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Anti-crisis Management of an Economy in Transition:
System of Analytical Triggers[1]

A new wave of financial crises generates the need for a more precise and timely management style.

The cyclic nature of typical situations and processes of an economy in recession, allows for the unification of management procedures based on the concept of analytical triggers.

This paper represents a summary of on-going research in the field of an innovative approach and development of information-analytical support for critical decision making.

The paper is written in a form of scientific essay. It defines a system of analytical triggers, highlights a methodological concept and principles of its integration into the existing system of macro and micro economic parameters and discusses a number of practical examples for its successful application.

Key words:

System of analytical triggers; macroeconomic level; microeconomic level; system of complex analysis; manual and automatic management system; triggers adjustments.

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[1] This paper was presented at the 10th Biennial Conference of the Australasian Association for Communist and Post-Communist Studies (AACaPS) in Canberra, 3-4 February 2011. It has been peer reviewed via a double referee process and appears on the Conference Proceedings Website by the permission of the author who retains copyright.

Introduction

The cumulative waves of the recent world financial crisis exposed the myth of market economy sustainability. It's ability for instant self regulation proved to be false due to the weakness of traditional management methodology and practical tools that are unable to support a dynamic equilibrium of the economic network (i.e. inter-related vertical and horizontal key economic parameters). These circumstances, along with the specifics of the Russian socio-economic environment, became the main reason for focusing the selected research in the intra-disciplinary areas.

The analytical triggers' notion is based on the similarities, discovered between combinational logic used in digital electronics and an algorithm of economic analysis and decision making procedures. Unlike 'signal norms', 'limits', 'indicative' and 'planed' parameters that are traditionally used in Russian and international management practice and could be seen as analytical triggers forerunners (precursors)[2], an analytical triggers' system and the way it is built into the information-analytical structure of economic objects, insures timely support and adjustment for determinative economic parameters.

Fundamentals of Analytical Triggers Theory

There are two composite components that determined the theoretical foundation and practical value of the Analytical Triggers Theory: economic and technical (engineering) components.

The economic component contains concepts of:

- Classical Russian Economics, including: Study of Investment and Macro-economic Cycles Consistency (Thugan-Baranovskiy, 1900); the Long Wave Cycle Theory (Kodratiev, 1925, 1928) and the Methodology of Strategic Economic Planning and Forecasting (Feldman, 1928)[3]

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[2] E.g.:

- risk minimising instruments (hedging, stop out, stop-loss and stop-trade, used at Forex Ltd (Foreign Exchange Market))

- norms and limits used for formation and adjustment of inter-related budget sets (e.g. parameters of the Federal Budget of the Russian Federation and Local Budgets; parameters of the cash, material, overheads and labour budgets of an entity)

- indicative parameters of compliance between goods and services available for consumers with their solvent demand

[3] Osadchaya (1967) states that postulates, published in Feldman's research were later independently developed by British economist Harrod (1939, 1948) and Russian-American

- Russian information-analytical system, that is based on unified methodologies of collecting, possessing (Sokolov, 2000; Kozeltseva and Starovoitova, 2003; Paliy, 2003), analyzing and reporting data (Bakanov and Sheremet, 2001; Suits, 2007), required for a multi-level, highly centralized economic systems' management

- Cultural tradition of Russian business management, that is based on the: social-community form of economic organisation (Aksakov, 1857; Chireevskiy, 1861; Chomjakov, 1900), admission of a strong leadership and paternalism, combination of collectivism and individualism, creativity, practicality, intelligence, diligence (Kartaviy and Nechashkin, 1999) and transition tendencies of competitive collaboration, partnership strategy, economy of scale cooperation establishment (Tokorev, 2011)

The formal-logic of the Analytical Triggers Theory is based on the electrical-engineering and digital electronics postulates of the SR-trigger (Set-Reset trigger) mechanism. Engineering science defines it as a '… memory devices in sequential circuits', which '… can assume one or two stable output states and have one or more inputs that can cause the output state to change' (Roth and Kinney, 2010 p.322) and acts as a ' … most basic block of combinational logic, its counterpart in sequential logic …' (Maini, 2007, p.357).

Qualitative and quantitative characteristics of a recession economy information structure, along with a snowballing cyclic nature of key parameters changes, allows for the unification of management procedures based on the concept of analytical triggers. As a result of the 'triggers' idea extrapolation from the technical realm to the field of economics and management, an analytical trigger was defined as a universal flexible analytical instrument that allows for the support of sustainable development for an economic object or system of objects.

The following simplified model is used to describe an analytical trigger conditions:

$$Q = S + Q^0 \overline{R}$$

(1)

Where:

S -   an input of a parameter in an individual condition with a direct output of high level Q

$\overline{R}$ -   an input of a signal (parameter) in a zero condition with a direct output of low level Q

Q^0-   trigger's condition before an operating signal is received (preceding state)

Q -   trigger's condition after receipt of a signal (following state)

Thereby, an analytical trigger contains three main components:

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economist Domar (Domashevitsky) (1946). The result of their research is currently known as the Harrod-Domar model of economic growth.

1. data input, including:
    a. variables, that characterize a current stage of an economic object and
    b. threshold characters of key parameters that determine an economic object's objectives
2. data output, including:
    a. schedule operations support (if key parameters are not going beyond threshold characters' interval)
    b. adjustments to current and strategic plans (if required)
    c. initiation of scheduled operations blocking (if key parameters are going beyond threshold characters' interval)
3. analytical mode(s) for information possessing

A fundamental scheme of an analytical trigger designed on the 'OR-NOT' principle is used for a SR-trigger in digital electronics (Fig. 1). This allows instant adjustment of managing system parameters in order to insure it continues sustainable conditions.
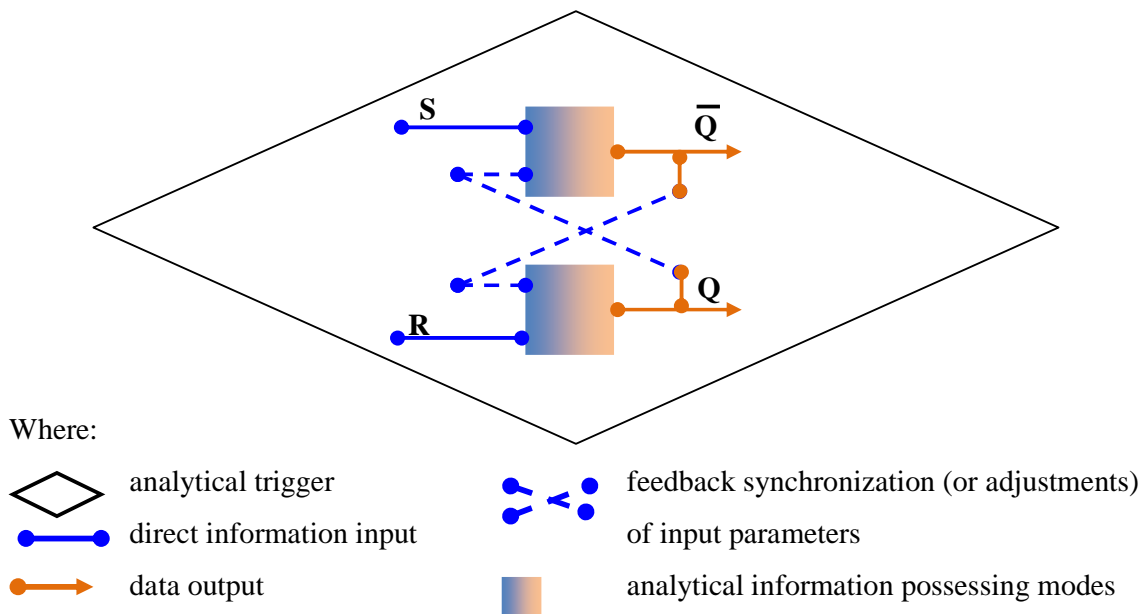

Fig. 1. Fundamental scheme of an analytical trigger, designed on OR-NOT elements

Source: Adopted from Roth & Kinney, 2010, p.324

As suggested by numerous analyzed cases, an analytical trigger condition changes depending on the combination of current parameters of economic system and parameters and the preceding state of an economic system. State numbers four and five (Table 1) provide an example of two steady conditions of an economic system, that change the state of Q by switching from one steady condition to another under the influence of entrance signals.

Table 1

Analytical trigger condition states

Number of state, N	S	R	Q^0	Q
1	0	0	0	0
2	0	0	1	1
3	0	1	0	0
4	0	1	1	0
5	1	0	0	1
6	1	0	1	1
7	1	1	0	α^4
8	1	1	1	α

The unique qualities of analytical triggers make them as an important part of an economic information system. Based on a preliminary set up of threshold characters of key parameters, a trigger allows keeping both macro and micro economic systems in a 'steady equilibrium' conditions as long as required. A multi-version algorithm permits instant selection of the most appropriate updates to the base economic model[5].

Analytical Triggers Paradigm

Although the Analytical Trigger Concept is relatively new[6], its applicability potentials are covering wide range of macro and micro level management structures. With minor adjustments, a multi-level analytical triggers system can be built into an information-logical model of a National Economy and significantly improve managements inter-structural links and effectiveness of decision-making procedures (Fig 2).

An analytical triggers system reflects complicity the complexity of inter-information relationships and the hierarchy boundary norms and objectives' shaping limits (threshold characters). An algorithm of alternating (motion) analysis, as a part of an analytical trigger, allows for the adjustment of a key parameter (s) to its optimally robust condition.

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[4] α - an uncertain condition of a trigger corresponding to false combinations of input variables

[5] A system checks ability to change subordinate parameters in a sequential or simultaneous order.

[6] The first project stage was completed in 2006 and some selected results were published in 2008 (Chaya, 2008).

As suggested by the feed-back on practical implementation of analytical triggers in the selected segments of finance, mining, and trade sectors (2006-2010), the best results were achieved when architecture of information system obeyed the principals of triggers hierarchy, triggers location and triggers expansion.
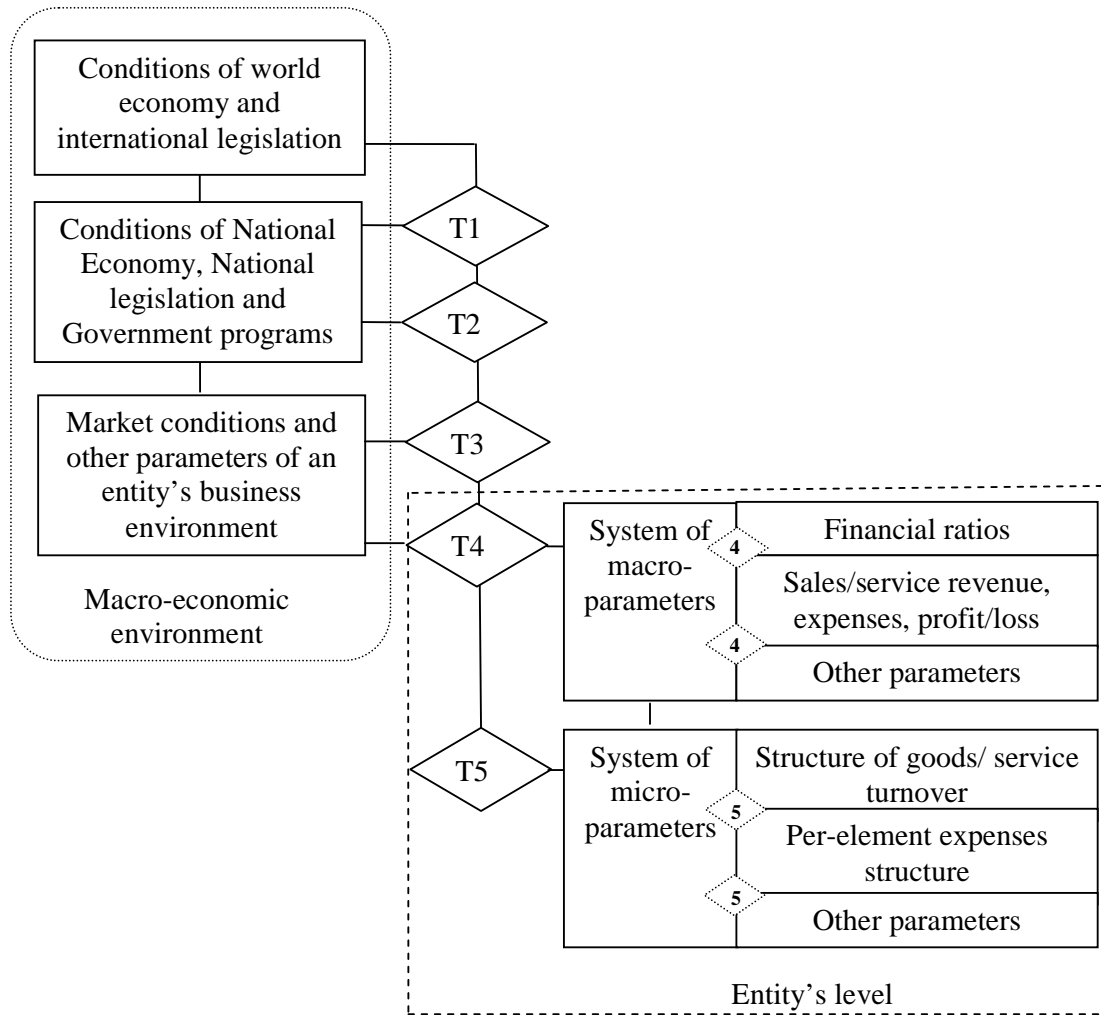
Where:

T1- System of the analytical triggers of first level

T2 - System of the analytical triggers of second level

T3 - System of the analytical triggers of third level

T4 - System of the analytical triggers of fourth level

T5 - System of the analytical triggers of fifth level

Fig. 2. Multi-level system of analytical triggers

The principal of a triggers hierarchy states that any economic object (e.g. National Economy, an entity, not-for profit organization, an entity's department, etc.) should be always seen as a

part of interrelated system of objects, that in every given time interval are characterized by a set of hierarchical variables and hence, hierarchical triggers (Fig.2).

Triggers are part of a dynamic information system. If changes in conditions of World and National economy, international and National legislation leads to the key socio-economic parameters' to fall outside the upper or lower thresholds, will launch analytical triggers of a first or second level. Their impact on the market conditions and other parameters of an entity's business environment might activate third level triggers system. On an entity's level, there were two interrelated hierarchical systems of macro[7] and micro parameters[8] identified.

An analytical triggers chain includes a hierarchy of self-tuning (adjusting) threshold characters of key parameters that are stipulated by performing of a certain event. Often, variables of a superior economic object become a trigger for key economic parameters of subordinate ones. A limit of a variable, when achieved, sets up a trigger of a lower hierarchy level. Generally a business, as a separate economic unit, does not have a direct impact on the T1-T3 triggers[9].

The principal of triggers location states that triggers should be located on joints of the analytical data sets that follow the goals of economic object topography.

The principal of triggers expansion states that the efficiency of any analytical triggers system increases proportionally to the related economic object increment and macro-chains forming.

To simplify this illustration, assume that a wholesale and retail trade entity specialized only in dairy products and sustainability of its business development could be ensured by the monitoring of only one key parameter – a gross profit margin ratio (GPMR):

$$\textit{Gross Profit Margin Ratio} = \frac{\textit{Gross Profit} \times 100}{\textit{Sales Revenue}} = \frac{\textit{Sales Revenue - Cost of Sales} \times 100}{\textit{Sales Revenue}}$$

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[7] includes financial reports data (e.g. revenue, expenses, profit or loss, financial ratios)

[8] includes per-element structure of an entity macro-parameters (e.g. structure of goods/service turnover, per-element expenses structure)

[9] except some lager National and international entities

$$= 1 - \left(\frac{\begin{matrix} \textit{Purchas} \\ \textit{Price (s)} \end{matrix} + \begin{matrix} \textit{Delivery} \\ \textit{Cost(s)} \end{matrix} + \begin{matrix} \textit{Other Related} \\ \textit{Costs} \end{matrix}}{\begin{matrix} \textit{Selling} \\ \textit{Price(s)} \end{matrix} \times \begin{matrix} \textit{Number of} \\ \textit{Units Sold} \end{matrix}} \right) \times 100 \qquad (2)$$

The GPMR threshold characters, as a part of GPMR analytical trigger, is built into the entity information system, determined by inequality:

$$15\% \quad \leq \quad \begin{matrix} \textit{Gross Profit} \\ \textit{Margin Ratio} \end{matrix} \quad \leq 25\% \qquad (3)$$

Any combination of parameters (table 2) that leads to an increase above the upper threshold of the GPMR over 25 percent is unrealistic and identifies ether fraud (s) or mistake (s). Logic mode of GPMR trigger suggests false combinations of input variables (→α-condition, table 1). The system generates a warning message to the supervising management team and immediately activates internal control/auditing procedures.

Table 2

Selected parameters, that impact threshold characters of the trade entity GPMR

Parameter (direct trigger)	Related (indirect) trigger	
	Code	Description
Purchase Price (s)	T1	Changes in the World and National dairy prices, changes in Government programs, legislation and sub-acts
	T2	Changes in Local Governments social rebate programs
	T5	Changes in length of supply chains, standard purchase amount, qualitative characteristics of goods and other related per-contract conditions
Selling Price (s)	T1,T2	Changes in Limiting price legislation; Central and Local Governments rebates on social programs
	T3	Changes in market segment characteristics (capacity, competition level, etc.)
	T4	Changes in cost of sales, time and speed of goods turnover, structure of goods turnover, etc.
	T5	Changes in per-item quality characteristics
Number of Units Sold	T3	Changes in a solvent demand of population in the area
	T5	Changes in trading space availability; discounts for certain customer categories
Delivery and Other Related Costs	T1,T2	World and National changes in the fuel prices
	T5	Length of supply chains; standard purchase amount, per-item quality requirements and other related per-contract conditions

Any combination of parameters (table 2) that leads to a decrease of GPMR below the lower threshold (i.e. 15 percent), launches the GPMR trigger (i.e. generates a warning message for a management team and blocks purchasing/selling functions until the problem is solved).

E.g. sudden changes in Russian Subordinate Legislation (Acts 2009[a-c]) activated the mechanism of Federal Law N 264 (2006) and Government Program (2008) which lead to suspension of Belarusian dairy-supplies from the Russian wholesale dairy market and as a consequence, changes in internal market conditions (i.e. instant decrease in amount of dairy goods, available for purchase and an increase in purchase price). A mechanism that was activated by first and third level triggers pulled up the GPMR trigger and, based on the selected objectives, terms and available resources, started a three-step algorithm of sequential adjustments of subordinate parameters in respect to threshold characters of the fifth level triggers (Fig. 3).
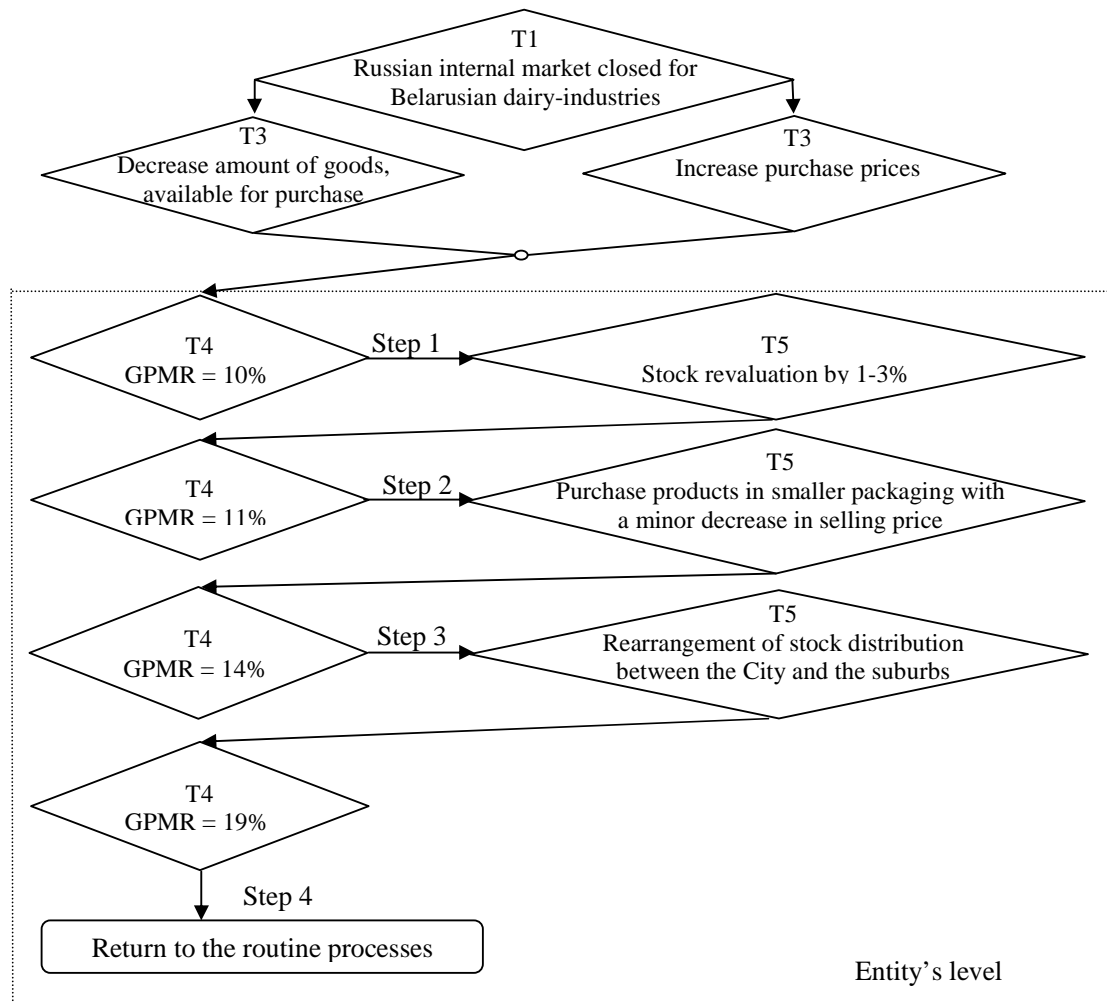

Fig. 3. Sequential Mechanism of the entity's GPMR feedback adjustments

An information system with two or more key parameters includes multiple collateral subordination variables, threshold characters of key parameters and logic analytical modes

9

that consider additive effect and support dynamic equilibrium of an economic object characteristics by multiple feedback adjustment subordinate parameters to a level that keeps key parameters within a primarily determined interval.

Conclusion

Economic instability, rapid increase of the amount and complexity of analytical information, on-going growth of management standards and, subsequently, added pressure on management systems along with low effectiveness of traditional management methods lead to an increasing demand for new and more flexible management instruments. The Analytical Triggers Theory was created in the response of these needs.

While tested on the selected segments of Russian bank, mining, wholesale and retail trade sectors (2006-2010), the system demonstrated the following main potentials:

- applicability in both stabile and crises economic environment, for different management systems hierarchy, different types of data sets (i.e. quantitative, qualitative and combinative) and different life stages of an economic object (s)
- ability to operate in manual of semi-automatic or automatic regime/mode
- increase in management efficiency, effectiveness and flexibility on all stages of decision making possess
- reassurance of strategic and operational management objectives harmonization

The achieved results prove that developed system of analytical triggers can and should become the universal maintenance tool of economic processes stabilization. It can provide new potentials for future theoretical and practical development.

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