

ANALYSIS AND REGULATION OF DEVIATIONS HAPPENING WHILE FINANCING INNOVATIVE ACTIVITIES

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In this article relevant aspects of improving the system of financing innovative activities are being reviewed. Main steps of innovative activities financing model are being defined, based on which the simulator of innovative activities' financing was developed. Chance model of mathematical expectation of deviations appearing between allocated funds for Federal Target Programs de facto and planned ones was generated. This will allow working out recommendations for administrative decisions for dissolution of the deviations.

Evaluation of structure and amount of resources involved into the innovative process is the basis of state innovative policy. One of the optimization methods of budgetary financing of innovative activities is equation between the demand in financial resources for their implementation and resources allocated for satisfaction of this demand.

A great deal of publications has been devoted to the problem of innovative activities financing, such as written by S. D. Ilyenkova, V. N. Gunin, G. Ya. Goldshtein, R. A. Fatkhutdinov [1, 2, 3, 4] etc, however the problem of financing Federal Target Innovative Programs has barely been researched.

State support of innovative activities is being conducted through forming and implementing Federal Target Programs. However if the mechanism of Federal Target Programs formation is rather developed, their financing during the implementation remains one of the most problematic tasks. The conducted research has allowed us to establish that over the last 5 years about two thirds of Federal Target Programs have not been fully financed which undoubtedly affects the whole spectrum of social problems [5, 6].

Thus, there is a necessity for working out the new conceptual approach for improving state methods of financing of innovative activities through Federal Target Programs. Primary goals for solution of this approach are:

- ◆ definition of the demand in resources for innovative activities' financing;
- ◆ developing the best model of financial and material maintenance of innovative activities

through state regulation elements, such as tax potential and tax resource.

According to the fact that the basis of financing of Target Programs is represented by tax revenues, the simulator of management of financing innovative activities (Fig. 1) which includes the following steps (see below) was developed:

- ◆ planning the state demand in innovative tax resources;
- ◆ financing of innovative activities through forming the budget of innovations;
- ◆ financial statement of innovative programs performance;
- ◆ analysis and regulation of the revealed deviations;

The following acronyms are used in fig.1:

FIP - Federal Innovative Program;

OITP - Objects of Innovative Target Programs;

IA - Innovative Activities;

TP - Tax Potential;

TR - Tax Resource;

TRV - Tax Revenues;

B_{cur} , B_{cap} , B_c - Budgets of current, capital and costs in general, respectively;

ITP - Innovative Tax Potential;

BI - Budget of Innovations.

The internal maintenance of stages of the simulator is in detail presented on fig. 1 where components of each of the stages and their interrelation are in detail considered. The greatest interest represents the stage called "Analysis and Regulation of the revealed deviations" in financing of innovative activities as it will allow us to calculate an expected deviation of

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actually allocated resources for conducting a program from the planned ones. Thereby it will be possible to develop administrative decisions on elimination and dissolution of the arisen deviations on all sources of financing. For implementing the given stage the chance model of calculation of the mathematical expectation of deviations in financing FTP by kinds of financing sources and by Target Programs as a whole has been offered.

For definition of the role of sources of programs' financing in their general structure the additive function considering the general deviation between the planned and actual volumes of FTP is being entered.

$$\Delta = \Delta_{FB} + \Delta_{SB} + \Delta_{EBR},$$

where \ddot{A} - is a total deviation between planned and actual volumes of FTPs' financing; \ddot{A}_{FB} , \ddot{A}_{SB} , \ddot{A}_{EBR} - deviations between planned and actual volumes of FTPs' financing from the Federal budget, budgets of Russian Federation subjects and extra-budgetary resources, relatively.

To get a story of FTPs' financing straight there has been considered a set of the Target Programs conducted in 2004 - 2006, as having not only look-ahead, but also actual data based on their results. As we see from the research results (Fig. 2-4) there has always been a regular infringement of obligations on FTP's co-financing from the budgets of Russian Federation subjects and extra-budgetary sources.

The data resulted on fig. 2-4 visually shows that in 2004 there was under-financing of programs from all of the sources though, for the sake of justice, it is necessary to note, that even thus the Federal budget tried to carry out its obligations. If the maximum deviation (\ddot{A}_{FB}) between the plan and the fact reached minus 20%, on other sources of co-financing such deviations as \ddot{A}_{SB} and \ddot{A}_{EBR} were on average minus 50 % or resources were not allocated in general.

Indicative, from the point of view of FTPs' financial maintenance is the year 2006 when the Federal budget has carried out all of its obliga-

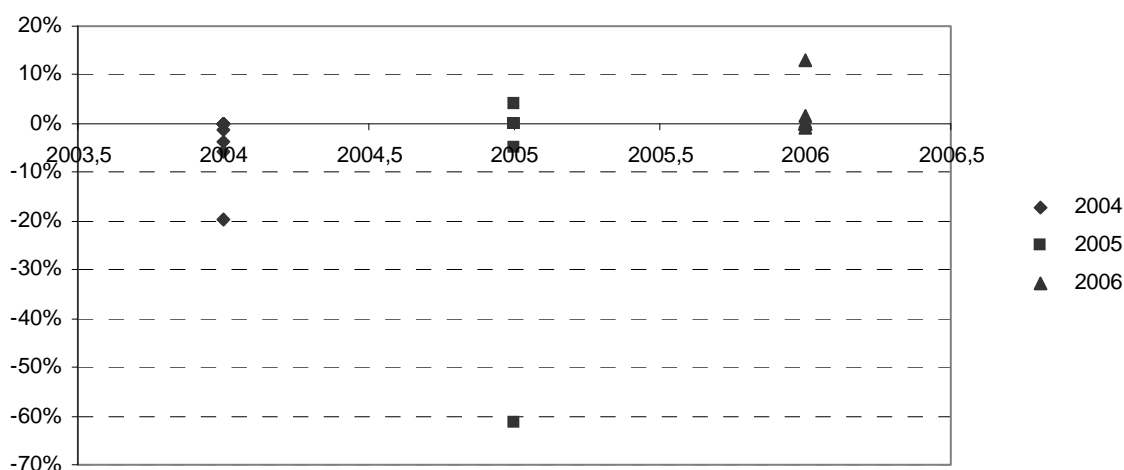


Fig. 2. Deviations (\ddot{A}_{FB}) between the planned and actual volumes of FTPs' financing from the Federal budget (FB), %

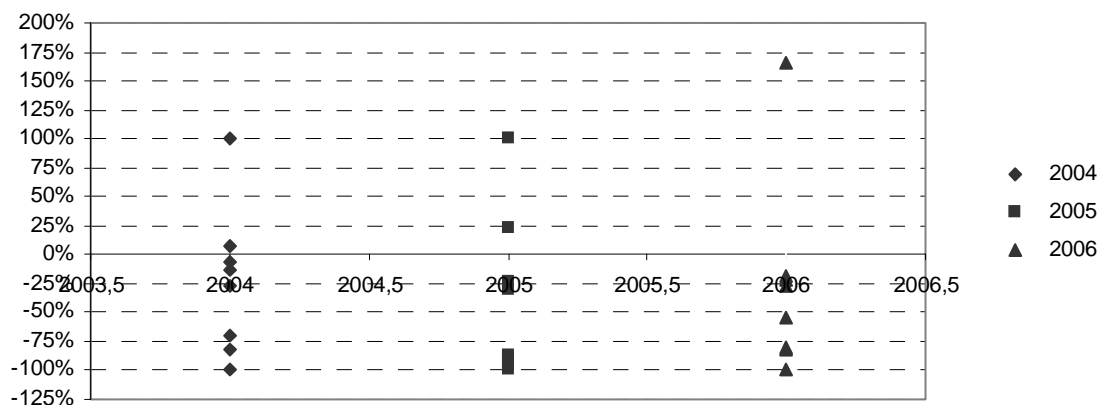


Fig. 3. Deviations (\ddot{A}_{SB}) between the planned and actual volumes of FTPs' financing from the budgets of the Federation subjects (SB), %

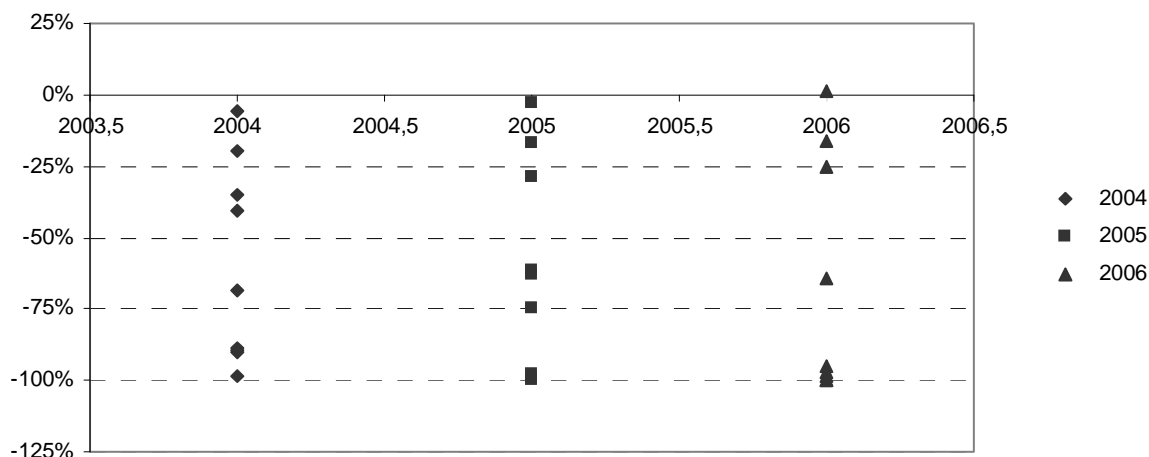


Fig. 4. Deviations (\ddot{A}_{EBR}) between the planned and actual volumes of FTPs' financing from the extra-budgetary recourses, %

tions (Fig. 2), however the co-financing situation practically has not changed, deviations there on average remained at the level of minus 50 %.

Thus, as the analysis has shown, the most reliable and obligatory source of FTP financing is the Federal budget. At the given stage it is necessary to establish a functional connection between the planned sums for FTP conduction and deviation of actually allocated amount of money resources from the planned ones for which we are using the method of correlative-regression analysis.

The deviation of actually allocated means for FTP implementation from planned ones is taken as a successful factor (y). As a sign-factor (x) the sum of the planned recourses is taken. The analysis at the stage of Programs' planning will allow counting in advance the subsequent lacks in co-financing, as the retrospective analysis of obligations conducted by various sources of financing shows that the Federal budget only carries out its obligations in full amount.

To establish existence of functional connection between the sign-factor and the successful sign we will apply the linear correlation coefficient. Results of calculation of selective factors of linear correlation we will present in table 1.

As correlation coefficients $> 0,75$ it is possible to draw a conclusion on presence of close linear dependence between deviations of actually allocated sums on FTP implementation from the planned ones and the planned means for FTP implementation. Therefore it is possible to define single-factor equations of linear regression to forecast appearance of these deviations for each source [7]:

$$\hat{y}_{FB} = a_0^1 + a_1^1 \cdot x_{FB}; \quad \hat{y}_{SB} = a_0^2 + a_1^2 \cdot x_{SB};$$

$$\hat{y}_{EBR} = a_0^3 + a_1^3 \cdot x_{EBR}.$$

Parameter a_1^i is a regression coefficient showing an average change of the result with a change of the factor on one unit. Parameter

Table 1

Sample correlation coefficients

Signs		Planned sum of means (equivalent to ruble values)		
		Federal budget, x_{FB}	Budgets of the Russian Federation subjects, x_{SB}	Extra-budgetary resources, x_{EBR}
Deviation of actually allocated amount of money resources from the planned ones (equivalent to ruble values)	Federal budget, y_{FB}	0,891	-	-
	Budgets of the Russian Federation subjects, y_{SB}	-	-0,916	-
	Extra-budgetary resources, y_{EBR}	-	-	-0,837

α_0^i shows the value of the consequent sign y at the zero value of x . In the considered economic model in the absence of the planned sums of financing ($x = 0$) deviations cannot arise, hence, it makes sense to accept a priori the constant α_0^i equal to zero. As a result the required equations of regression will become:

$$\hat{y}_{FB} = \alpha_1^1 \cdot x_{FB}; \quad \hat{y}_{SB} = \alpha_1^2 \cdot x_{SB};$$

$$\hat{y}_{EBR} = \alpha_1^3 \cdot x_{EBR}.$$

With the help of regression equations it is possible to estimate average sums of deviations while investing into FTP from planned ones on each kind of a source. To estimate the average sums of deviations on all three sources of financing as a whole it is possible to develop a model of mathematical expectation of a random variable Δ . To implement this specified approach it is necessary to estimate the probability of infringement of its obligations by the certain source of financing. As such estimation of probability we will accept the statistical probability of incomplete al-

Table 2

Equations of linear single-factor regression with a zero constant and estimation of their adequacy

Financing sources	Equation of linear regression	Coefficient of determination R^2	Observable value of Fisher's variance ratio	Statistical significance of the regression equation, %
Federal budget	$y_{FB} = 0,0116 \cdot x$	0,768	39,67	99,99
Budgets of the Russian Federation subjects	$y_{SB} = 0,184 \cdot x$	0,914	244,21	99,99
Extra-budgetary sources	$y_{EBR} = -0,291 \cdot x$	0,751	129,81	99,99

In tab. 2 equations of linear single-factor regression and estimation of their adequacy on the basis of Fisher's variance ratio are resulted.

As the coefficient of determination (R^2) for the first equation equals 0,768 the constructed equation considers 76,8 % of a variation of a studied variable. The remained share (23,2 %) is a result of influence of other factors, basically including infringements of obligations on FTP co-financing. The similar situation takes place according to the values of coefficient of determination for the second and third equations. Observable values of Fisher's variance ratio show that all constructed equations of linear regression are statistically significant, and the model is adequate, with a probability belief exceeding 0,9999.

The found factors of regression: 0,0116; -0,184; -0,291 allow us to assert that during the planning of Federal Target Programs financing from budgets of subjects of the Russian Federation it is possible to expect in advance under financing of programs from this source on average on 18,4 %, from extra-budgetary sources on 29,1 % from the planned sums. While planning the financing of FTP from the Federal budget there is observed an insignificant tendency to the over-expenditure of means.

location of money resources for considered set of programs. Such probabilities are outlined in table 3. Considering the amount of deviations as a discrete random variable it is possible to calculate its mathematical expectation that is an average predicted value depending on indicators of the factors included in the regression model.

Calculation and estimation of deviations while financing FTP (\ddot{A}_{FB} , \ddot{A}_{SB} and \ddot{A}_{EBR}), is an exclusively important problem. Its solution will help to carry out more exact and correct forecasting and planning of means for implementation of programs in the future.

Thus, on the basis of stated above it is possible to draw the following conclusions:

1. The operating order of working out and implementing of Federal Target Programs assumes the Federal budget as the basic source of financing, and also budgets of subjects of the Russian Federation and extra-budgetary sources. The most reliable and obligatory source of FTP financing is the Federal budget.

2. The simulator of innovative activities financing through creation of budget of innovations based on a universal model of calculation and implementation of tax potential is developed.

Table 3

Calculation of an expected deviation

Financing sources	Federal budget	Subjects of the Russian Federation	Extra-budgetary sources
Probability of financing infringement occurrence	$\rho_{FB} = 0,288$	$\rho_{SB} = 0,959$	$\rho_{EBR} = 0,912$
Calculation of an expected deviation	$\hat{y}_{FB} = 0,0116 \cdot x$	$\hat{y}_{SB} = -0,184 \cdot x$	$\hat{y}_{EBR} = -0,291 \cdot x$
Expected sum of a deviation taking into account probability of financing infringement occurrence	$M(\Delta) = \rho_{FB} \cdot \hat{y}_{FB} + \rho_{SB} \cdot \hat{y}_{SB} + \rho_{EBR} \cdot \hat{y}_{EBR}$		

3. The chance model of mathematical expectation's calculation of deviations of FTP financing by each kind of a source and on programs as a whole is developed, allowing calculation of the amount of an expected deviation of actually allocated means for implementation of a program from the planned ones.

Owing to "The Analysis and Regulation of the revealed deviations" stage it is possible to develop recommendations for administrative decisions based on elimination and disposition of the arisen deviations.

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