CHAOS OR TURBULENCE ON THE VOLATILITY OF PUBLIC REVENUES

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In an intuitive attempt to define financial distress in the public sector, it can be represented by the turbulence over the normal rhythm of indicators' evolution in the public revenues, due to the influence of exogenous factors coming from the real economy, the behavior of taxpayers as well as to other influencing factors. This way of defining financial distress makes it possible to measuring its composing elements, such as: the turbulence and the influence of exogenous factors. The application of financial distress tests for the public budgetary indicators and the notification of its existence can be of real use for the central and local governments, taxation policy.

Keywords: local government revenues, public taxation, financial distress

JEL Classification: G17 - Financial Forecasting, H21 - Efficiency; Optimal Taxation, G01 - Financial Crises

1. Introduction:

The central governments but also the local ones are presently interested to identify the best solutions for successfully dealing with the global economical crisis, which deteriorated the public budgets, financially contaminating them with the virus of chronic budgetary deficits.

Having this reality, the global economical crisis, the central governments put in practice budgetary policies oriented most of the times towards constraints applied to the operational costs of the governmental device and called for momentary solutions, to solve the crisis of budgetary deficits through public loans[308].

But the problem of public loans is easy to explain when these, in crisis times, assure the financing of public investments; on the other hand, the same loans are very controversial when they assure the financing of consumption costs. A budgetary policy of covering the budgetary deficits through public loans destined for consumption costs (pensions, the salaries of those working for the state) make the experts shiver, having serious consequences on long term on the macro-economical balance of a country.

In fact, the classic and modern economical theories show that for crisis periods, the immediate solutions at hand for the central governments is to support the public investments with implications regarding the jobs increasing and indirect support of the investments in the business sector. The essence of public investments is that through the development of public utilities infrastructure the business investments are to be supported so that the *automated propelling*

[308] Boloş Marcel, (2006), *Bugetul şi contabilitatea comunităţilor locale – între starea actuală şi posibilităţile de îmbunătăţire,*, Ed. Economică, p.40

stimulus for the increase of budgetary revenues is generated. The multiplier of the public investments cannot lead to multiplying the budgetary revenues unless through investments in the business sector[309].

In this period of global economical crisis some conclusions are to be learned, written on paper along the time as a matter of fact by the experts in public finances, briefly as follows:

-the budgetary revenues are connected to the real economy, having as main communication channels the percepts and taxes;

-a turbulence generated in the companies' activity on the goods and services markets leads to a turbulence in the public budget expressed most often as budgetary deficits;

-the central governments, during crisis times put in operation budgetary policies which aimed at constraints applied to the operational costs, and naturally supported the investments in the public sector[310];

-by accident but as a real fact, some central governments, lacking other solutions for the moment, to avoid the financial collapse appealed to public loans to support the consumption costs (pensions and/or the salaries of those working for the state)[311].

When the momentary solutions, to avoid the financial collapse, were to support the consumption costs from the public loans, was nothing else that the clear fact of weakened economies, not able to produce public revenues to support the consumption public costs. This uncontestable reality leads to the idea that a characterization of the national economies can be done through the situations resulted from comparing the public revenues (percepts and taxes from the business sector) with the public consumption costs (operational) which can be expressed as follows:

-percepts and taxes collected from the business environment / the public consumption costs (operational) the national economies have the capacity to generate public revenues, the central governments can develop and support the public investments as an essential condition for keeping a living standard accepted by the population;

-percepts and taxes collected from the business environment / the public consumption costs (operational), the central governments are in the critical point indicating the imminence of starting a crisis, whose causes can be the uncontrolled increase of the public costs or on the contrary a decrease of the economical growth rhythm registered at local level;

-percepts and taxes collected from the business environment / the public consumption costs (operational) indicate the existence of a crisis, regardless of its nature (financial or global economic) or can be the result of uncontrolled policy of growing the public costs.

The third situation is the subject of our research to indicate the conditions of financial distress existent on the market and its influence on public revenues, with immediate consequences as is already known on budgetary deficits of central governments.

The experience demonstrated that during the periods without crisis, the local and central governments appealed most of the times to the necessary tools to support the economical development as a solution for the budgetary deficits sometimes hard to control. Moreover, to respond to the existent needs in the public sector, the governments, especially in pre-electoral periods, supported the salaries increase for the persons working in the public sector, which on long term added consumption costs and an unreasonable support of the budgetary deficits.

All economic theories, regardless it is about the classic or modern theories were elaborated for the situations existent at that time. Therefore during the economic boom periods the crisis

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[309] Cowell Frank A., (2004), *Microeconomics, Principles and Analysis, Sticerd and Department of Economics,* London School of Economics, p.134

[310] Moşteanu, Tatiana, coord. (2004) *Budgetary policies and techniques*. published in University House, Bucharest, pp.23-34.

[311] Tulai Constantin, (2003), *Finanţele publice şi fiscalitatea,* Ed. Casa Cărţii de Ştiinţă, Cluj Napoca, pp. 15-20.

situations were not taken into account, as well as the inverse situation is also valid. We know only by intuition if during economic boom times the prudential reserves would have been good to stock, even if in currency, for the governments to intervene in crisis situations. We don not know if during crisis times some anti-crisis measures have to be taken and not protection measures against the crisis. There are questions, answers, dilemmas which experts in economical sciences should solve even if to adapt the results of their research to the economical reality.

2. What is financial distress and how we measure it?

It is obvious that any interested reader, in the simplest terms would define the distress as a discomfort situation generated by the existence of undesired events, which negatively influence the people's behavior and sometimes their welfare. The distress was conscious for the people in Eastern Europe mostly in the same time with reaching the market economy, when the lack of jobs, unemployment danger, the decrease of the purchase power led to a stressful situation which on long term influenced the welfare of people and generally of the whole population.

How the population protects itself from the forms of stress? The most frequent protection forms against stress is to economize (to make reserves) which offer the individuals a mental comfort that in any situation *"the money can help them".* But forming the reserves is only possible when the economies register situations of economical growths, except the fact that the individuals, during economical boom, have a bigger tendency towards consumption. In crisis times, avoiding stress is almost impossible mostly by the individuals lacking reserves or financial investments. They cannot fight against the stress, being practically condemned to support the negative consequences of crisis manifestations.

It is interesting to study the companies' behavior during economic boom but also during crisis times. The reality showed that during economic boom, in the lack of a solid business, the business people in Eastern Europe were attracted by the short-term gains, being caught in the whirlpool of *speculative businesses*[312]. For example, the most frequent expression forms of speculative businesses were the businesses in the construction field but also those resulted from the currency exchange speculations. The speculative businesses worked, true on short term, but most of the times the investors endured, afterwards, the negative consequences of crises and of disappearance of speculative businesses from the market. The behavior of the business environment, in the lack of the speculative businesses, for the boom economic times can be characterized through an emphasized inclination towards investments, and not for making reserves, as we would be tempted to say about a future prudential-pessimist investor[313]. In fact if the market would be dominated by the pessimist investors, than the progress, economical growth, welfare would be only theoretical concepts forgotten in the dusty drawers of science. Can we talk about a stress of the business environment during economic boom? The answer is yes only it is a positive form of stress caused by the desire of reaching the development rhythm expected by the investors.

During crisis times, the same business environment in Eastern Europe, in the lack of an alarming culture but also protection against the unwanted impact of crisis, adopts different forms of sheltering against the devastating effects of crisis. Slowing down of the business growth rhythm and the operation at the damage limit is the most frequent type of behavior met among the investors. The recent global economical crisis made the proof of this type of behavior which eventually led to cutting off jobs, the growth of the unemployment level, reducing the volume of the business, etc. Moreover, in the same crisis times the companies, which during economical

[312] Fabozzi J. Frank, Peterson Pamela, (2003), *Financial Management and Analysis*, 2nd ed., John Wiley & Sons, Inc, USA, pp.35-134.

[313] Gibbons Robert, (1992*), Game Theory for Applied Economists,* Princeton University Press, New Jersey, pp.45-60.

boom speculatively made businesses, rapidly gave up in the fight with the crisis, closing their doors. The result is that the number of companies going bankrupt rose exponentially. We would be tempted to say that the crisis times are useful for the business sector as it cleans off the "sick companies". The financial contagiousness of crisis leads even partially to the health condition of the business sector. Is the stress present during crisis times at the level of the business sector? The answer is again yes. Stress has now a negative component, the investors being worried by the protection form they should implement to successfully cope with the unwanted effects of crisis.
But the public economy functions connected to the real economy. Any shock in the real economy is inducted into the public one the same as any economic boom in the real economy leads to a boom, if not so intense, in the public economy. It is a vital connection for the public sector whose financial resources are rooted in the real economy[314].
The complex mechanisms of the public services cannot function without a real feeding with percepts and taxes at the necessary level for these services to work. But so as the behavior of the business sector and population is different during crisis times, so as the governments' behavior is different. During crisis times the governments' concern is to control the operational costs of the governmental system and support the public investments. But all these budgetary policies are translated eventually in almost chaotic budgetary deficits, which according to economical theories must finance public investments having only one alternative accepted by specialists to be covered and that is to contract public loans.
In economic boom periods, the same governments, legitimately, are tempted to support the public investments with a double aim: to improve the living standards of the population and to indirectly support, through public utilities infrastructure, the business sector. It is also true that in the same economical boom periods the central governments to gain popularity exceed of generosity and increase the pensions and salaries of those working fro the state, but this type of measures must be accompanied by a constant growth of economy to avoid the financial collapse in the public sector. The state of financial distress, as we would be tempted to appreciate only intuitively is also present during economical boom and respectively crisis. This state of financial distress can be understood in a first stage, without considering scientific arguments, as being a malfunction of the normal rhythm of evolution regarding the indicators in the public sector.
This way of defining the financial distress makes that this to have two base defining elements, in our approach and that are: the turbulence and the influence of exogenous factors.
Measuring the financial distress in the public sector and the study of the exogenous factors which determined it help the central governments mostly to adopt anti-crisis measures which could stop the decline of the studied indicator and could lead to its re-launching, with an impact on the macro-economical balance. To prove scientifically the measuring technique of the financial distress the *revenue tax* was considered as indicator in the public sector. As already known the revenue tax is used both for measuring the economical growth at the level of a region/ state and for deducting it between budgets with the help of shared taxes. The study of this indicator's evolution, permanently leads to obtaining information related to the dynamics of employed people but also to information related to the evolution of the salary gains of the employed people at the level of a locality.
Consequently for measuring the financial distress the following stages were taken into account:
-the revenue tax is calculated by the companies and is transferred to the state budget after which by deduction, with the help of shared taxes, is transferred, based on some deducted quotas, to the state budget and to the local budgets;

[314] Baker, (2003), *Notes for Mathematics, Groups, symmetry and fractals*, Department of Mathematics, University of Glasgow, p.60

-each budget where was transferred registers a certain level of the collection noted with (I_{impv}), for each period of calculation($t_0, t_1, ...t_n$); usually in the case of revenue tax the period of calculation is equal to the calendar month;
-for the series of data constituted the simple arithmetical mean was determined, to identify the average level of the encashment from the revenue tax, using the formula: $\bar{I}_{impv} = \sum_{i=1}^{12} \frac{I_{impvi}}{i}$;
-based on the data series and the arithmetical mean the mean square deviation was established $\sigma^2 = \frac{1}{n}(I_{impvi} - \bar{I}_{impv})^2$ and the mean deviation ($\sigma = \sqrt{\sigma^2}$) with the aim of establishing the deviation of encashment as to the mean, in normal conditions, without financial distress[315];
-for each budget type (state or local) which collects revenue tax at least two influence factors are important: the evolution of the number of employed people and the average revenue they make;
-*the scenarios of financial distress* were simulated, by subtracting the number of employed people and the average revenue, respecting the constraint according to which the wage cannot be lower under the average national wage, so that the mean square deviation resulted from the modification of the two indicators, respectively the number of the employed people and the average revenue per person, to embrace consecutively values of ±2σ, ±3σ; For these variations of the two indicators in the conditions of the modification of mean deviation with values of ±2σ, ±3σ, different levels of encashment were registered.[316]
The following results were obtained which were validated by the results of the research and that are:
-the financial distress is a phenomenon that characterizes the turbulence of the indicators in the public sector as to the normal evolution rhythm which can be measured with the help of mean square deviation (σ_{Ib}) and intervene for the values between ($I_b \pm 2\sigma$);
-the financial distress is determined usually by the influence exogenous factors of the budgetary indicator and is the result of continuous modifications registered by the exogenous factors in the conditions of registering turbulences in the activity of companies or taxpayers;
-the presence of financial distress for a certain budgetary indicator allows the public authorities to adopt policies of avoiding the risk or to diminish or even remove the risk involved by the negative impact caused by turbulence on the normal evolution of the studied public indicator.

3. Measuring the value of budgetary indicators in conditions of financial stress
For each budgetary indicator studied in conditions of financial stress is interested to analyze its value registered when subjected to the stress test.
Why is the stress test necessary? The stress test can indicate the values of the budgetary indicator beyond which, the values registered by the indicator, can lead to the registration of some budgetary deficits that could often be beyond control and for which the volume of public loans to be contracted leads to the substantial growth of the public debt level.
In the case of revenue tax for example, the value of this indicator in financial distress conditions implies knowing the limits for which the encashment of the revenue tax reach the stress limit. Respecting the research methodology for measuring the financial distress such a limit of financial distress is reached when the encashment of the revenue tax register values of the mean square

[315] Kolmogorov N., Fomin S., (1970), Introductory real analysis, Dover Publications, New York, p. 45
[316] Greene William, (2003), Econometric Analsysis, 5th Ed., Prentice Hall, USA, pp.23-45.

deviation over ±2σ according to the formula:

$$N_s \times S_l \times \%p\,\mathrm{Im}\,pv(1-g_i) = 2(\sqrt{\frac{\sum_{i=1}^{n}(\mathrm{Im}\,p_i - \overline{\mathrm{Im}\,p})^2}{n}} \qquad (1)$$

Raising to second power and considering the level of encashment 100% the equation indicating the maximum level of revenue tax encashment can be obtained, after which the financial distress conditions are registered, leading to very serious turbulences of the macro-economical balance.

$$N_s{}^2 \times S_l{}^2 \times 0{,}16^2 = 2\left(\frac{(\mathrm{Im}\,pi - \overline{\mathrm{Im}\,p})^2 + \ldots + (\mathrm{Im}\,pi - \overline{\mathrm{Im}\,p})^2}{n}\right) \qquad (2)$$

By re-arranging the terms of the quadratic equation of above we obtain the value of revenue tax in conditions of financial distress whose solutions are the following:

$$\mathrm{Im}\,p_i = \frac{4\,\mathrm{Im}\,p \pm \sqrt{16\,\mathrm{Im}\,p^2 - 8(\mathrm{Im}\,p^2 - N_s{}^2 \times S_l{}^2 \times 0{,}16)}}{4} \qquad (3)$$

The results of applying the research methodology are presented in the case below. If we note the values of the revenue tax indicator in financial distress conditions with ($\mathrm{Im}\,p_{sf}$) and its mean values with ($\overline{\mathrm{Im}\,p}$) the conclusion is that the values between ($\mathrm{Im}\,p \pm \mathrm{Im}\,p_{sf}$) are securing values which are not affected by the action of influence exogenous factors of the budgetary indicator in condition of financial distress.

Figure 1.Variation of Ns

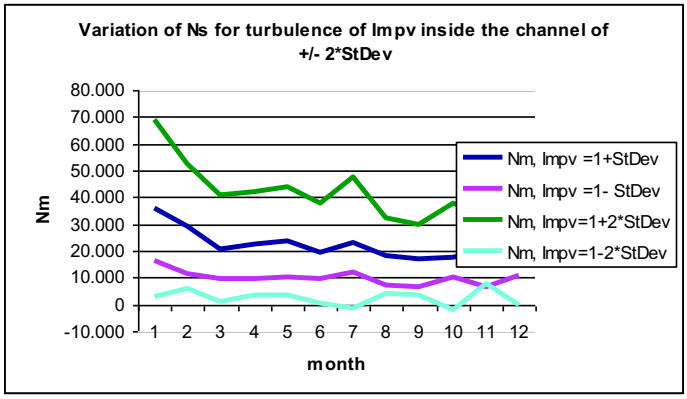


Figure 2. Variation of Sl

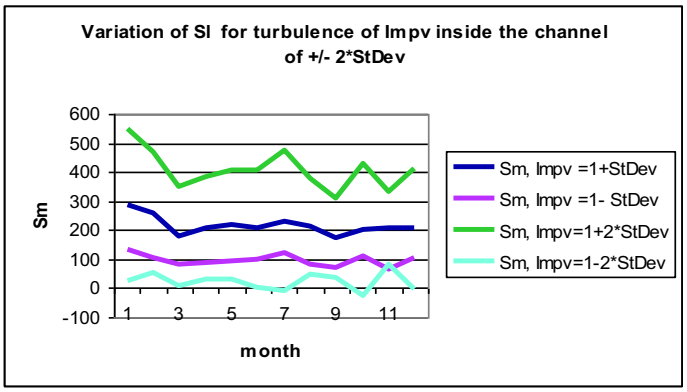
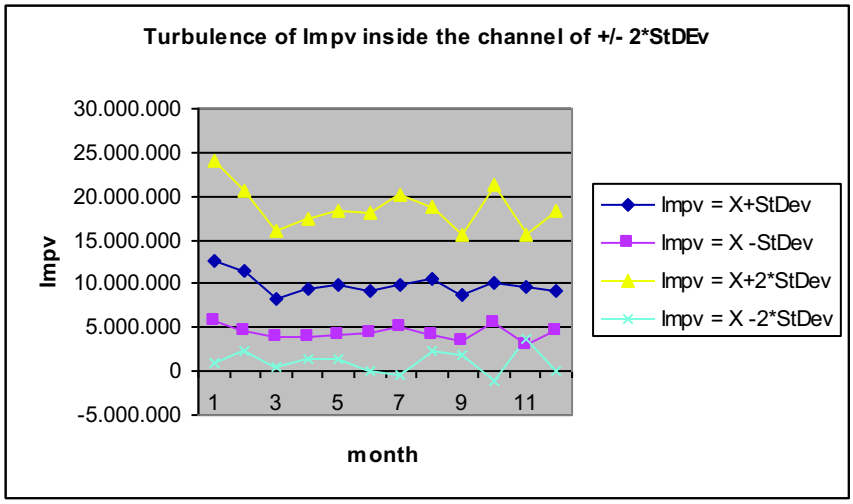


Figure 3. Turbulence of Impv



Source: authors simulation (for the three figures)

4. Conclusions

The existence of financial distress for any studied budgetary indicators is a reality that cannot be contested. Essentially the financial distress of any budgetary indicator indicates that state of turbulence registered by the indicator as to its normal rhythm of evolution, caused most often by the existence of exogenous factors.

Measuring the financial distress can be done for any budgetary indicator with the help of mean square deviation, and the determination of the distress condition can take place by simulating the modification of the influence exogenous factors of the budgetary indicator. By repetitive simulations of the influence factors we reached the conclusion that a condition of financial distress for a budgetary indicator intervenes when the values of the mean square deviation registered are equal to $\pm 2\sigma$. These values of the mean square deviation are registered when the studied exogenous influence factors of the budgetary indicator are modified. Any exceed of these

values of the mean square deviation can lead to the study of other phenomena such as turbulences and chaos.

Each of the studied budgetary indicators register certain limit values for the existence of financial distress beyond which other phenomena occur, and that can be researched with the help of tools offered by the science of statistics or econometrics. These values of budgetary indicators noted with (I_{sf}) offer information related to the safety channels, inside which the budgetary indicators are not affected by the existence of financial distress. The safety channels have values comprised between $(I_b \pm I_{sf})$, and outside the range of these values the budgetary indicators can signal the existence of turbulences or even chaos with devastating effects on the budgetary balances.

Financial distress testst are used for measuring the existence of influence exogenous factors can be detected which on long term can lead to deterioration of the financial condition of the countries or regions of a country. The anti-crisis measures can be identified in due time to diminish as possible the devastating effects of the global economical crisis.

However the financial distress tests have some limits. They can detect the presence of the financial virus established, it is true, through research as present when the budgetary indicators register certain values, but these do not identify the exogenous factors that determine the existence of distress nor the intensity or the level of the influence of exogenous factors on financial distress.

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