficient tools in sales policy for concrete periods in economic cycle.

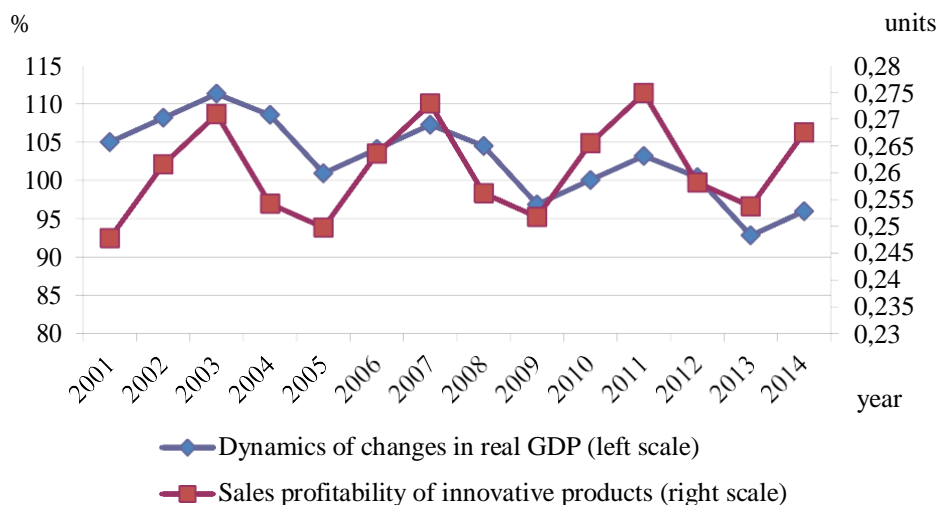
Analysis of economy practice allowed to determine main tools in sales policy, particularly:

- Part of expenses for innovation production sales in total expenses for sales ( $K_1$ );
- Ratio between innovative production sales expenses and profit from innovative production implementation ( $K_2$ );

- Number of managers, who had advanced training on innovations specialization in total number of company management ( $K_3$ );
- Part of selling to three biggest clients in relation to the total amount of innovative production selling ( $K_4$ );
- Conflicts with clients ( $K_5$ ).

Practice shows that innovative production selling profitability depends on their power and impact direction.

PJSC “Sumy SPU” (Sumy scientific and productive union) is chosen as object of investigation as leading innovatively active industrial enterprise. Ratio between factors of real GDP change and innovative production selling profitability in PJSC “Sumy SPU” during 2001 - 2014 is shown in fig. 2.



**Fig. 2. Ratio between factors of real GDP change and innovative production selling profitability at PJSC “Sumy SPU” during 2001 - 2014**

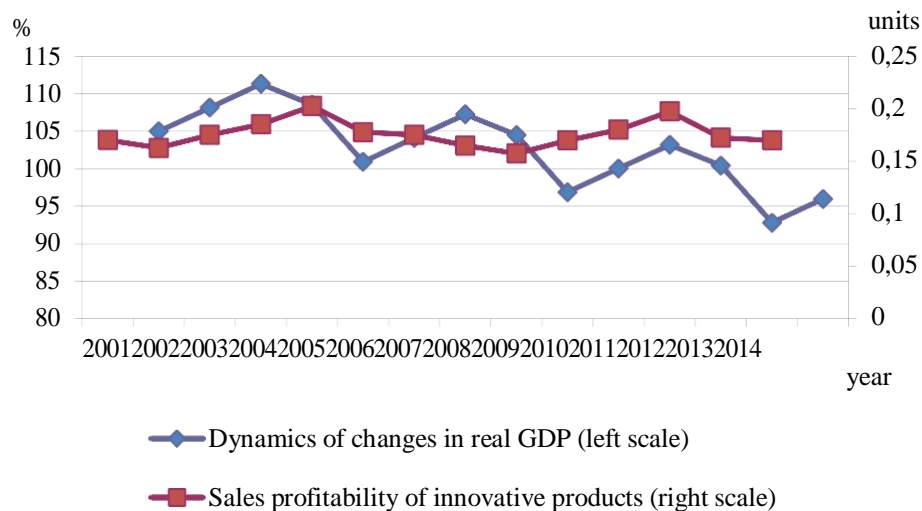
(created by authors)

Analysis of the fig. 2 allows to conclude about shifting on one year in time series of the innovative production selling profitability change at PJSC “Sumy SPU” in relation to time series of the real GDP change in Ukraine. It means that innovative production selling profitability changes with time lag in one year repeat changes of real GDP. The proper shift on one year is shown in fig. 3.

Thus, it has to be rightly mentioned that sales policy tools use (see above), e.g., during economic stagnation period will lead to grow innovative activity profitability at PJSC “Sumy SPU” in one year, confirmed by retrospective data for 2002 and 2010. Breaking of this regularity occurs in 2006, when under fall conditions in economy profitability increased after five time periods, taking into account identified annual lag. At the same time, if we mention the fact that in 2007 innovative production selling profitability was not changed in comparison with previous year, that is also positive fact during crisis period, annual effect between sales policy tools use activation and expected effect is kept.

Analogical calculations and proper graphical constructions were conducted for innovatively active machine building enterprises in Sumy region in Ukraine: SC

SPCGTB “Zorya” – “Machproject”, PJSC "Sumy Pump Power Engineering Plant", LLC "Turbomach".



**Fig 3 – Ratio between factors of real GDP change (shifted on 1 year) and innovative production selling profitability at PJSC “Sumy SPU” during 2001 - 2014**  
(created by authors)

### 3. Formation of sales policy strategy

At the final third modeling stage it is necessary to form sales policy strategy for every analyzed enterprise. With purpose to present graphically approach to implement this task we will group received results within previous stages in the table 1.

Analysis of the sales activity at all four innovatively active enterprises showed that among five mentioned above (see p. 2) factors of the sales policy tools, three make the biggest impact:

- Part of expenses for innovative production selling in total expenses for sales;
- Ratio between expenses for innovative production sales and innovative production realization profit;
- Number of managers, who had advancing training by innovation specialization in total number of company management.

At the same time, there is an interesting fact that for every analyzed enterprise rating of three mentioned tools is absolutely different and shows their activity peculiarity.

Presented equations of innovative production selling profitability depending on sales policy tools in fig. 1 are received through function “Regression” in the applied programs package Excel Microsoft Office due to analyzed enterprises data. This information, which characterizes productive and selling activity of analyzed enterprises with purpose to save commercial secret is hidden.

Since Ukrainian economy is in crisis, particularly machine building branch, the given results of calculation in the table 1, analytical information and recommendations reveal peculiarities of this phase in the economic cycle, because it is urgent.

**Table 1. Systematization of outgoing data to make decision to form sales policy strategy at the innovatively active machine building enterprise**

Enterprise	Equation of innovative production selling profitability dependence on sales policy tools	Factors rating	Lag	Regularities of the sales policy tools impact during economic crisis
PJSC "Sumy SPU"	$RPIP = 0,1971 + 0,3018 \cdot K_1 - 0,0718 \cdot K_2 + 0,2040 \cdot K_3 + 0,0137 \cdot K_4 + 0,0069 \cdot K_5$	1. K1; 2. K3; 3. K2.	1 year	Selling profitability has 7-years cycle, it occurs in one year for sales policy tools
SC SPCGTB "Zorya" – "Machproject"	$RPIP = 0,2849 + 0,2320 \cdot K_1 - 1,5510 \cdot K_2 + 0,2435 \cdot K_3 - 0,0185 \cdot K_4 - 0,0163 \cdot K_5$	1. K3; 2. K1; 3. K2.	-	Selling profitability has not 7-year falling cycle, it occurs next year for sales policy tools
PJSC "Sumy Pump Power Engineering Plant"	$RPIP = 0,0754 + 0,1062 \cdot K_1 - 0,4524 \cdot K_2 + 0,0707 \cdot K_3 - 0,0102 \cdot K_4 + 0,0109 \cdot K_5$	1. K2; 2. K1; 3. K3.	-	Selling profitability has 9-years cycle, sales policy action occurs next year
LLC "Turbomach"	$RPIP = 0,1945 + 0,2314 \cdot K_1 - 0,1650 \cdot K_2 - 0,1621 \cdot K_3 + 0,0083 \cdot K_4 + 0,0104 \cdot K_5$	1. K1; 2. K2; 3. K3.	-	Selling profitability has 4-years cycle, repeating economic development cycles, sales policy tools actions occur next year

(created by authors)

Particularly, determined regularities of sales policy tools impact during economic crisis in Ukrainian industry are oriented to investigate practically oriented recommendations concerning analyzed enterprises crisis recovery. Rating of factors (table 1) points sales policy tools, to which one has pay attention first of all. The given equations give ability to prognosticate profitability of innovative production selling, depending on factors, which characterize sales policy tools at every analyzed machine building enterprise.

Thus, information, given in table 1 can be used as methodic help while choosing effective strategies of sales policy at machine building enterprises-investors.

## Conclusions

Summarizing we have to conclude that the most active tools of sales policy, which mostly impact the innovative production realization profitability, and enterprise recovery after crisis, include: expenses part for innovative production sales in total expenses for sale; ratio between expenses for innovative production sales and

innovative production realization profit; number of managers, who had advanced training by innovations specialization in total quantity of company management. All they depend on sales activity financing amount, however this dependence is revealed in various way. If expenses part for innovative production sales in total expenses for sales and ratio between expenses for innovative production sales and innovative production realization describe amount and efficiency of the invested costs into sales, number of managers, who had advanced training by the innovations specialization, characterizes expenses into personnel and partially another direction to provide sales policy 0 personnel competence.

It is necessary to pay attention to impact factors, which are not very important but exist in the model, on the innovative production selling profitability, particularly on the selling part to 3 biggest clients in relation to total selling amount of the innovative production ( $K_4$ ) and conflicts with clients ( $K_5$ ).

However there is not only little impact of these factors on the productive and sales activity efficiency (contrary to it, diversification and clients' wishes satisfaction in the most significant thing in organization of sales policy in developed countries), but also different direction of their influence on the innovative production realization profitability for investigated enterprises. For SC SPCGTB "Zorya" – "Machproject" these both factors have feedback effect on profitability, and for SC "Sumy plant "Pump Power Engineering Plant" it is not only a factor, which describes selling concentration. In the first case, it may be explained by state form of enterprise property, and in the second case – stability of relations with clients and negative impact of any changes in this aspect.

Taking into account detention in positive shifts existing after sales policy tools introduction, we may mention that lag of sales policy action on innovative production selling profitability either in stability period, or during crisis, is one year.

Thus, we may conclude, that suggested methodic approach gives opportunity to determine sales policy implementation tools for concrete machine building enterprise, considering its functioning specific. Activation of these tools will allow to prevent crisis in economy. Besides, the investigated methods give ability to choose sales policy tools depending on financial abilities of the enterprise and desirable term of expected results appearing.

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**Note about Author (Authors):**

Illiashenko Segii, Doctor of Economics, Professor, Head of the Department of Marketing and Management of Innovative Activity, Faculty of Economics and Management, Sumy State University, Sumy, Ukraine;  
 Habilitated doctor, Professor, University of Economics and Humanities, Bielsko-Biala, Poland

**Olefirenko Oleg,**

Olefirenko Oleg, PhD, Associate Professor, Associate Professor of the Department of Marketing and Management of Innovative Activity, Faculty of Economics and Management, Sumy State University, Sumy, Ukraine.

**Abstract**

The article deals with identification of the most active sales policy tools set at the innovatively active machine building enterprise, considering economic development cycles. One establishes cyclical constituent of the real GDP change time series, interconnection between real GDP lag change in one year and innovative production selling profitability from machine building enterprises. Authors determine sales policy tools impact on enterprise ability to recover from crisis and their impact lags. Methodic recommendations concerning sales policy efficient strategies choice at the machine building enterprises-innovators are investigated.

**Key words:** sales policy, sales policy tools, innovatively active enterprises, machine building, economy cyclicity.