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ANALYTICAL AND MATHEMATICAL INSTRUMENTS OF THE COMPETITIVE DYNAMIC DIAGNOSTICS IN THE RETAIL DEALING

The article deals with conceptual approach to use analytical and mathematical instruments of the competitive dynamics research in the retail dealing, which show the specific of the retail operators activity, character of the participants' competitive behavior character in the competitive struggle, conditions of the participants' competitive positions changes in the branch. The competitive dynamics research conception is suggested, retail dealing development diagnostics is presented and matrix to choose strategies of the participants' competitive behavior taking into account results of the competitive positions fractal analysis and estimate potential concerning retail operators' net development.

Keywords: competitive dynamic, retail dealing, competitive behavior, competitive position, fractal analysis, potential of net development.

Introduction. Economic changes quickening and complication of ties between the product market subjects actualize the further development of theory and methodology on the competitive advantages control concerning enterprises structures. The most complicated situation is to form bases for competition theory in the retail dealing, because the present models and methods don't take into consideration changes dynamic of the competitive position among trade enterprises. That's why they need profound theoretical investigation of the retail operators' competitiveness, based on dynamic approach extension in the completion theory.

The diagnostic instruments as analytical base of the control system concerning retail enterprises' competitive advantages correspond to the general vector of the retail dealing net development in the modern conditions. Control of the retail dealing enterprises' competitive dynamic creates ground to make strategic decisions concerning commercial net development taking into account specific, character and conditions of the competitive process in the retail dealing. Practice shows that many retail enterprises are not ready to conduct active competitive struggle, to form and keep long-term competitive advantages. The commercial enterprises are oriented to achieve exceptionally current financial and commercial results without space and time coordinates concerning competitive advantages growth. It actualizes the necessity of the managerial paradigm investigation, based on the competitive positions estimation on the dynamic ground.

Analysis of the research and publications. Managerial approach to the theory of competition from the point of view of competitive struggle methods, choice of enterprise behavior strategies in the market is represented in works of I. Kirzner [7], A. Smith [9], F. Hayek [11] and others. The discussions concerning competitive advantages research, methods of their estimation and control in the Russian scientific environment – in studies of S. Avdasheva [1], G. Azoyev [3], S. Svetun'kov [8], Yu. Taranukha [10], A. Yudanov [12] etc. Modern researches of the retail dealing development problems are based on the works of such authors as V. Apopiy [4], L. Balabanov [5], V. Grosul [6] and others.

Unresolved questions, which are part of the general matter. In spite of the serious

achievements in theoretical researches and methodical investigations concerning mentioned problems, several conceptual and methodical questions are not answered yet. There are no concept to control retail enterprises competitive dynamics, diagnostic instruments to evaluate net development taking into account competitive dynamic character. One needs to investigate new methods of the competitive diagnostics, methods to control net development together with models to evaluate competitive behavior and retail enterprises competitive positions. It shows the reasonability from the scientific and practical point of view to develop theory and methodology to control competitive dynamics of the retail dealing enterprises. The urgency of the above mentioned problems and extension of the scientific search in the enterprises competitive advantages control sphere on the dynamic base, exist misbalance between theoretical concepts concerning competitiveness study and practical problems to control retail enterprises' net development define the aim of this work.

Aim of the article is to:

– form author's concept to control competitive dynamics of the retail dealing enterprises *on the theoretical level*;

– *on the methodic level* improve analytical and diagnostic instruments to study competitive dynamics level among retail enterprises. It should be based on the statistic analysis of parameters concerning their development and improvement of the optimization procedures to prognosticate competitive position changes.

Main results. The necessity to study the competitive dynamics control processes is caused by changes of competition study from the analytical and static format to the diagnostic and dynamic format. In order to form diagnostic instruments of the competitive dynamic research in the competitive process modern researches system *the competitive dynamic* is reasonably to observe in the interconnection and interdependence of the subject-object characteristics in the competitive mechanism. Multiaspects of the competitive advantages (feature of the subject to control) and multidimensionality of the development vector provide not only complex diagnostics of the competitive positions changes parameters, but also the implementation of the following basic dynamic elements: mass, impulse and energy into the categorical apparatus in the completion theory. Analysis of the theoretical approaches to control enterprises competitive advantages using the researches [3; 8; 10], gives reason to distinguish *hypothesis of the fractal markets* as theoretical preconditions to investigate diagnostic instruments of the dynamic methods in competition. In order to avoid the abruption between theory and practice concerning control of the enterprises' competitiveness the methodological constituent of the competitiveness fractal theory is reasonably to show through parameters, which study and prognosticate competitive dynamic, particularly speed and activating of the enterprise's competitive advantages changes.

During 2004-2009 Ukraine couldn't strengthen its positions in the world ratings in the competitive economy and quality of the economic environment for business. Economic policy of the neoliberal, particularly conservative type, held in Ukraine, set aside fundamentals to develop economy under market conditions – competition, simple business dealing and protection of its rights, stable macro-economic environment. Significant changes and negative tendencies passing in Ukraine need to observe conceptual grounds of the economic policy through economy monopolization level decrease and efficient methods for branches and markets development introduction. In this sense the competitive process in dynamic requires to generalize the sphere of the correspondent tools and procedures use through their specific. You suppose that the approbation object of the principally new approaches concerning competitive dynamic study, one may choose sphere for turnover commodities, consumer's

market, its macrosegments (market of the retail and wholesale mediators). Such choice is easy to explain through commercial sphere role to set stable interconnections in the systems of the higher hierarchy level, through great number of participants, higher than in the productive sphere, through competitive struggle intensity level. We think that the research of the competitive process in the sphere of the retail dealing represents scientific interest through competitive interrelation hierarchic variant, local, regional, national levels, complicated nature for competitive dynamic vector formation, more significant experience to use enterprises' net development forms in practice. The fact concerning insufficiency in the competitiveness problems study in the retail dealing, based on principles factors dynamic consideration doesn't raise doubts. That's why within our research we will not be restricted by analysis of the retail commercial mediators' segments.

Development of the retail dealing mediators system is determined by contradictions, characterized by its internal environment. One of the main contradictions of this system is two opposite tendencies in the product type dynamic at the retail enterprises, i.e. specialization and universalization of the shops. The shops specialization is appeared in limitation of proposed goods assortment and simultaneous increase of its. Shops universalization is followed by assortment growth, opportunity to buy various goods in one shop. The level of specialization and universalization is characterized by two factors. They are ration between number of specialized shops and their general number in the market and ratio between trade area of these shops and general value of the trade area. Therefore one should consider that the second factor allows to get more objective estimation of the tendencies in the shops' product type dynamic.

The problems in the retail dealing are focused reflection of the complicated, mostly contradicted tendencies, which show the today's state in the country economy. One has to establish the simplified approach to the problems of the retail dealing mediators development as consumers' market subjects. This points serious gaps in the diagnostic instruments system to study vector of the turnover commodities sphere development at a whole. The study of retail dealing mediators' systematic features and characteristics allows to fill gaps in the retail dealing diagnostics theory and practice, to reveal stages and parameters of the retail mediators, essentially different by activity format and [2, p. 102-104].

After research we found out that the competition allows to stabilize retail dealing owing to that fact that only competitive enterprises and organizations will function in the market. Thus, the development of the competitive relations and correspondently increase of the enterprises' and organizations' competitiveness are the main grounds to improve the retail dealing in the country.

In light of the necessity to increase enterprise competitiveness level under modern conditions, it is concluded that one needs to form the concept to control the competitive dynamic of the retail enterprises taking into account existing competitive development vector in the national economy. Analysis of the retail dealing tendencies development indicates the competitive struggle intensity increase because of the retail segment temps increase showdown and new participants growth, who combine the local place advantages and net organization form in the dealing. It points the perceptiveness of the investigations concerning diagnostic providing of the retail nets competitive dynamics control process (Fig. 1).

The formation of the author's conceptual approach key elements is based on some development problems in the branch, particularly: absence of the positioning among local level operators; high level of the competition thank to the small trade nets irregular placing; necessity to diagnose parameters and vectors of the competitive process based on analytical procedures deepen; necessity to adjust existing managerial technologies to the commercial

operations specific, which unlike with producing activity require structural and adaptive approach and systematic managerial procedures. It is essentially to mention that dynamic approach is the target parameter of the suggested concept.
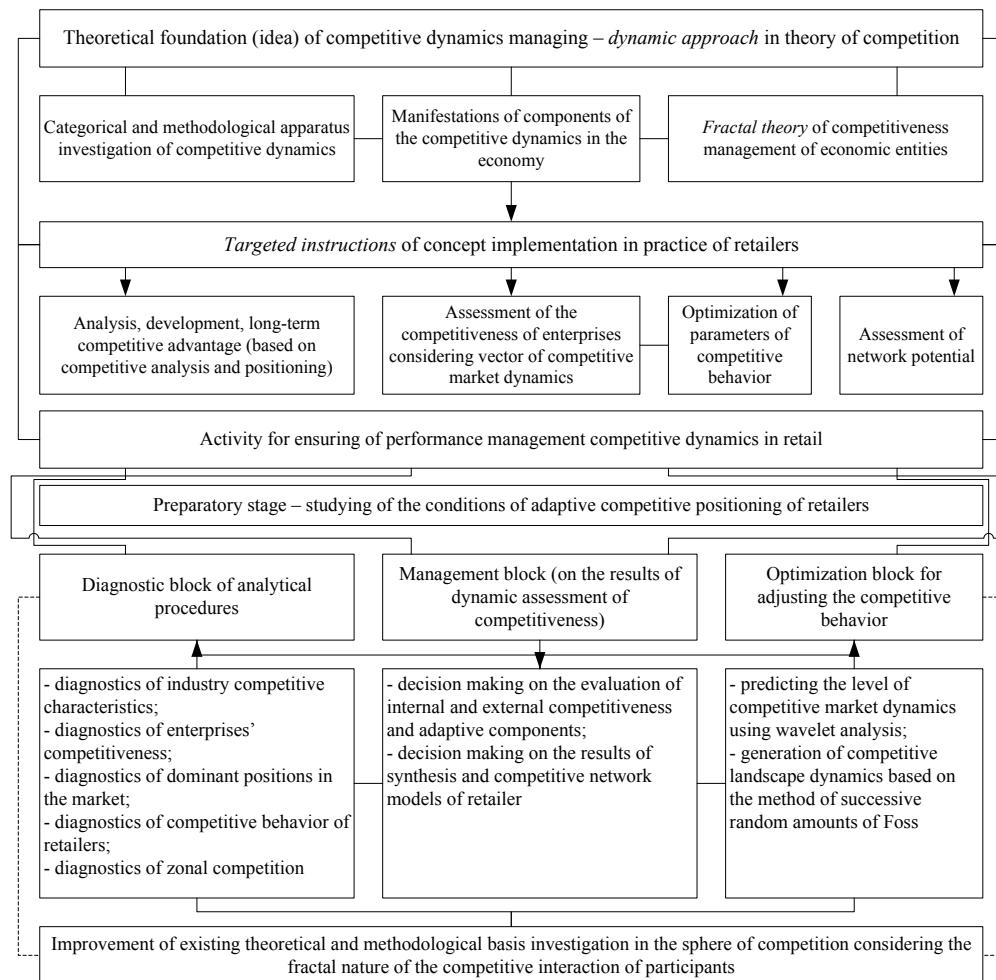

Figure 1 – **Concept to control competitive dynamics of the retail dealing enterprises,** (author's study)

On the basis that concept is the complex of points, connected with common idea, which determines the activity character and is oriented to achieve concrete aim, the author systemizes competitive dynamics concept elements to improve the existing methodic and analytical base to make decision concerning retail dealing enterprises competitive advantages control. The diagnostic block is worth noticing. It acts as basic element to make decisions and creates ground to optimize characteristics and constituents of the participants' competitive behavior. Target orients represent tasks concerning long-term development of the retail dealing

enterprises, adaptation of their resource base to the changeable conditions in the competitive environment according to the retail dealing local and net vectors development.

One can confirm that retail dealing processes development and its competitive dynamics conditions are beyond scientists'-economists' scientific search. The author proposes to distinguish the competitive dynamics as the basic platform to develop modern retail enterprises. In its turn it is observed as the process to adapt participants in the competitive struggle with qualitative and/or quantitative change of the competitive market elements. The following questions have not been solved yet: which factors and parameters point the possibility of such adaptation (form and character of the competition, increase of the enterprise competitiveness, competitive position change); which methodic instruments is necessary to form such parameters system in qualitative and quantitative estimations variety; which models and methods are able to control changes in the market structure over time.

Thus, the theoretical aim realization in our work results in that fact that one suggests to point out the competitive dynamics as the main platform to develop modern retail enterprises. In its turn it is observed as *the process to adapt participants in the competitive struggle while quantitative and/or qualitative change of the elements and structure in the competitive market*. The retail dealing development in Ukraine depends on social and economic position in the country, macroeconomic conditions of the separate regions development (*macrodiagnostics)*, internal variables and factors concerning commercial sector development (*mesodiagnostics*) in different regions, complex estimation of the retail dealing factors in the separate region (*microdiagnostics*). It is important to mention that received results in each level create the basis to make decisions. These factors mustn't be observed isolated, vice verse through comparative analysis one has to find out, how macroeconomic situation influences the process of the retail dealing development in regions. After systematization of the subsystems to diagnosticate the competitive dynamics development vector we realize the correspondent procedures, particularly regressive and correlative analysis concerning some parameters and grades impact on the integral factor in the retail dealing development in the region (subsystem "microdiagnostics" – "local cut").

Formation of the parameters due to the hierarchic principle allows not only to distinguish diagnostics subsystem, but also to study characteristics and results to evaluate enterprises functioning processes, based on the requirements of the national, regional and local cuts на in the trade development process. Aimed to the deepen analysis and evaluation of the retail dealing development local cut in the region the integral coefficient is suggested to be used $I_{rt}^{dev} = f(P_{T1}...P_{T7})$. It will help to estimate individual factors contribution into effective one and to determine the prognosticating grades with correlative and static analysis methods (form. 1):

$$I_{rt}^{dev} = \sqrt[7]{K_1 \cdot K_2 \cdot ... \cdot K_n}; \qquad K_i^{+} = \frac{P_{Tij}}{P_{Tij}^{max}}; \qquad K_i^{-} = \frac{P_{Tij}^{min}}{P_{Tij}}, \qquad (1)$$

where I_{rt}^{dev} – integral factor of the retail dealing development in the region; $K_1, K_2...K_n$ – received by form. (1) individual estimations of the retail dealing development factors in the region; K_i^{+} – standardized factor of the individual estimation providing positive P_{Tij} factor impact on the retail dealing processes development; K_i^{-} – standardized factor of the individual estimation providing negative P_{Tij} factor impact on the retail dealing development process; P_{Tij}^{max}, P_{Tij}^{min} – correspondently maximum and minimum level of the separate

factor P_{T1} ... P_{T7} for the individual estimations rating.

In this case we get the broad picture of retail dealing development conditions and factors in the local level (Table 1) and can talk about prospectivity to make decisions concerning retail dealing enterprises competitive dynamics control.

Table 1 – **The main factors impact (P_{T1} … P_{T7}) to form integral factor of the retail dealing development during 2005-2012**

	Fact features	Coefficient of correlation	Coefficient of determination	Regression quotation
P_{T1}	Retail turnover of commodities per 1 person	0,99840	0,9968	$y_1 = -0,3686x^2 + 0,9795x + 0,5014$
P_{T2}	Providing of population with retail dealing objects	0,86747	0,7525	$y_2 = 4,4271x^2 - 10,634x + 6,9193$
P_{T3}	Intensity of the territory with retail dealing objects	0,92201	0,8501	$y_3 = 0,7522x^2 - 3,7566x + 5,1997$
P_{T4}	Providing of population with trade area, m²/10000 persons	0,87178	0,7600	$y_4 = 2,5834x^2 - 3,0171x + 1,546$
P_{T5}	Medium size of the shop, m²	0,97283	0,9464	$y_5 = -0,3459x^2 + 1,4767x - 0,1922$
P_{T6}	Retail dealing turnover of commodities for 1 m² of the trade area	0,99161	0,9833	$y_6 = -0,1669x^2 + 0,8094x + 0,4764$
P_{T7}	Medium radius of the shop act, km	0,90802	0,8245	$y_7 = 6,5414x^2 - 20,3980,9795x + 16,408$

The investigated system of the diagnostic estimations and procedures plays a significant function to make strategic decision concerning commercial system development, trade outlets placing, because it takes into account not only results of the trade objects' functioning, but also creates the base to make decisions on net development.

We consider that in spite of competitive dynamics complication, it's necessary to observe it in the categories, close to physics. In particular we have to determine competitive positions of the participants through passed distance value during time t and based on this to observe the speed, impulse characteristics in order to suggest author's model to estimate competitive dynamics of the analyzed objects both separately (for operators, who are studied) and for the system at a whole.

The model incoming data may be calculations of the real competitive positions in the market due to the static estimation of the competitiveness basic level, objects' ranking, which were studied. The model incoming data is the level of participants' competitive positions changes, who together give opportunity to determine market competitive dynamics level at a whole. The conducted research proposes the following author's model to estimate net operators' competitive dynamics level based on the generation of the competitive index time series concerning retail enterprise competitiveness:

$$L_{cdi} = f\left(D, H, B_H(t), t_i\right);$$

$$L_{cdi} = \frac{\Delta B_H(t)}{t - t_O}, \qquad (2)$$

where L_{cdi} – estimation of the market participant's competitive dynamics; D – fractal dimension; H – Herst factor; ΔB_H *(t)* – change of the market participant's competitive

positions change as a result of the behavior *Fractal Brownian Motion (FBM)*; t_i, t_o – real and initial periods of the competitive dynamics evaluation.

The economic interpretation of such model is simple: distance (as feature to shift competitive positions of each operator) demonstrates the level of the competitive advantages growth. The ratio of this parameter and time *t* (time interval) allows to calculate speed with which operator improves his own competitive position. Thus, the feature of the competitive advantages growth speed is quantitative display of the *competitive dynamics* level. However in order to make managerial decisions it is necessary not only simply to evaluate such factor for separate participants. We need competitive dynamics landscape as demonstration of the competition peculiarities in retail dealing (zonal, regional, local) taking into account speed of the participants' growing. On the bases of competitive dynamics modeling level results with fractal analysis instruments, one needs to come to managerial procedures systematization by matrix principles, which particularly foresee to choose participants' competitive behavior variant *taking into consideration the competitive dynamics level and net development potential* (Fig. 2).

		The level of competitive dynamics (L_{cd}) dynamics		
		High	**Medium**	**Low**
Potential of network development (statics)	**Low** (H<0,5, D>1,5)	Strategy of aggressive competitive behavior	Strategy of active competitive behavior	Strategy of adaptive competitive behavior
	Medium (H=0,5, D=1,5)	Strategy of active competitive behavior	Strategy of adaptive competitive behavior	Strategy of active competitive behavior
	High (H>0,5, D<1,5)	Strategy of adaptive competitive behavior	Strategy of active competitive behavior	Strategy of passive competitive behavior

Figure 2 – **Matrix of the market participants' competitive behavior due to the competitive dynamics modeling results,** (author's approach)

The author's systematization of the competitive strategy realization directions to form and keep the competitive advantages is based on the combining of static evaluation principles concerning net development potential in the fractal theory categories and factors and evaluating of the competitive dynamics level in terms of surplus modeling *Fractal Brownian Motion (FBM)*. The important element of the proposed matrix is combination of dynamic and static constituent; evaluation of the key elements in matrix, based on the quantitative estimations, which have new nature – fractal, i.e. they can consider interconnections of model

factors by nonlinearity principles. Potential of the net development by our evaluations is the result of the complex interrelation between Herst factor and fractal dimensionality. We get over the biggest problem concerning the potential theory – estimation of its size by the simple resources concluding, which form its value. Overcoming this problem by fractal geometry instruments, we can consider all changes in the potential size, using fractal, but not topological dimensionality. Dynamic constituent of the suggested matrix is formed owing to the time series generation concerning competitive position changes in time. If we can get distance feature, which the investigated object passes, and, using time come to the speed – we will get unusual dynamics in physical parameters. The given approach difference is in its novelty, necessity to turn the view into the phenomena and processes, which have the complicated nature, that's why they need new approaches, models, procedures. Modern software packages and informational systems are able to provide the algorithmic realization of the competitive dynamics modeling process, to overcome mathematical calculations complexities. Thus, fractal theory procedures give opportunity to form principally new modeling instruments to make decisions concerning participants' competitive behavior, to study competitive procedure in time and space drastically wrong, to change ground concerning realization of the existing competitive struggle strategies in retail dealing.

Conclusions and perspectives of the further research. Thus, according to the research results one investigates in the theoretical level *the concept to control retail dealing enterprise competitive dynamics,* which systematically includes three constituents: structural study of the competition in the retail dealing, investigation of the retail dealing competitiveness concerning dynamic estimation methods and competitive behavior modeling of the net and local market operators. Together they create base to form and keep the competitive advantages in the long-term perspective.

The *analytical instruments* use concerning competitive dynamics is based on the integral factor of the retail dealing development in the region, using microdiagnostic research principles and practice. Due to the proper calculations one can form analytical ground to study competitive dynamics level in terms of several clusters in the retail dealing enterprises in the region, taking into account format, specialization etc.

The system *of the optimization procedures* concerning enterprises competitive dynamics modeling in the retail dealing is suggested on the bases of fractal analysis. It acts taking into consideration competitive advantages forming terms, competitive process character and operator's competitive behavior specific in the net format competition in the retail dealing. Modeling procedures include ranking of the objects with competitive position (statics) consideration, fractal time series generation of the competitive positions change, competition impact and participants' competitive behavior (dynamics).

The further orientation of the research is to reveal and develop market subjects' competitive advantages, fixing the dynamic constituent in the base of analytical and diagnostic procedures. It is the ground for further profound research in the competition theory, competition fractal theory and market competitive dynamics theory.

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Аналітичний та математичний інструментарій діагностики конкурентної динаміки в роздрібній торгівлі

У статті розроблений концептуальний підхід до використання аналітичних та математичних інструментів дослідження конкурентної динаміки в роздрібній торгівлі, що відображають специфіку діяльності роздрібних операторів, характер конкурентної поведінки учасників конкурентної боротьби, умови зміни конкурентних позицій підприємства в галузі. Запропонована концепція вивчення конкурентної динаміки, представлені результати діагностики розвитку роздрібної торгівлі, сформована матриця вибору стратегії конкурентної поведінки учасників з урахуванням результатів фрактального аналізу конкурентних позицій та оцінки потенціалу мережного розвитку роздрібних операторів.

Ключові слова: конкурентна динаміка, роздрібна торгівля, конкурентна поведінка, конкурентна позиція, фрактальний аналіз, потенціал мережного розвитку.

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Аналитический и математический инструментарий диагностики конкурентной динамики в розничной торговле

В статье разработан концептуальный подход к использованию аналитических и математических инструментов исследования конкурентной динамики в розничной торговле, отражающих специфику деятельности розничных операторов, характер конкурентного поведения участников конкурентной борьбы, условия изменения конкурентных позиций предприятий в отрасли. Предложена концепция изучения конкурентной динамики, представлены результаты диагностики развития розничной торговли, сформирована матрица выбора стратегии конкурентного поведения участников с учетом результатов фрактального анализа конкурентных позиций и оценки потенциала сетевого развития розничных операторов.

Ключевые слова: конкурентная динамика, розничная торговля, конкурентное поведение, конкурентная позиция, фрактальный анализ, потенциал сетевого развития.