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METHODICAL ASPECTS OF ADEQUATE BASKET FORMATION OF UKRAINIAN STOCK INDICES

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Introduction. The dynamics of the stock indices gives a completely objective interpretation of the current situation and prospects of development of both: market conjuncture and national economies as a whole. In today's globalization environment, multinational stock exchange indices have become key indicators of sustainability of the world economy development. Today, national stock indices also play a similar role: as an indicator of the growth of investment attractiveness of the Ukrainian economy; as a reflection of the level of profitability of the corporate sector; as a criterion for the stability and duration of management of Ukrainian economic counterparties. The base for the formation and calculation of the stock index – the index basket – are the securities of the largest and most powerful national companies, which are the "locomotives of the economy". That is the reason for an adequate determination of the composition and timely adjustment of the index basket allows to objectively assess the trends of the national economic environment, identify negative shifts and disparities in a timely manner, and make relevant forecasts of the further dynamics of the economic situation in the country.

Review of recent sources of research and publications. The issues of stock exchange indices formation and implementation practically do not lose their relevance. The functions of indices, the role of indices in the analytical interpretation of economic fluctuations, the search for a stochastic link between the dynamics of indices and certain sectors of business have been studied and continue to be explored in scientific publications and business papers. Systematization and grouping of methodological approaches for the construction of stock indices have been studied in the works of S. Bezvukh [1] and T. Sitash [2]. A stock index analysis of adequacy as a market transformations monitor is presented in paper by N. Matseliukh [3]. The methodological basis for the construction of the stock index and functionality was investigated in the work of O. Zhykhor and I. Neskorodieva [4].

The research specificity of foreign specialists is aimed at finding tools and models of stock exchange indices practical application, for solving strategic and practical problems of different levels of economic systems. E. Chong, C. Han, F.C. Park [5] consider the stock index information array as an analogue of neural networks, for the purpose of analyzing and forecasting the market. J. Bai, R.S. Goldstein, F. Yang [6] determine the relevance of the index basket with the maximum coverage of all market segments in context of crisis detection; W.-C. Chiang, D. Enke, T. Wu, and R. Wang [7] propose mechanisms for the stock indices effective use to make effective financial asset management decisions. Works of other scholars are also devoted to the similar problems of stock exchange indices implementation.

At the same time, it is necessary to emphasize the adequate formation of the index basket in the aspect of a wide range of stock indices functional application. This is especially relevant in today's conditions of geopolitical transformation of the territory of Ukraine, namely the impact of these transformations on the situation in national economy.

Setting objectives. The purpose of the article is to explore the methodological aspects of the formation, revision and adjustment of the components of the Ukrainian stock indices index basket, particularly in adequacy of the real market environment situation to reflection in ticker, free-float and weight components.

Main material and results. The current value of the stock exchange index has gone far beyond the ordinary indicator of a particular trading activity on organized securities market. Today, the stock exchange index represents not only the aggregate characteristics of the quantitative-value values of a certain set of securities. The significance of the stock index and its qualitative interpretation is transformed:

- from the micro-environment, where the stock index reflects the vector of market dynamics, the forming criterion of the investment assets portfolio, and the subject of "binding" terms of financial contracts;
- to the macro environment, where the stock index is one of the key indicators for monitoring the statement of the national economy, along with the specific level of GDP, discount rate, etc.

The modern role of the stock exchange index in the economic environment is determined by the functional qualities, that it is able to bear on the basis of the methodology of formation [1, 928], which allows their relevant use:

- reflect the real availability of the competitive environment;
- compare the structural stability of market dynamics;
- determine the continuity of the cycle of market fluctuations, as well as its reproducibility.

In turn, stock indices depend on the influence of a number of factors that create deficiencies and limitations on their analytical and applied use [1; 2; 4], in particular:

- fluctuations in the value of total capital;
- the state of financial and market infrastructure;
- susceptibility to the negative impact of inflation and exchange rates;
- sensitivity to concentration of capital on the basis of ownership and / or beneficiary;
- the inherent influence of various risk factors.

Overcoming these deficiencies is foreseen by systematic research and improvement of all multifaceted identification and grouping of stock indices according to the relevant classification features. According to the authors of [4], this approach systematizes and deepens knowledge of stock indices, which will serve as a useful and convenient tool for their practical application for various purposes of knowledge in the economic environment.

Despite the variety of classification criteria for stock indices, methodological approaches to the construction of components and calculation of indices, it is quite correct to prioritize the level of development of the securities market [4, 9]. According to the MSCI classification, the degree of stock market development is a key factor in the process of stock indices formation and influencing. World practice has shown that the stock index was formed at a specific trading platform – the stock exchange, and with the development and growth of the scale of the exchange – has acquired the status of national and / or world market situation indicator. Today in Ukraine, in particular, such "status" is held by two Ukrainian stock indices, which are recognized as a major by professional participants of the securities market of Ukraine, and are included in the world list of the national economy stock indicators:

- PFTS index – Ukrainian stock exchange index, which is calculated on the base on the results of trading on the PFTS stock exchange, based on the average prices of deals and transactions;
- UX index – Ukrainian stock index, which is calculated, traded on the Ukrainian Stock Exchange on the basis of the blue chip shares of Ukraine, the largest companies, leaders in their industries.

Such companies are the “locomotives” of the Ukrainian economy, they are industry- and budget-forming. Accordingly, the trading boards (exchanges) where this trade takes place are the largest in Ukraine. Thus, the PFTS Stock Exchange has historically been one of the largest in Ukraine. It has been operating since 1996; it is a correspondent member of the World Federation of Stock Exchanges and the International CIS’s Exchange Association. Ukrainian Stock Exchange (UX) – one of the largest securities exchanges in Ukraine, has been operating since 2008. However, there is a tendency for a significant decrease in the volume of securities trading on the Ukrainian stock exchanges (Table 1).

In 2018, the volume of trade decreased by 2.41 times compared to 2014, and the number of systematically functioning stock decreased from 10 to 5, or twice. The most powerful trading platforms today are Perspective and PFTS. At the same time, while the index of the Ukrainian Stock Exchange is recognized as one of the main indicators of the stock market of Ukraine, the volume of securities trading on it is relatively insignificant. The calculation and publication of the UX index began on April 27, 2009,

however, the role of the Ukrainian Stock Exchange on the Ukrainian stock market has significantly decreased with the emergence of new trading platforms. At present, in the UX index basket are included only six major Ukrainian corporations from different business fields.

Table 1

The volume of trading in securities on the Ukrainian stock exchanges*

Ukrainian Stock Exchanges	Years					
	2014		2016		2018	
	millions UAH	%	millions UAH	%	millions UAH	%
UFB	463,08	0,07	18,93	0,01	-	-
KMFB	9955,61	1,58	1743,32	0,74	-	-
INNEX	27,32	0,00	1,98	0,00	0,49	0,00
PFB	12739,29	2,02	252,09	0,11	-	-
UMVB	257,59	0,04	27,71	0,01	34,94	0,01
UMFB	118,76	0,02	-	-	-	-
SEFB	1249,38	0,20	59,09	0,02	-	-
PFTS	99910,23	15,87	95023,54	40,10	112518,20	43,13
Perspectyva	496103,96	78,82	136296,56	57,52	127324,98	48,81
UX	8604,15	1,37	3536,08	1,49	20992,16	8,05
Total	629429,38	100	236953,29	100	260870,78	100

*based and calculated on [8]

The PFTS index is the main indicator of the stock market of Ukraine together with the UX index. The PFTS index basket also includes the most liquid stocks, which are determined by the PFTS Index Committee on the base of market capitalization, trading volume, number of transactions, and other factors affecting on stock liquidity. As the PFTS is one of the first effectively operating stock exchanges in Ukraine, therefore, the base period from which the calculation of the PFTS index begins since October 1, 1997.

During the period 1997-2014, the PFTS index basket did not undergo significant structural changes. But the incidents and causes of 2014, their political and economic consequences, greatly influenced on:

- the formation of the index basket components;
- the reduction of the number of "blue chips";
- the shift in the weight of these components (Table 2).

For quite a long period (including until 2014) the index basket was made by shares of about 20 issuers. The specific structure of the business reflected the specific structure of the national economy of Ukraine. Thus, the index is dominated by heavy industry companies: mining, energy, metallurgy, chemistry, heavy machinery. The financial sector and telecommunications were represented only individually. Therefore, an index basket as this, fully objectively reflected the quantitative dependence of GDP and national income on the economic structure, but did not allow the stock index to carry out an objective analysis of qualitative structural changes.

Table 2

PFTS index basket history*

No	Share issuer (stock ticker)	Total number of shares	Free float shares		Weight ratio
			number		
Date: 15.01.2014 - 14.04.2016					
1	Alchevsk Metallurgical Plant (ALMK)	25 775 254 803	997 101 281	3,87	1,00
2	Avdiivka Coke Plant (AVDK)	195 062 500	15 969 772	8,19	1,00
3	Azovstal (AZST)	4 204 000 000	158 911 200	3,78	1,00
4	Raiffeisen Bank Aval (BAVL)	29 977 749 080	1 063 700 471	3,55	1,00
5	Centrenerho (CEEN)	369 407 108	80 201 991	21,71	0,56
6	DTEK Dniproenerho (DNEN)	5 967 432	112 784	1,89	1,00
7	Donbasenerho (DOEN)	23 644 301	3 343 541	14,14	1,00
8	Yenakiievo Metallurgical Plant (ENMZ)	10 550 688	974 708	9,24	1,00
9	Khartsyzsk Pipe Plant	2 598 495 120	51 848 869	2,00	1,00
10	Kriukiv Wagon Building Plant (KVBZ)	114 679 552	6 684 488	5,83	1,00
11	Motor Sich (MSICH)	2 077 990	415 598	20,00	0,24
12	Poltava Mining and Processing Plant (PGOK)	191 000 000	5 077 023	2,66	1,00
13	Northern Mining and Processing Plant	2 318 828 000	12 753 554	0,55	1,00
14	Stirol Concern (STIR)	27 125 280	2 508 075	9,25	1,00
15	Stakhanov Wagon Building Plant	226 389 510	18 111 161	8,00	1,00
16	Ukrnafta (UNAF)	54 228 550	4 338 281	8,00	0,26
17	Ukrsotsbank (USCB)	77 390 328 095	147 041 623	0,19	1,00
18	Ukrtelecom (UTEL)	18 726 248 000	1 336 558 512	7,14	1,00
19	Yasnyiv Coke Plant (YASK)	273 598 680	23 666 286	8,65	1,00
20	DTEK Zakhidenerho (ZAEN)	12 790 541	353 504	2,76	1,00
Date: 15.04.2016-30.06.2016					
1	Alchevsk Metallurgical Plant (ALMK)	25 775 254 803	997 101 281	3,87	1,0000
2	Avdiivka Coke Plant (AVDK)	195 062 500	13 654 375	7,00	1,0000
3	Azovstal (AZST)	4 204 000 000	158 911 200	3,78	1,0000
4	Raiffeisen Bank Aval (BAVL)	61 495 162 580	1 058 639 224	1,72	1,0000
5	Centrenerho (CEEN)	369 407 108	80 201 991	21,71	0,2451
6	DTEK Dniproenerho (DNEN)	5 967 432	112 784	1,89	1,0000
7	Donbasenerho (DOEN)	23 644 301	3 343 541	14,14	1,0000
8	Yenakiievo Metallurgical Plant (ENMZ)	10 550 688	974 708	9,24	1,0000
9	Khartsyzsk Pipe Plant	2 598 495 120	51 848 869	2,00	1,0000
10	Kriukiv Wagon Building Plant (KVBZ)	114 679 552	5 733 978	5,00	1,0000
11	Motor Sich (MSICH)	2 077 990	415 598	20,00	0,1301
12	Ukrnafta (UNAF)	54 228 550	4 338 281	8,00	0,2214
13	Ukrtelecom (UTEL)	18 726 248 000	1 336 558 512	7,14	0,5930
14	DTEK Zakhidenerho (ZAEN)	12 790 541	353 504	2,76	1,0000
Date: 17.10.2017-31.12.2018					
1	Raiffeisen Bank Aval (BAVL)	61 495 162 580	1 058 639 224	1,72	0,28
2	Centrenerho (CEEN)	369 407 108	80 201 991	21,71	0,07
3	Donbasenerho (DOEN)	23 644 301	3 343 541	14,14	1,00
4	Kriukiv Wagon Building Plant (KVBZ)	114 679 552	5 733 978	5,00	1,00
5	Turboatom (TATM)	422 496 520	16 208 234	3,84	0,44
6	Ukrnafta (UNAF)	54 228 550	4 338 281	8,00	0,20
7	Ukrtelecom (UTEL)	18 726 248 000	1 336 558 512	7,14	0,54

*based on [9]

The experience of countries with developed stock markets shows, that index funds have become a popular investment tool because they offer attractive low-cost income profiles [10]. Therefore, a relevant basket allows investors to effectively solve portfolio balancing tasks by tracking an index fund in response to new market information. A retrospective analysis of the index basket structural transformation shows the stability of free float volumes. However, the share of free float in the total issue is rather low, so the index fluctuations of the stock market are not able to reflect the dynamics of real economic processes. This is confirmed by M. Zaporozhets study [11]: the scientist sees the main problem in the underdevelopment of the stock market as a whole. Using stochastic valuation, M. Zaporozhets found that the relationship between major macroeconomic indicators and stock indices in Ukraine is almost non-existent, so market participants do not use stock indices to assess the situation of affairs in the economy. With this state of the index basket formation we have the following results:

1) the stock market of Ukraine, according to the hypothesis of information efficiency, is rightly attributed to the market with a low degree;

2) the interlinks between the real economy and the stock market is one-sided.

N. Matseliukh interprets the specifics of the mechanisms of functioning of the national stock market in the same way [3]. Her point of view is that the underdevelopment of the Ukrainian stock market is a consequence of an oligarchic economy. Thus, large stakes are monopolized, and companies hold on with "squeeze out" to strengthen corporate control. Therefore, it is necessary to create effective conditions for attracting cash savings to the stock market (through mutual investment institutions and non-government pension funds), as it is comprehensively implemented in Europe and the USA. At the same time, without neglecting the peculiarities of property relations in the Ukrainian economy, the stochastic instability of the relationship between the stock market and the real sector is inherent in almost all emerging markets. This is fully demonstrated by A. Gniadkowska-Szymanska's research on the investment systems construction, in particular taking into account the characteristics of emerging markets [12]:

- a small number of companies;
- short time series of samples;
- problems of investor's low activity;
- lack of free access to relevant information and market data.

Similar features of the functioning are inherent to the stock markets of Poland and the Baltic countries, which also makes it difficult to obtain a relevant analytical assessment based on stock indices [12]. But even in such circumstances, the index basket remains the country's baseline, or "investment portfolio". This is the trend, which also seen in emerging markets of China, Colombia, Greece, Mexico, South Africa, South Korea – as their prospects are extremely relevant to global economic growth [13].

Adequate formation of an index basket should also ensure the relevant impact of intra-market correlations between securities. Studies of DNN-models for forming trading strategies reflects [5; 14] the presence of chain changes and reactions to market fluctuations in the characteristics of yield and risk of securities. Mathematical models of such a mechanism allows to predict the overall market yield and the risk, which can be used for derivative market indices, such as futures indices and options. Therefore, the methodology for determining the composition of the index basket and the weight of the securities of individual issuers should be based on the principle of excluding autocorrelation. This further ensures the suitability of the stock index for forecasting the market, given the complex nonlinear influence of numerous factors. At least, this feature is indicated by W. Thorbecke [15], based on the study of the dynamics of oil price fluctuations. He found that despite the divergent price fluctuations, the beneficial effects of rising oil prices on the US stock market have increased, and the adverse effects have diminished after US oil production increased after 2010. In studies [6; 16] also clearly traces the chain mechanism of strengthening the correlation effect of the index basket. And it is proved that such effect is much stronger for options for specific stocks than for indices. Therefore, the authors' data models are based on an "average" basket of indexes and interpret market fluctuations almost perfectly [6]. A similar effect can be seen through the PFTS index dynamic of volatility during 2014-2018 (Figure 1).

On conditions of the stability and the smooth functioning of the economic environment, the stock index is almost close to its peak. This is a manifestation of the specificity of the PFTS index basket, on the basis of ownership. The upward trend of the index and the narrowing of the gap between its maximum just reflects the adjustment of the index basket, which took place in 2016-2017. Thus, the index reached its quantitative positions, but only in quantitative (not qualitative) characteristic. In particular, the conclusions of M. Zaporozhets regarding the inter-market interaction of national and world stock indices are correct [11]. He notes that national Ukrainian indices have been under the influence of foreign ones for a long time, and in

some periods such dependence has practically had functional features. Therefore, national stock indices were more a reflection of the situation on the international capital market rather than a reflection of the situation in national economy.



Figure 1. PFTS index volatility 2014-2018*

*based on [9]

Accordingly, there is a need to change methodological approaches to the formation of an index basket, but this is usually related to the strategic tasks and functions that a particular stock index should implement. Prospects for an adequate methodology for the formation of an index basket are to implement the experience of developing adaptive investment systems. According to the developers of such models [7; 17], adaptive investment systems are unique to a particular stock market. It optimizes the performance of a network of inter-correlation chains between the composition of securities (for each individual index of a group of assets) and use only those technical indicators that contribute to better network performance.

The stock index, formed on the basis of these adaptability and flexibility approaches, will allow relevant interpretation of real economic processes, as well as identify the generation of relevant market signals to predict further economic transformations of both the stock market and the real economy.

Conclusion. Despite the considerable global experience in implementation and developing a methodology for stock index formation, there are real drawbacks to the national stock market in adequately determining the composition of the index basket. The loss of some of the economic potential was somewhat offset in the index basket, but instead there appeared no promising Ukrainian issuer capable of playing the role of a “blue chip”. At the same time, the current composition of national index baskets does not reflect the impact of the systematic risk that free float securities always have in countries with advanced stock markets. Thus, the formation of an index basket is considered advisable by the methodological approaches of adaptive investment models. The prospects for further scientific research on the formation and application of national stock indices are visible in these directions.

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методології формування. Досліджено залежність фондових індексів від впливу факторів стосовно обмеження аналітичного та прикладного використання, а також напрями подолання цих недоліків. Розглянуто історичну ретроспективу формування основних національних біржових фондових індексів, зміни та перегляду складу індексного кошика ПФТС, встановлено поточні проблеми щодо адекватного формування індексного кошика, зокрема волатильність щодо функціонування економічного середовища, тенденції зростання і скорочення у зв'язку з коригуванням індексного кошика, взаємодії національних фондових індексів з іншими характеристиками економічного середовища. Проаналізовано стохастичні особливості функціонування механізму індексного кошика, що дозволяє визначити принципи його формування та напрями вдосконалення. Запропоновано методичні підходи до адекватного формування індексного кошика шляхом імплементації методології адаптивних інвестиційних систем.

Ключові слова: фондовий індекс, індексний кошик, біржа, цінні папери, стан економіки.

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Khadartsev Oleksandr, Ph.D. in Economics, Associate Professor, Department of Enterprise Economics and Personnel Management. Poltava National Technical Yuri Kondratyuk University. **Methodical Aspects of Adequate Basket Formation of Ukrainian Stock Indices.** There are considered the methodological aspects of forming, reviewing and adjusting the components of the index basket of Ukrainian stock indices in the article, in particular as to the adequacy of reflecting the real state of the market environment in ticker, free-float and weight components. The modern role of the stock index in the economic environment in terms of functional qualities is analyzed. The dependence of stock indices on the limitation of analytical and applied usage, historical retrospective of formation, stochastic features of the index basket are investigated. The article suggests with the improvement of index basket formation by implementation of methodology of adaptive investment systems.

Keywords: stock index, index basket, stock exchange, securities, economic situation.

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Ключевые слова: фондовый индекс, индексная корзина, биржа, ценные бумаги, состояние экономики.