

Coupled Line Regression

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The insufficient level of theoretical questions' development in the sphere of the state budget, led not only to the loss of its identity, as an independent economical category, for a long time, but at the same time, it made it difficult to develop a budget fund's model of a country. Budget's fund, which is materially-financial basis of a country's activity, was being formed according to the tasks of functioning of command administrative system. Its size was oriented not on the optimal proportions, which are necessary for economy's regulations and decisions of social questions, but on an expenditure approach, which was oriented on providing financial resources for numerous organs of state authority. With this approach a sphere of action of a distributive function was practically without any limits.

There were some tries of finding an optimal criterion of forming state budget's fund. But the result of them in conditions of total planning system was insufficient: the sizes and levels of centralizing financial researches were in hands of state authority and were defined by commands from highranking people, but not by scientific criteria. In these conditions, while a state budget of a country was forming, they were coming from needs of financial resources on each level of a state governing, and revenues were found for them, revenues, which would be possible to mobilize in a budget and to provide fiscal interests of a country.

While an economy of a country was functioning without any problems and a sufficient level of its effectiveness was provided with the help of the administrative system, there were no problems in revenues and expenditures of a budget. But when the administrative system started to fall apart and couldn't provide relation between revenues and expenditures with the help of will methods, the problems of economy came out, thus showing a great growth of budget deficit.

Budget deficit- is a financial phenomenon, which is not obligatory connected with extraordinary actions. In modern world there is no such a country, which didn't face budget deficit in certain periods of its history.

While providing economical analyses, scientists work with different by meaning definitions of deficit budget. Budget of full employment(structural budget) is defined by the level of balance of a budget, which would have a place in a current real level of state expenditure and tax stakes in conditions of a potential

issue in economics. The change of a structural budget shows the direction, in which a fiscal policy will influence on a change of joint demand in economics. CYCLICAL BUDGET shows the influence of a business cycle on a state budget, i. e. it shows how a phase of an economical cycle influences on revenues, expenditures and a budget's balance. FACTUAL DEFICIT of a state budget is formed under influence of a discrete budget-taxing policy(structural deficit) and cyclical movements in economics(cyclical deficit).STRUCTURAL DEFICIT is defined as a budget deficit when tax stakes are functioning and there is a potential level of an issue. The overdraft of a factual deficit over a structural deficit gives a cycling deficit and the overdraft of a structural deficit over factual is a cyclical bonus. The change of an absolute size of a cycling deficit is defined by changes in tax structures and state expenditures, the automatic change of which answers to the changes of a real volume of production, inflation and unemployment depending on an economical cycle phase.

A budget deficit in its conventional meaning is the overdraft of expenditures over revenues.

$$\text{DEFICIT} = \text{EXPENDITURES} - \text{REVENUES}$$

The size of a budget deficit depends on the right relation of operations of organs of governing to the main statistical categories of state financials, which make its analytical, concept basis, i. e. to revenues, expenditures and financing.

For better understanding and for more effective figure of a deficit in the future, we'll calculate an equation of coupled regression of deficit's depending on revenues and expenditures.

Building of a couple line model of regression of deficit figure of state budget and figures of revenues and expenditures.

These are the following data (the resource is Ukrainian Committee of Statistics)

| Budget | Billion, karbovanci | | | Billion, hrn | | | | | | | |
|-------------|---------------------|--------|--------|--------------|------|------|------|------|------|------|------|
| | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
| revenues | 1227, 5 | 49622 | 523093 | 20,7 | 30,2 | 28,1 | 28,9 | 32,9 | 49,1 | 54,9 | 61,9 |
| Expenditure | 1919, 7 | 57249 | 630647 | 24,3 | 34,2 | 34,3 | 31,2 | 34,8 | 48,1 | 55,5 | 60,3 |
| Deficit | 692,2 | 7626,9 | 107554 | 3,6 | 4 | 6,2 | 2,3 | 1,9 | -1 | 0,6 | -1,6 |

For building a line regression it is necessary to check a selection of quantity and quality of uniformity and also absence of abnormal observations.

As a result of this checking it was established, that observations of 1992-1994 years were necessary to exclude from a selection, as they were abnormal and also they were not uniform in quantity with the rest indicators.

The received new data are in the table below:

| Year | Deficit (y) | revenues (x_p) | Expenditure (x_e) |
|------|-------------|--------------------|-----------------------|
| 1995 | 3,6 | 20,7 | 24,3 |
| 1996 | 4 | 30,2 | 34,2 |
| 1997 | 6,2 | 28,1 | 34,3 |
| 1998 | 2,3 | 28,9 | 31,2 |
| 1999 | 1,9 | 32,9 | 34,8 |
| 2000 | -1 | 49,1 | 48,1 |
| 2001 | 0,6 | 54,9 | 55,5 |
| 2002 | -1,6 | 61,9 | 60,3 |

Basing on this data we'll built an equation of coupled correlation of budget's deficit and revenues/expenditure.

$Y = a_0 + a_1 x_p$ - equation of coupled correlation of deficit and revenues

$Y = a_0 + a_1 x_e$ - equation of coupled correlation of deficit and expenditures

In these equations:

$$a_1 = R_{yx} * \frac{\delta_y}{\delta_x}$$

where R_{yx} – coefficient of coupled correlation, and δy and δx are dispersities

$$a_0 = \bar{y} - a_1 \bar{x}$$

Having calculated the coefficients we get the following equations:

$Y = 7,7052 - 0,14882 x_p$ - equation of coupled correlation of deficit and revenues

$Y = 8,4681 - 0,16035 x_e$ - equation of coupled correlation of deficit and expenditures

The given equations permit to forecast the deficit's figure basing on state expenditures data or having information of planned expenditures.

Also the given models describe the direction and tightness of links between regressars and regressant. In both cases it is revers and tight.

$$R_{yxp} = -0,84265$$

$$R_{yxe} = -0,77766$$

This permits to see the main tendencies of Ukrainian budget policy: the shorting of deficit while revenues and expenditures are growing and also a greater dependence of deficit figure on expenditures, but not on state's revenues.

The last conclusion is also confirmed while calculating coefficient of elasticity:

$$E = a_1 * \frac{\bar{x}}{\bar{y}}$$

According to the given formula the elasticity of the deficit of revenues is -2,8526, and of expenditures - 3,23407, consequently state expenditures more influence on deficit figure (1% changing, changes deficit figure on 3,23407%), that's why it's necessary to pay more attention while developing the methods of regulation of the state deficit's budget, on the dependences written above and to choose the write methods according to it.

The question which was put before the beginning of research, consist in a presence of more influential factor which more than others influences on the size of budgetary deficiency. The coefficient of elasticity and the equation of regress were calculated this purpose. The received conclusions may have a great importance at definition of ways of reduction of budgetary deficiency. However sizes of revenues and expenditures are fundamental at definition of size of deficiency. As any economy is complex system so other parameters which indirectly influence on budgetary processes are interesting also. A lot of these parameters are existing now, therefore it is not obviously possible to consider all of them within the framework of one research. Here I shall try to study influence on size of budgetary deficiency of one of the main parameters of economy of any country - rate of inflation.

There are parameters of rates of inflation in Ukraine for 1995-2002 .

| Year | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|-------------------------|---------|---------|---------|------|---------|---------|---------|--------|
| Price index (inflation) | 281 , 7 | 139 , 7 | 110 , 1 | 120 | 119 , 2 | 125 , 8 | 106 , 1 | 99 , 4 |

Using the same formulas we may receive the equation of dependence budgetary.

$$Y=0,1486+0,01344x_i$$

Also the coefficient of elasticity is interesting too. It is following:

$$E=0,9257$$

It means that inflation strongly enough influences on size of deficiency. In Ukraine the 1 % of the inflation increases deficiency by 0,93 %. This example precisely shows, that deficiency it is not simple scheme "incomes – charges". It is complex economic event and it is necessary to know how to manage it. Therefore choosing a way of reduction of budgetary deficiency it is necessary to understand its

communication with other phenomena in economy and to know in what degree they influence on it. In this research I have tried to give an example of revealings of such communication, its narrowness and a direction and I think that linear regress is the best way to define it.

Thus, knowing прогнозные values of the state budget of Ukraine for the future periods, it is possible to predict a rate of inflation of the corresponding period with the certain share of probability.

Ways of shortening.

Very negative consequences(financial, economical , social) of the enormous budget deficit demand a providing of a system of its overcoming , organizing an active financial policy , using the world adopted methods of fighting with deficit. An aspiration to equality of state revenues and expenditures by means of balancing state budget – it is one of the main tasks nowadays. Only deciding them, it is possible to provide an aim-oriented financial policy.

In a program we have to include some methods in order to shorten budget deficit, we have to provide such methods that, on one hand, would stimulate the coming of funds in a country's budget and, on the other hand, they would shorten state expenditures. These methods are:

- the change of directions of investments of budget funds in a sphere of a national economy in order to increase financial feedback from each hryvna.
- to save financing of only important social programs; to provide moratorium on accepting new social programs , which are in need of state financing;
- a prohibition for Central Bank of a country to give credits to government structures of any rank without proper documentation of state debt securities.

Apart from this , it is necessary to take into account, that in world practice a method of foreign funds (capital) is widely used. With its help several tasks are decided, but not only of fiscal character ,but economical also; state expenditures are shortening, which are given for financing of capital investments (in goes like this: the gap between revenues and expenditures is shortening) , the base for producing goods and services are widening, e new taxpayer appears (so revenues are coming to a budget), the state of paying balance is increasing.

For budget deficit financing inflational and non-inflational resources are used.

Non- inflational resources consists of:

- Financing of budget deficit is organized on account of borrowings on internal and external financial markets and on account of the usage of the left state funds. Borrowings are happened in a form of selling state securities(bonds and bills of exchange), borrowings from non-state funds (for example, from Pension fund or a fund of fighting unemployment) or from bank's credits. The last form of financing budget deficit is used by local authorities. External borrowings for covering state budget's deficit, in such organizations as International Monetary Fund, World Bank and in developed countries and its unions, like EU, are typical for developing countries and for the countries with transferring economy, like Ukraine.
- Transfery- is financing in the form of free financing.

To shorten deficit of a budget , a state must accumulate debts-delay debts payments or bought goods and increase taxes. These methods have non-inflational character.

Inflational resources of financial of budget deficit is monetary of deficit, which is happening as a result of borrowings of Central Bank and its acquiring of state securities.

Budget deficit is always covered by emission. As a result of this emission an uncontrolled inflation is developing, incentives for investments are undermining, people's accumulations are devaluating and the appearance of a budget's deficit.

Credit emission as a way of covering budget deficit is widely used in Ukraine. So, in 1996 25% of deficit meant financing based on credit emission of NBU. In 1994 this position was practically a half, and in 1995-67%. 35% of deficit was covered by means of bonds of internal state borrowings(BISB)and Treasury's obligations. In countries with market economy there is constitutional point of independency of national emission bank from executive authority and legislative power. Emission bank doesn't have to finance the government, so obstacle is forming to prevent inflation, which could have happened , if the bank had published money for state order.

State borrowings as a method of deficit covering are safer than emission, but they influence negatively on country's economy. Firstly, under certain circumstances a government has to allocate state securities and breaks market motivation of private financial institutes' activity. Secondly, even if the government is creating sufficient incentives for a juridical person or physical person to buy state securities, but state borrowings, mobilizing free funds in the market of borrowed funds, limit the possibilities of accepting credits by private firms. Firms, which are small and medium, can't be such reliable borrowers, as state organs. The increase of popularity in market of borrowings through new state loans influences on the price increase of credits- and the increase of interest rate. The consequences of external loans are particularly difficult.

Budget deficit is connected with the phenomenon of state debt, which appears because of government's and state organs' debts. An external state debt, which increases on 70 % from Gross National Product(GNP) or more in 2,2 times of country's export, is thought to be insecure for a stable economy, especially for a stable money exchange.

Financing of budget deficit is calculated on a clean basis, i.e. from gross volumes comings of borrowed funds the main sum debt payments are subtracted.

Proceeding from all aforesaid it is possible to draw such conclusions:

1. In conditions of the Ukrainian economy the formation of deficiency of the state budget and his increase in the greater degree are influenced with expenditures than revenues. It proves that fact, that the effective restraint of growth of deficiency is reduction of an account part of the budget, instead of increase profitable.

2. The interrelation between inflation and deficiency aspires to 1. So change of inflation to 1 % will change also a deficiency to 0.93% according way. It is necessary to understand, that forecasts of values of the researched parameters, given in projects of budgets for the future periods, can be in dependence not corresponding certain by me. However these distinctions can be caused by various factors, in particular discrepancy of the current forecasts.

3. The concept financing of deficiency of the budget assumes use of inflationary or not inflationary methods, and also combinations and to other methods which are not concerning to one groups are possible.

The list of the literature:

1. “Макроекономіка” Пол А. Семюелсон, Вільям Д. Нордгауз / К.: “Основи”, 1995.
2. “Мікроекономіка і макроекономіка” за заг. Редакцією Світлани Будаговської / К.: “Основи”, 1998
3. “Финансы” под редакцией профессора В.М. Родионовой / Москва: “Финансы и статистика” 1995
4. “Основи економічної теорії: політекономічний аспект” за редакцією Г.Н. Климка, В.П. Нестеренка / К.: “Вища школа” – “Знання” 1997
5. “Макроекономіка” за ред. А.Г. Савченка / К.: “Либідь” 1995
6. Закон України “про Державний бюджет”