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Information management systems in the systematization of indicators for assessing the effectiveness of investment processes in the securities market

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Abstract

The purpose of this study is to study the indicators for evaluating the effectiveness of the implementation of investment processes on the securities market, taking into account the scientific foundations of information management systems and analysis of indicators of financial efficiency of the investment function of the securities market in Ukraine.

The relevance of this study is due to the growing importance of management information systems in all sectors of the Ukrainian economy, in particular, the provision of solutions to the problems of activating investment processes in the securities market of Ukraine by analyzing

and reassessing the effectiveness of investment processes at this level, taking into account the scientific basis of management information systems.

A set of indicators that best reflect the implementation of the investment function of the Ukrainian securities market is proposed. A matrix of characteristics of investment processes in the securities market is proposed. It is argued why domestic and foreign investors prefer local securities market indices when making investment decisions. Through the implementation of correlation-regression models, it has been proven that, on average, 87% of changes in investments in securities are due to changes in the number of licensed entities, which on the Chedoch scale indicates a close relationship between the indicators. The results obtained using statistical inference methods indicate a high impact of both external macroeconomic factors that inhibit the development of the securities market and internal, which in turn is reflected in the indicators of assessing the effectiveness of investment processes in the securities market.

Keywords: Indicators; Investment Processes; Securities Market; Information Management Systems; Stock Exchange Indices; Efficient Market Hypothesis.

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Introduction

The process of growth of economic life of the country and the process of investment development of the securities market are interdependent processes. Covering monetary deficits by obtaining investment capital by enterprises in the securities market is a common world practice that does not lose its relevance. It is logical that the main evaluative parameter of successful and efficient functioning of the securities market is the efficiency and quality of investment processes in it, because the primary task of the securities market is to attract and redistribute investment resources.

Today in Ukraine the intensification of processes of investing in securities and increasing the efficiency of the securities market in general, which contributes to the redistribution of resources between suppliers and consumers of financial capital, capital accumulation for investment in production and social spheres, structural adjustment of the economy, positive dynamics social structure of society, improving the welfare of citizens through the possession and free disposal of securities, the preparedness of the population for market relations.

The efficient functioning of the securities market infrastructure in the country ensures the efficient use of free financial resources and sustainable economic growth. That is why the securities market, depending on the degree of development is the main mechanism for the accumulation, distribution and redistribution of free financial resources among all sectors of the economy. And since the securities market in Ukraine is characterized by a low level of development, it is relevant and necessary to study the systematization of indicators for assessing the effectiveness of investment processes in the securities market, which aims to intensify investment processes in the securities market.

The purpose of the study is to systematize indicators for evaluating the effectiveness of investment processes in the securities market by researching scientific and practical approaches to evaluating the effectiveness of the functioning of the securities market in Ukraine taking into account the scientific basis of information management systems. The main idea of the study is that the effectiveness of investment processes in the securities market is one of the main criteria for long-term growth of the economy. Taking into account the scientific foundations of management information systems should contribute to the rapid implementation of this idea.

The research hypothesis is as follows: the condition for long-term growth of the country's economy to achieve strategic goals is the intensification of investment processes in the securities market of Ukraine by improving the efficiency of the securities market, namely – improving the systematization of indicators for assessing the effectiveness of investment processes in the securities market.

In Ukraine, the securities market has not yet played the role played by leading international markets. Choosing a more profitable option for investing their savings, Ukrainians prefer the banking system.

According to the results of the analysis of the peculiarities of the functioning of the securities market in Ukraine, the following problems of its development should be singled out: 1) the lack of a long-term development strategy of the securities market. It is often developed by representatives of other countries, which, in our opinion, are not always able to objectively assess the state of the domestic securities market and the financial and economic situation in the country, as well as these representatives "promote" "their interests"; 2) ignorance and disinterest of the population in the tools of the securities market, as well as the low standard of living in the country, which reduces their propensity to save; 3) a small selection of financial instruments (usually using classic securities); 4) strong competition with bank deposits, which are more reliable and understandable for the population; 5) low level of investment attractiveness due to the economic and political crisis in the country; 6) monopolization; 7) low productivity; 8) long-term existence of a large number of stock exchanges, most of which carried out irregular transactions; 9) low liquidity of securities of

public joint-stock companies; 10) there is no clear mechanism of interaction of exchanges with uniform standards of settlements and clearing, depository system; 11) imperfection of currency regulation, ie there is a fairly low guarantee of return on investment for foreign investors; 12) inaccuracy of information data on the total amount of trade in the organized market, which hinders the transparency and openness of the securities market, while reducing the already low level of confidence in the national instruments of the securities market; 13) senseless "depiction" of foreign paradigms without the necessary conditions; 14) non-compliance by market participants with the principles of transparency, honesty, responsibility, etc., which is the result of a weak legal framework for the regulation of the securities market; 15) low level of free-float.

Literature Review

An analytical review of the scientific literature suggests that there is no single universal indicator, indicator or criterion that would take into account and demonstrate all aspects and components of the functioning of the securities market. Therefore, for a comprehensive assessment of the effectiveness of investment processes in the securities market should be measured by different methods and ways. This issue is extremely important for both scholars and direct participants in the securities market. Economic science, especially foreign, is rich in scientific theoretical paradigms and methodological and practical approaches to determining the efficiency of the securities market.

But we believe that due to various reasons, for example, due to the great complexity and application of a large number of indicators that are simply missing and not monitored in our country, the vast majority of indicators cannot be used to assess the efficiency of national securities market investment processes. Effectively functioning prototype markets are created in academic research models, and efficiency tests are performed in different markets (Bilovus, 2019).

The study of the theory of indicators for evaluating the effectiveness of investment processes in the securities market is based on research: effective market hypothesis (Fama, 1970); Hvostenko and Babich hypotheses that the Ukrainian securities market is information-efficient (Khostenko and Babych, 2013); a new approach to the modification of the method of importance of criteria through inter-criteria correlation (CRITIC), which refers to objective methods for determining the weighting coefficients of criteria (Žižović, Miljković, & Marinković, 2020); a holistic approach to evaluating the value of information (VOI) with fuzzy data and decision criteria (Vilela, Oluyemi, Petrovski, 2020), (Gontareva et al., 2020); indicators of financial security of the securities market (Baranovsky, 2016); mechanism of scalability of financial services in the context of the developing market (Priyadharshini, Barney, Felix, Carmen, 2021); a number of approaches to measuring the liquidity of the securities market (Emelyanova, 2015), (Plastun, 2012), (Shkolnyk and Chervyakova, 2012),

(Yurkevich and Shinkarenko, 2012), (Levine and Zervos, 1996), (Singh, 1997); a hybrid approach that combines the advantages of tokenized securities and index funds, while eliminating some of their disadvantages (Babenko, 2020), (Ciriello, 2021); approaches to calculating stock indices (Rubtsov, 2007); modern world indices of the securities market (The World Bank, World development indscators, The Global economy). One of the central ideas of modern financing is the efficient market hypothesis (EMH) presented by Fama (Fig. 1).

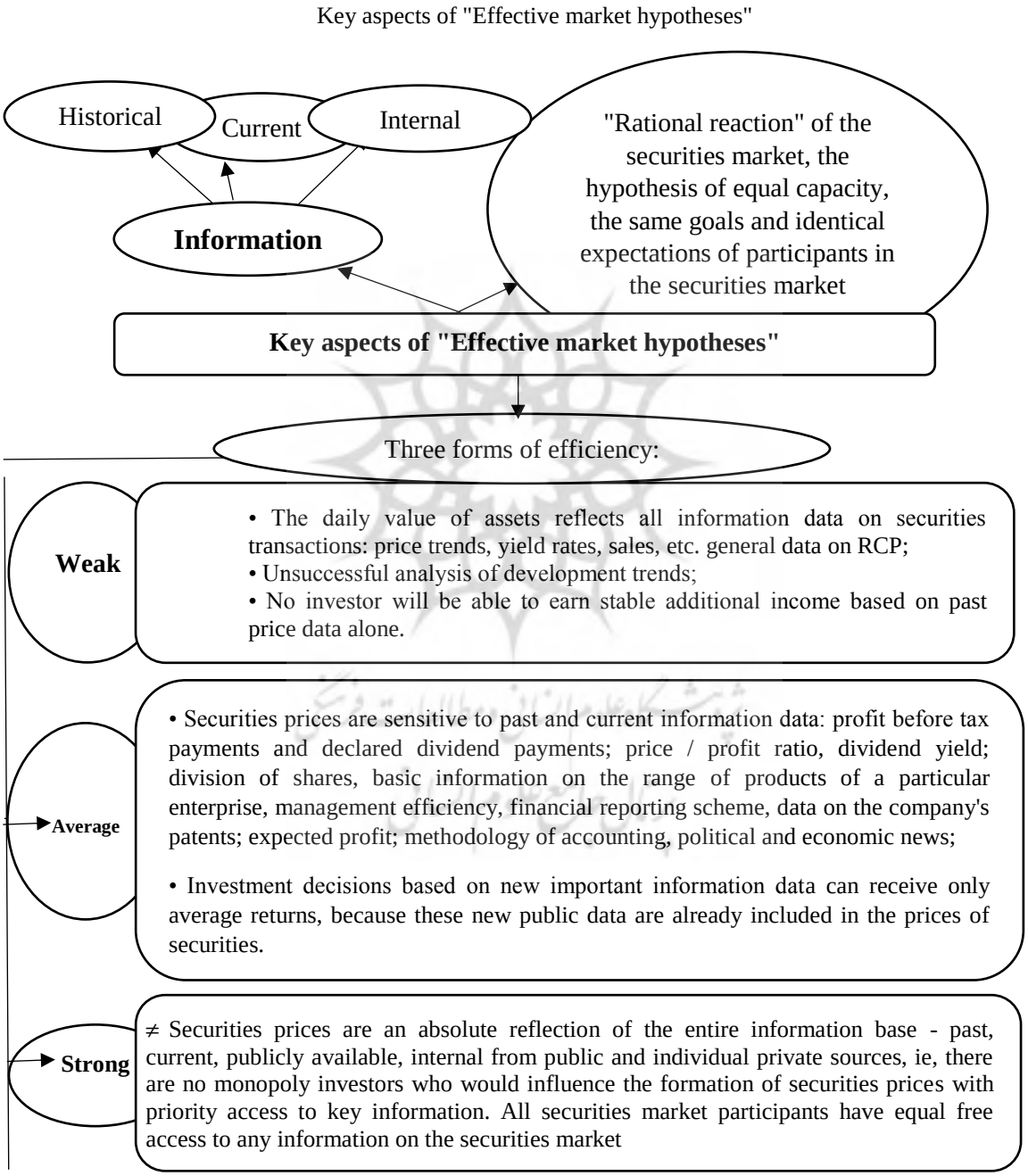

Figure 1. Key aspects of the efficient market hypothesis

Source: based on (Fama, 1970)

This hypothesis was first published by the French mathematician Bescheler in his doctoral dissertation "Theory of Speculation", but was completely ignored until the 1050s.

This study acquired the status of an outstanding theoretical hypothesis in the middle of 1960 after the publication of E. Fama's doctoral dissertation. This hypothesis divides the efficiency of the market according to the set of information that is reflected in market prices (Fama, 1970):

weak form of information efficiency - current market prices reflect all information about prices that have been on the market in the past, information on the state of securities market in the past, based on technical analysis (analyzes of price changes and the number of contracts over time);

semi-strong form of information efficiency – current market prices reflect all publicly available information that is available at the moment in the financial market and securities market, in particular. That is, it is about public, open and currently available to all information, which also includes information about past transactions in the market;

strong form of information efficiency - the internal value of securities is completely the same as external, current prices reflect all possible information at the state level and at the level of private enterprises, ie, one that is known even to a narrow circle of people, etc., which avoids monopolies on securities market and receive income above market norms during the formation of the price of securities.

Malkil, continuing this theme, argued that a capital market is effective if it fully and correctly reflects all relevant information in pricing, which takes into account price security, risk assessment and expected returns. This means that it is not possible to obtain economic benefits from the established information. All empirical research on the theory of efficient markets is due to the fact that the price fully reflects certain subsets of available information. Weak forms of tests were performed with an information subset representing past price histories. Weak performance tests include consistent correlation, mileage, trading rules, and variance.

Tests of semi-strong form of efficiency are conducted using the methodology of research of events, behavior and reaction of prices to public announcements, etc.

To test the strong form of efficiency, tests are conducted on private information (whether there are specific investors who are informed not only about market prices). In practice, investors are very concerned about how to get clear information about prices and achieve high returns. Market efficiency also implies the optimal distribution of resources in the economy. In this aspect, three components of market efficiency are identified (Testing the Weak Form, 2012):

1) efficiency of operations: the financial market is operationally efficient if it works flexibly, with limited delays (orders can be transferred from all over the world to the securities market

very quickly, as well as quickly executed and confirmed). Markets must perform their operations at the lowest cost. Competition between markets is an integral part of improving operational efficiency. Technology is also an important factor in achieving operational efficiency. The market can work effectively, however, without being information efficient;

2) associative efficiency: resources in the economy are scarce, and it is important to allocate resources in such a way as to achieve optimal productivity. An efficient market must direct the funds of attracted investments in such a way as to help the growth of various sectors of the economy;

3) pricing efficiency / information efficiency: in an efficient market, the investor can calculate the pricing and expected return taking into account the risk, as any news about the price moves instantly and impartially on the market.

An information-efficient market is one in which prices respond quickly to new information. But world practice shows that this hypothesis does not always work for some reason. First of all, due to numerous market distortions: time deviations, anti-trend programs, "trend similarity" programs, positive autocorrelation of price increases in intervals of up to six months and negative - time limits of three to eight years for market indices, a number of calendar deviations.

In addition, the result of the global financial crisis in 2007–2009 was that the most negative effects of the crisis were felt by those participants in financial relations who, according to the market efficiency hypothesis, were considered effective and with an extremely low probability of crises.

The crisis situation of these securities markets, whose subjects carried out operations with credit and mortgage instruments, became the center of the spread of shocks to the financial markets of foreign countries and disrupted the overall stability of the financial and economic systems of the world. All the above only proves that this hypothesis of an efficient market is not perfect, like most financial hypotheses.

From the standpoint of information, the effectiveness of the securities market and domestic scientists studied. In this aspect, the research of Ukrainian scientists V. Khvostenko and M. Babich (Khostenko and Babych, 2013) is interesting, who hypothesized that the Ukrainian securities market is information-efficient (Fig. 2).

In support of their hypothesis, they analyzed the relationship between the information about the expected parliamentary elections in Ukraine on April 2, 2007 and the change in the value of shares of the Ukrainian Stock Exchange, as a result of which they concluded that the value of securities in the Ukrainian securities market is sensitive. to external information.

In the Ukrainian securities market, all entities have access to information on past prices, transactions of the number of concluded contracts with securities, etc., because there are a sufficient number of available sources of information, in particular, this information is

reflected in the annual reports of the National Commission on Securities and Stock market, mutual investment institutions, stock exchanges, depository institutions, the National Bank of Ukraine and other market participants, and is publicly available to all electronically.

Also, all securities market participants and the media cover all current information on securities market instruments as of the relevant date. It is obvious that the securities market is sensitive to external information, because the analysis uses various indicators of securities market entities and information on the value, volume, number of securities, contracts, etc. and, as a rule, a "parallel" between the deterioration of general indicators of securities market development and adverse external political, socio-economic events and the conflict in eastern Ukraine.

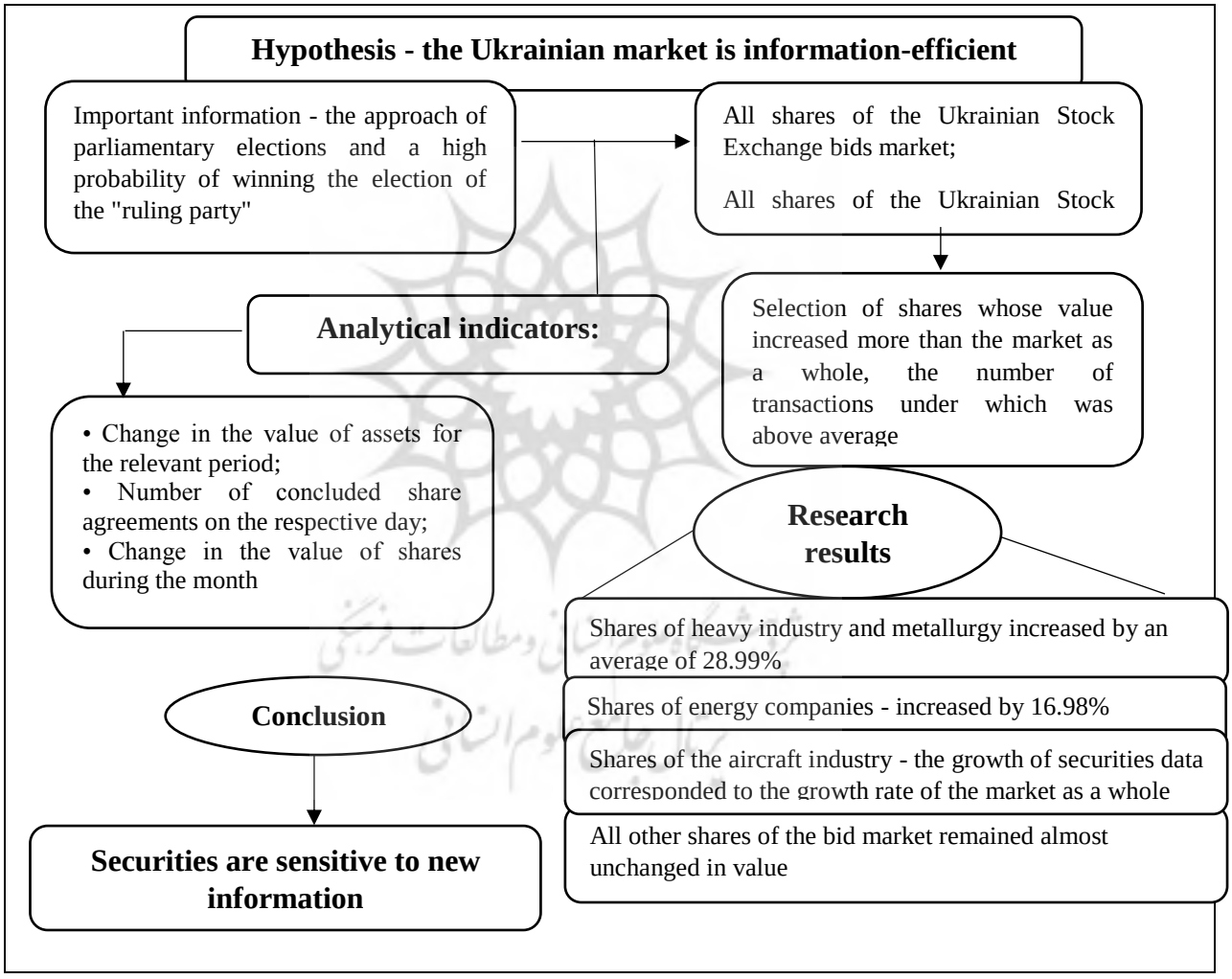

Figure 2. Key aspects of information efficiency of the Ukrainian securities market

Source: based on (Khvostenko and Babich, 2013)

Since 2015, the National Commission on Securities and Stock Market has been actively "cleaning" the market of "fictitious", "garbage" securities, resulting in the liquidation of a significant part of stock exchanges and enterprises. An example of false information, in particular, is the events of 2017, when the Prosecutor General's Office of Ukraine revealed a

large-scale scheme with the manipulation of securities on the market of UAH 25 billion. In order to legalize the proceeds of crime, several entrepreneurs in Kyiv conspired and organized the sale on the securities market of "junk" securities with "artificially" inflated value, resulting in the circulation of "fictitious" securities of 38 issuers with a total value of about UAH 25 billion.

In this way, these individuals legalized funds obtained by criminal means, used business entities with fictitious features and carried out financial transactions with funds allegedly received for purchased securities, promissory notes from enterprises of the real sector of the economy. Thus, these companies also avoided the tax burden on these funds (Plastun, 2012).

As mentioned earlier, developed markets are more attractive for investment, so they better perform the investment function and provide the necessary investment to the economy of their region. In this context, it is advisable to focus on key indicators that reflect the development of the securities market. When talking about the efficiency of financial markets, we should focus on the most common indicators of the development of the securities market used in the world.

There are authors who evaluate the effectiveness of the securities market through a set of certain evaluation indicators, which can be quite narrow or very broad (for example, 22 indicators) (Baranovsky, 2016). Thus, assessing the effectiveness of investment processes in the securities market requires a proper systematization of indicators that indicatively reflect the level of development of these processes in different categories. It should be noted that the choice of the correct indicators to describe a particular parameter of evaluation is a complex process, because an adequate indicator must have the following characteristics: quantitative expression (ie the indicator can be quantified); argumentation (the indicator conveys the essence of what needs to be characterized and evaluated); unambiguity (the indicator has an exact established statement); endurance (inherent periodic time slices of indicators on the indicator); openness and ease of access (the information used to calculate the indicator is in the classic available information sources).

Methodology

To achieve the goal of this study, a system of general scientific and special methods and approaches of scientific knowledge was used, namely: scientific abstraction, systems analysis and synthesis, functional and systems analysis, induction and deduction, historical and logical. The following methods became the basis of this research: dialectical – for substantiation of theoretical and methodical bases of investment process, in particular on securities market; system - to study the implementation of investment processes on the securities market; comparative analysis - to assess national stock indices compared to leading international ones; descriptive statistics and statistical conclusion - to identify the objects of investment processes on the securities market; extrapolations – in the projection of foreign experience on domestic practice; logical generalization – to substantiate the systematization of

indicators for assessing the financial efficiency of the securities market; graphical and tabular for visual presentation of research results.

Indicators for assessing the investment function of the securities market

Determining the weight of a criterion is one of the key problems of multicriteria analysis models (Žižović, Miljković & Marinković, 2020). To assess the implementation of the investment function and the development of the securities market, we propose to use a set of indicators common in developed markets, in particular: 1) capitalization of the securities market (volume and percentage of GDP); 2) liquidity of the securities market (volume of shares and interest on GDP); 3) capital turnover ratio (the ratio of the volume of shares in circulation to the size of the capitalization of the securities market); 4) the number of resident companies listed; 5) the world stock index S&P (changes in growth rates).

On this basis, a matrix model of characteristics of investment processes in the securities market is built, based on generalizing indicators, such as capitalization of the securities market (depth), concentration (availability), liquidity of the securities market (stability) and productivity of the securities market (efficiency).

Consideration of these methodological foundations by the participants of the securities market is of great importance both for the development of the strategy for the development of the securities market and for the formation of security conditions for integration into the European and world economic space. This strategy should include, in our opinion, certain indicators (table 1): 1) the volume of participants in the securities market and markets (financial depth); 2) availability of participants in the securities market (investment services); 3) the effectiveness of participants and the securities market in trading in investment securities; 4) stability of participants and markets (stability).

Today, the market for high-depth securities does not necessarily indicate a high degree of affordability of securities and services; a highly efficient securities market is not always more stable compared to a less efficient one, etc. The proposed indicators should be indicative with a gradual direction to a certain vector. In modern realities, such a task was not mentioned at the level of regulators.

In view of this, in our opinion, of all the proposed as key indicators of the efficiency of the securities market of Ukraine, and hence the effectiveness of investment processes in it, it is necessary to use such general indicators that characterize certain aspects of the securities market, namely: capitalization securities market (depth); liquidity of the securities market (stability); securities market performance (efficiency).

Table 1. Matrix of characteristics of investment processes in the securities market

	Investment tools	Securities market participants
Depth	The size of the market capitalization of equity securities, UAH million Total value of sold equity securities,% of GDP Equity securities in circulation,% of GDP Corporate debt securities,% of GDP Government debt securities,% of GDP Debt securities of foreign issuers,% of GDP	The size of the capitalization of national issuers,% of GDP Value added of financial investment intermediaries,% of GDP
Accessibility	Yield of domestic and external government bonds (3 months and 10 years),% Ratio of domestic government bonds to all debt obligations,% Ratio of corporate to all domestic debt,% New corporate bond issues,% of GDP	Number of national companies with a stock exchange quotation per million inhabitants Market capitalization outside the top 10 largest companies,% Value circulating outside the top 10 joint stock companies,% Index of strength of legal rights,%
Efficiency	The turnover ratio of equity securities,% Price synchronicity (joint movement); The impact of prices Liquidity / transaction costs Spread of purchase and sale of government bonds of domestic / external government loans Turnover of bonds (corporate, government) on trade organizers Efficiency calculation	Non-interest income in total income,% Overheads in total assets,% Return on equity (profitability, return on assets),% Boone indicator (Herfindahl, H-statistics)
Stability	Annual changes in the global S&P stock index,% Volatility (standard deviation / average) of the stock price index, national bond index Index asymmetry (stock price, national bonds) Price / profit ratio (P / E) Duration; The ratio of short-term to all bonds (corporate, external) Correlation with the best bonds of Germany, USA, etc.	Z-account (default) Capital adequacy ratios Asset quality ratio Liquidity ratios Others (net currency position to capital, etc.)

Source: based on (The World Bank, Kovalenko, Yu., 2014)

In general, capitalization is a process of increasing value.

Capitalization of the securities market is the current market value of companies whose securities are quoted on the securities market. Given the various scientific paradigms for definition, capitalization can be interpreted as: the transformation of profits from securities market instruments into capital; generation of capital, the calculation of which is based on income from securities owned by the entity; compensation of one-time expenses, which demonstrate the investment of money capital due to the growth of profit for the year; multiplying the value of the company's shares by their total quantity.

Typically, market capitalization is used to comparatively analyze the securities market in different countries or the country's securities market over a period of time.

Therefore, it is important to determine the numerical parameters of capitalization of the securities market, transmitted through absolute and relative ratios.

Thus, the absolute value of the capitalization of the securities market is measured by the amount of capital in circulation on its exchange segment. The relative value of capitalization, the so-called capitalization ratio, is personified in relation to the capitalization of the securities market to nominal GDP, measured as a percentage.

Market capitalization is only an approximation of market size. Needless to say, without scaling, it is as informative as comparing the size of national economies. However, when adjusting gross domestic product (GDP), this gives us an approximation of the relative size of stock markets.

Market capitalization is a measure that reflects the ability of the securities market to allocate capital for investment projects and its ability to provide significant opportunities for diversification of investor risks.

Table 2 shows the dynamics of market capitalization indicators of the TOP-10 securities markets of the world and Ukraine in 2016–2019.

These tables allow us to state the correctness of our chosen approach to assessing the capitalization of the securities market through its absolute and relative values, which reflect the different effect on the very essence of these indicators. Thus, consideration of the absolute values of the size of the capitalization of the securities market of different countries showed that the US securities market dominates and actually dominates and influences the course of events and the situation on the world securities market.

Changes in the prices of securities in the US market significantly affect the prices of securities of foreign countries, and the degree of capitalization of the American securities market significantly exceeds the market of any country at times. As for the values of the capitalization ratio, the leading position in this indicator is occupied by Hong Kong in 2016-2019 (with relative capitalization characterizing the incredibly high data on the predominance of capital involved in trading on the Hong Kong stock market compared to its GDP).

Of course, the securities market of Ukraine in terms of its capitalization is far from the indicators of the countries included in the TOP-10.

There is also a significant lag in Ukraine in terms of average capitalization of the securities market in the world. Thus, compared to the average value of the capitalization ratio of the world securities market, the Ukrainian securities market showed the following lags: in 2016 by 63.46%; in 2017 - by 77.32%; in 2018 - by 61.98%; in 2019 - by 75.25%.

Source: National Commission on Securities and Stock Market , Ukrainian investment business association.

Table 2. Dynamics of turnover indicators of the TOP-10 securities market countries of the world and Ukraine in 2016-2019

№	Country that is in the TOP-10	Market capitalization	
		Place in the ranking	Absolute capitalization, billion dollars
1	2	3	4
2016 p.			
1	China	1	249,17
2	Turkey	2	168,6
3	South Korea	3	126,08
4	Japan	4	105,44
5	Spain	5	97,84
6	USA	6	94,72
7	Thailand	7	80,92
8	Saudi Arabia	8	77,46
9	Germany	9	74,93
10	Brazil	10	60,70
		The average value of the indicator 39,45	
Ukraine		0,009	
2017 p.			
1	China	1	197,12↓
2	Turkey	2	165,76↓
3	USA	3	116,08
4	South Korea	4	112,36↓
5	Japan	5	92,84↓
6	Spain	6	82,62↓
7	Brazil	7	67,02↑
8	Germany	8	63,58↓
9	Thailand	9	61,87↓
10	Switzerland	10	55,39
		The average value of the indicator 35,11 ↑	
Ukraine		0,024↑	
2018 p.			
1	Turkey	1	247,76↑
2	China	2	206,65↑
3	South Korea	3	173,71↑
4	Japan	4	119,02↑
5	USA	5	108,51
6	Germany	6	92,08↑
7	Spain	7	86,18↓
8	Brazil	8	83,90↑
9	Thailand	9	77,19↑
10	Canada	10	70,88
		The average value of the indicator 41,12 ↓	
Ukraine		0,005↓	
2019 p.			
1	China	1	223,66↑
2	Turkey	2	187,94↓
3	South Korea	3	129,83↓
4	Brazil	4	87,48↑
5	Japan	5	82,34↓
6	Thailand	6	64,49↓
7	Germany	7	64,36↓
8	Spain	8	62,74↓
9	Canada	9	59,46↓
10	Australia	10	56,08
	South Africa	The average value of the indicator 26,56 ↓	
Ukraine		0,001↓	

* excluding data from the USA, France and South Korea

Source: compiled from (The Global Economy).

Trend analysis showed that the current state of the Ukrainian securities market is characterized by incomplete market transformations under the influence of the trajectory of previous development.

Figure 3 clearly shows that the market capitalization of listed issuers in 1992–2020 increased from only 1.2 to 4% of GDP, which indicates the lack of active investment processes in the securities market. Its further development is not facilitated by capital investment, which has grown since 1996 from 13 to 15.7% of GDP.

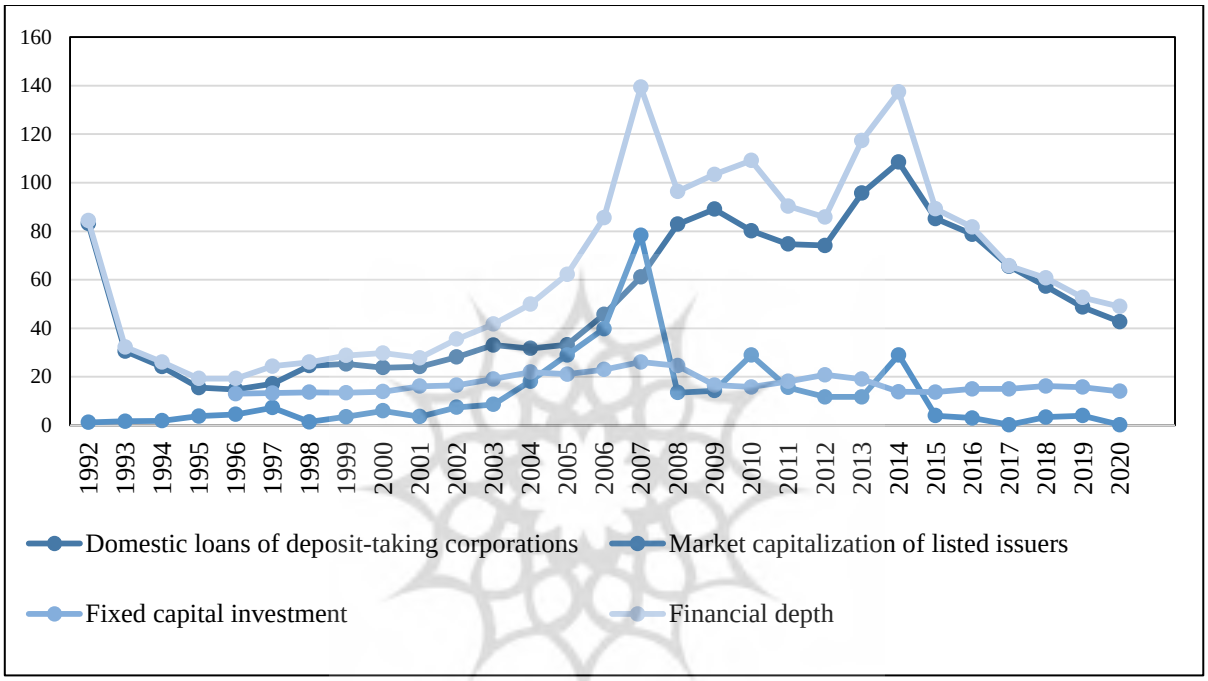

Figure 3. Capital investments and financial depth of the economy in Ukraine in 1992–2020, % of GDP

Source: based on data (The World Bank; State Statistics Service of Ukraine)

Instead, there is a separation of the financial sector from the real one due to a significant increase in deposits of banks and credit unions, ie deposit-taking corporations, especially since 2008 when they exceeded the capitalization of listed issuers by 5.8 times, and in 2019 – 12.2 times. The period of 2009-2015 was the only one when the volume of trades on the securities market exceeded the GDP of Ukraine.

Quantitatively, the impact of GDP on trading volume in the modern securities market (table 3) was assessed using a correlation-regression model, the implementation of which allowed to analyze macroeconomic factors influencing the activities of participants in investment processes in the securities market.

Table 3. Dynamics and ratio of trading volume on the securities market and GDP of Ukraine in 2015-2020

Year	Volume of trades on the securities market						GDP, billion UAH	GDP growth rate,%	Volume of trades on the securities market,% of GDP
	Trading volume on the stock market, UAH billion	Growth (decline) of trading volumes on the stock market,%	Trading volume on the over-the-counter market, UAH billion	Growth (decline) of trading volumes on the OTC market,%	Total trading volume, UAH billion	Growth rate (decline) of total trading volumes,%			
2015	286,21	0	1886,5	0	2172,7	0	1979,5	0	109,8
2016	235,4	-17,8	1892,1	+0,3	2127,6	-2,1	2383,2	+20,4	89,3
2017	205,79	-12,6	262,9	-86,1	468,7	-78,0	2982,9	+25,2	15,7
2018	260,87	+26,8	329,7	+25,4	590,6	+26,0	3558,7	+19,3	16,6
2019	304,88	+16,9	473,2	+43,5	778,1	+31,7	3974,6	+11,7	19,6
2020	335,41	+10,01	665,58	+40,7	1000,9	+28,65	4194,1	+5,5	23,87

Source: National Commission on Securities and Stock Market of Ukraine, State Statistics Service of Ukraine

According to the coefficient of determination, it can be concluded that on average 83% change in the volume of trading in the securities market is due to changes in GDP, which according to the Chedoch scale shows a high close relationship between trading in the securities market and GDP. The value of the Student's criterion indicates that the value of the coefficient of determination is significant, and the relationship between the volume of GDP on the volume of trading in the securities market is reliable, according to the Fisher's ratio, the model is adequate.

Exchange transactions are represented by shares, corporate bonds, investment certificates and derivatives, and the lion's share is government bonds, the share of which in 2015-2019 increased from 87.12 to 96.81%, which directly affects the specifics of investments of institutional investors in securities.

The use of descriptive methods of statistics allowed us to conclude about the low level of infrastructure of the securities market and its activity, the lack of the required number of securities market participants, in particular, there is an urgent need for reliable issuers and investors with strong capital. Through the implementation of correlation-regression models, it has been proven that, on average, 87% of changes in investments in securities are due to changes in the number of licensed entities, which on the Chedoch scale indicates a close relationship between the indicators. According to the Student's criterion and the Fisher's ratio, the relationship between the indicators is reliable and the model is adequate.

The second indicator, which we selected in order to assess the effectiveness of investment processes in the securities market, characterizes the functioning of the securities market by the degree of its liquidity. Liquidity is the ability to convert non-monetary assets into their

equivalent without losing the principal amount. Securities markets that easily convert non-monetary assets into cash are liquid. All other things being equal, international financial managers believe that it is better to invest in liquid markets. Given the preference for liquid stocks, illiquid stocks should offer more compensation. The liquidity factor is manifested when the investor intends to sell quickly, a block of shares, but market conditions at this time - unfavorable: demand for these shares has fallen, they have become less liquid, and as a result - the investor suffers losses or profits less than expected (Yurkevich and Shinkarenko, 2012).

In general, liquidity in the securities market can be characterized by the ability to: 1) conduct trade, ie if there is no liquidity in the securities market, then trading in securities is impossible. Thus, there must be at least one offer to buy and one offer to sell securities; 2) purchase and sale of securities market instruments of a specific size with an impact on their value, ie interested in a certain impact of the contract on the final value. In the liquid securities market, purchase and sale transactions will cause small changes in price; 3) purchase and sale of securities of a specific size without changing the value of these securities. The securities market with higher liquidity provides less influence on the value of securities. Therefore, at a certain level of liquidity of the securities market, the signing of contracts will not cause a change in value at all; 4) purchase and sale of securities at the same price on a certain date; 5) carry out transactions instantly without any impact on the value of securities (Plastun, 2012).

There are a number of approaches to measuring the liquidity of the securities market, which are considered in the studies of economists (Emelyanova, 2015; Plastun, 2012; Shkolnyk and Chervyakova, 2012; Yurkevich and Shinkarenko, 2012) They are quite variable both in the scale of calculations and in the processing of the array of information that is necessary for their calculation. In any case, without reducing the importance of generally recognized at the global and national level indicators that assess the level of liquidity of the securities market, let us single out one indicator. After all, in order to determine the effectiveness of investment processes in the securities market, we are convinced that an important point for choosing indicators that will characterize the liquidity of the securities market is the simplicity of calculation and availability of information on data for calculation. And since liquidity indicators are primarily of interest to investors, who are the main initiators of the "launch" of investment processes in the securities market, in our opinion, such available indicators of liquidity of the securities market is the turnover ratio (stock turnover ratio), which is the ratio of total stock trading and market capitalization.

This indicator, in our opinion, is a reflection of whether the securities market is liquid. After all, liquid securities markets make investments less risky and more attractive, as they allow you to buy a certain asset first, and then, if necessary, sell it quickly and inexpensively to access your savings or simply change your portfolio (Emelyanova, 2015).

Of course, there are other views on the impact of liquidity on long-term economic growth. Some economists (Levine and Zervos, 1996) believe that highly liquid securities markets lead to "short-sightedness" of the investor. In such markets, the investor may lose the desire to engage in corporate control, management supervision, monitoring of the firm, its productivity and potential. From this point of view, increasing the liquidity of the securities market may hinder economic growth.

Note that the liquidity ratios indicated by us can be calculated for different time periods of trading in shares (annual, monthly, daily turnover ratios of shares (government securities) are determined respectively on the basis of the value of trading on the market capitalization for the year, month, day).

According to the table. 2 indicators of turnover of securities markets TOP-10 securities markets of the world and Ukraine for 2016–2019 show that the securities market of Ukraine is low liquid, because the turnover of securities market does not even reach tenths in decimal terms. We can highlight 2017, in which this liquidity ratio is much higher than the previous evaluation year (by 0.015 units). However, already in 2018 the turnover of the securities market of Ukraine again fell sharply to 0.005, and in 2019 this decline continued and the figure reached 0.001.

In terms of stock turnover, the efficiency of the Ukrainian securities market also lags far behind the securities markets of neighboring countries such as Hungary, Poland, Russia and Kazakhstan (Fig. 4).

Figure 4. Indicators of turnover of securities market shares in neighboring countries of Ukraine

Source: Ukrainian stock exchage, Forinsurer

Stock indices as indicators of financial efficiency of the securities market

Another important generalizing indicator that characterizes the performance of the securities market is the so-called testing of the securities market, which allows the investor to measure the average productivity of the national market through indices. In the investment process, stock indices are used, which measure the value of the division of the country's securities market by the weighted average value of selected stocks. These indices help investors and analysts describe the market and compare different investments. Various mutual funds and exchange-traded funds try to track these indices to give investors the opportunity to influence the market. The three most common types of indices are global, regional and national.

Global Securities Market Indices help investors and analysts describe the market and compare different investments. Global indexes track stocks from around the world. For example, the MSCI World Index tracks shares of large and medium-sized issuers in 23 developed countries, covering approximately 85% of the market capitalization adjusted for free float in each country. It should be noted that global markets, measured by market capitalization, do not offer access to emerging securities or frontier markets because they are too small to include.

The following methodological approaches to calculating stock exchange indices for a certain period are known in the system of international management (Rubtsov, 2007):

1) the rate of change of the arithmetic mean value of the value of shares of a certain number of selected companies and organizations. This methodological approach is reflected in the most famous US index - the Dow Jones index, which was the first index to emerge in the world. It is calculated as the arithmetic mean of the value of the shares of the 30 most powerful companies. Under the risk of a fraction is not a quantitative sample of enterprises, but a certain coefficient that reflects the large distribution of investment capital by issuing enterprises (split), which has been carried out continuously since 1928;

2) the rate of increase (decrease) of the arithmetic mean (by the number of circulating shares) of the value of the vast majority of shares of corporations. The Standard & Poor's index is calculated using this methodological approach. This index is most popular among professional participants in the securities market. Its calculation is based on 100 or 500 shares of powerful corporations operating in more than 90 different areas of economic activity;

3) the arithmetic mean of the rate of increase (decrease) in the value of shares. This methodological approach underlies the calculation of the calculated Ukrainian PFTS stock index. The calculation of this exchange indicator is carried out on the principle of market weighing, which uses the arithmetic mean method. This is the geometric mean derivative of the price increase of 1695 shares.

The value of the stock index is used as an indicator of the general dynamics of the stock market. Knowledge of the main types of stock indices and methods of their calculation gives the opportunity to be guided in their activities by securities traders in the stock market, using analytical materials based on indices.

National stock indices have an impact on individual countries. In some cases, the shares of these indices will consist entirely of large-cap stocks similar to the Dow Jones industrial index in the United States. In other cases, the shares may be considered small, as there may not be many large companies in the country. This is often the case in emerging markets and market economies.

In addition, there are many other types of specialized securities market indices to determine demographic data. For example, the Islamic S&P and Sharia indices focus on investors who support Islamic law, while other indices focus on goals such as investing in environmental and social governance. Investors may wish to consider these types of indices, which may provide them with access to global stocks with certain restrictions.

Today, the securities market in Ukraine compared to the securities markets of developed countries is at an early stage of development. "The international rating agency Standard & Poors 20 ranks the Ukrainian securities market in the S&P Frontier BMI index. The S&P Frontier (marginal) BMI is determined by the numerical characteristics of 35 small and illiquid securities markets. When classifying by category, macroeconomic indicators, political stability, protection of property rights, trade processes and terms of transactions, reviews of institutional investors are taken into account.

Due to the small size of capitalization, low investment attractiveness and limited information in free access that characterize the "border" securities markets, the S&P Frontier BMI index is determined separately from the whole class of global global stock indices S&P Global BMI. Along with the national securities market, the group of border markets includes the markets of European countries such as Croatia, Romania, Slovakia, Slovenia, Bulgaria, the Baltic States, Cyprus, and others, although some of them have a better institutional basis. The markets of our neighbors Poland and Russia belong to the S&P Global BMI series, or more precisely to the emerging markets: S&P Emerging BMI (The World Bank; Naumenko, K., 2017).

The next index, which is widely used as a benchmark for international investment portfolio management, is the S&P Global Equity Indices. S&P Global Equity Indices measures the change in the US dollar exchange rate in the securities markets covered by the S&P / IFCI S&P / Frontier BMI. The ratio of end-of-period levels in US dollars compared to previous values at the end of the period in US dollars.

The S&P Global Equity Index Series covers about 11,000 securities from more than 80 countries. It includes such indices as S&P Global Broad Market Index (BMI), S&P Global 1200, S&P / IFCI and S&P Frontier BMI. All indices have floating-rate indexes with market capitalization and include security classifications for the country, size, types and industry.

The S&P Global Broad Market Index (BMI) is a global index package with a transparent modular structure that has been fully adjusted since 1989. This series of indicators uses a transparent and consistent methodology in all countries and includes approximately 10,000 stocks from 26 developed markets and 20 emerging markets.

The S&P Global 1200 index reflects real-time securities trading in the world, covering about 70% of the world's market capitalization, giving a detailed overview of the global economy. It is a set of seven major regional indices: S&P 500®, S&P Europe 350, S&P TOPIX 150, S&P / TSX 60, S&P / ASX, S&P Asia 50 and S&P Latin America 40.

As can be seen from figure 5 This indicator gained the highest value in 2004 - 170.3%, the lowest critical indicators: in 1998 (-82.25%), which is quite understandable, because the securities market was just "born" in Ukraine; in 2008 (-82.19%), which is most likely the result of the impact of the global financial crisis; in 2014 (-51.5%) - the result of the aggravation of the general situation in the country.

Local indicators of the efficiency of the securities market in Ukraine

Local indices are widely used by domestic investors to calculate efficiencies, market beta codes, hedging ratios, and more. Private international investors often prefer domestic indicators because they:

1) have a wider coverage of stocks (give an idea of the market portfolio);

2) available immediately;

3) have been used for decades and therefore there is more data.

The choice of index is important, although they are very correlated, the difference in productivity between the two indicators for one market can be significant by several points. National indicators that take into account the economic situation and specific features of the securities market in Ukraine are two stock indices - the PFTS index and the UX index. When calculating the PFTS index, indicators of issuers from different segments of the economy, whose securities are traded in real time, are used. The basis for calculating the UX index is the share prices of the most powerful Ukrainian companies in their fields of activity during the trading session on the Ukrainian Stock Exchange every 15 seconds (Malyshenko, 2014).

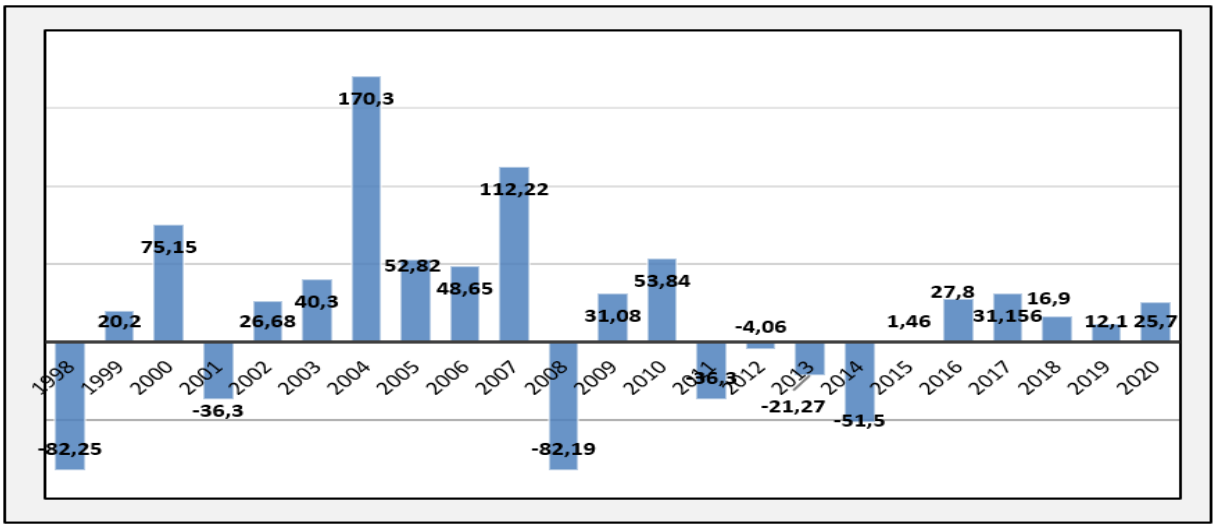

Figure 5. Development of securities market of Ukraine according to the S&P Global Equity indices, %

Source: The World Bank

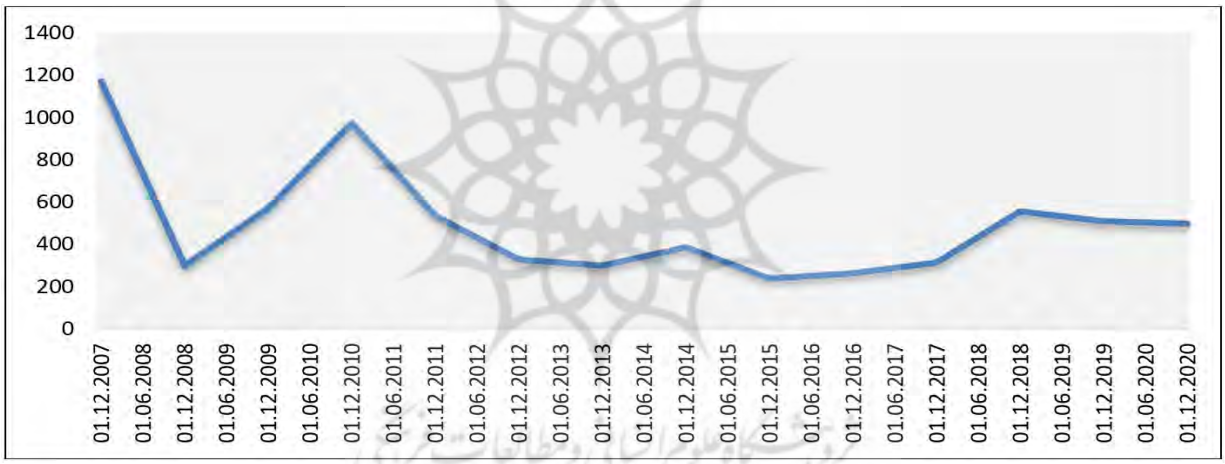

Figure 6. Dynamics of the PFTS index in 2007-2020

Source: PFTS Stock Exchange

In figure 7 shows the maximum growth of the UX index in 2011 – 2812.83 and the lowest in 2009 - 500 (the result of the financial crisis) and in 2016 – 546.67 (due to the deteriorating political, social and economic climate in the country).

Since December 2010, the Warsaw Stock Exchange has introduced the national index of Ukrainian issuing companies WIG Ukraine.

This is the first stock exchange index that is tracked outside Ukraine and takes into account only the shares of Ukrainian companies.

The portfolio of the WIG Ukraine index includes shares of 11 national enterprises. Its introduction is justified by the increase in the number of IPOs of Ukrainian companies on the Warsaw Stock Exchange. However, there is a gradual decline in the WIG Ukraine index.

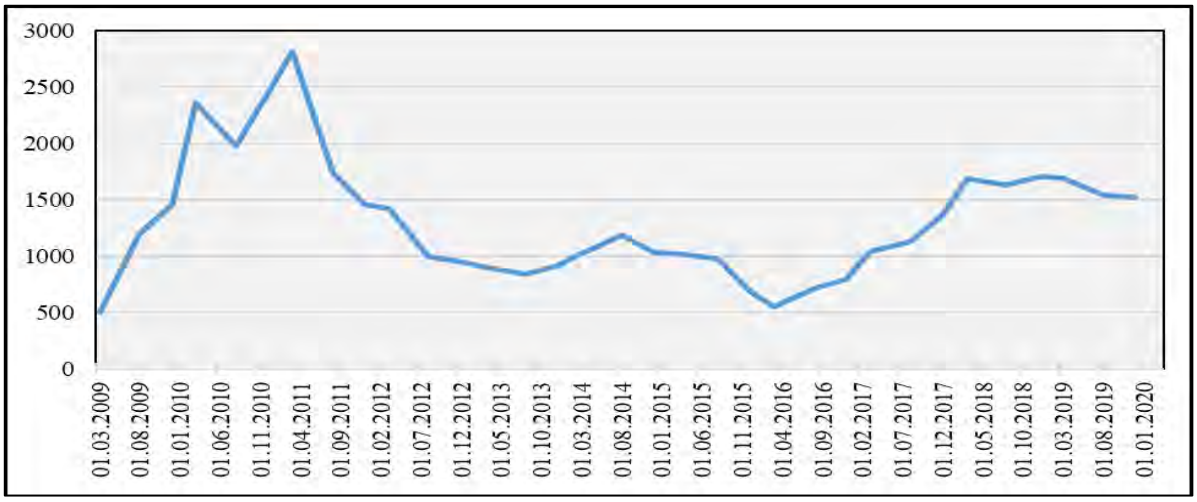

Figure 7. The value of the UX index in 2009-2020

Source: Ukrainian stock exchage

Figure 8 shows the fall of the WIG Ukraine index to a historically low level – 292 points in August 2014, which shows the deterioration in the efficiency of securities of Ukrainian issuers, high risk and difficult political and economic situation in the country.

From 2014 to 2017, we see an increase in the index, but after 2017 and still there is a decrease in this indicator.

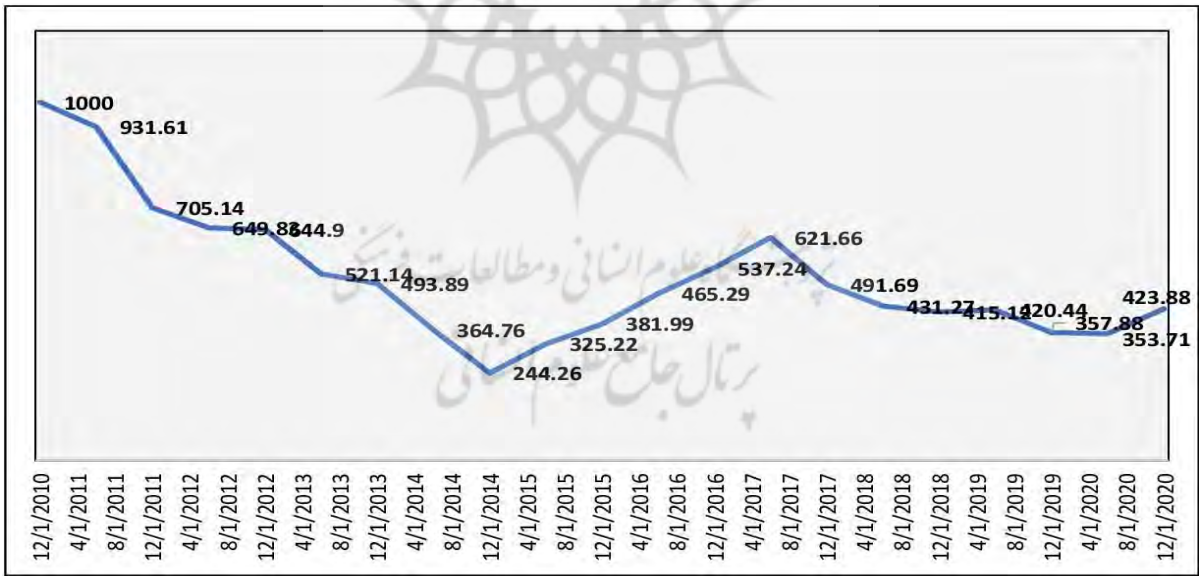

Figure 8. Dynamics of the WIG-Ukraine index from 2010 to 2020

Source: WIG-Ukraine index

We will add that for investment decisions it is also important to monitor such economic indicators, which indirectly, but significantly affect the efficiency of the securities market: employment, inflation, consumer activity, activity and investor sentiment.

Conclusion

Having studied various indicators for evaluating the implementation of investment processes on the securities market using scientific knowledge of the information management system, we can state that there is no single universal indicator, indicator or criterion that fully and comprehensively reflects the entire range of elements of the functioning of securities.Therefore, for a comprehensive assessment of the effectiveness of investment processes in the securities market should be measured by different methods and ways. This issue is extremely relevant and needs further study.

To assess the implementation of the investment function and the development of the securities market, we propose to use a set of indicators common in developed markets, in particular: 1) capitalization of the securities market (volume and percentage of GDP); 2) liquidity of the securities market (volume of shares and interest on GDP); 3) capital turnover ratio (the ratio of the volume of shares in circulation to the size of the capitalization of the securities market); 4) the number of resident companies listed; 5) the world stock index S&P (changes in growth rates). On this basis, a matrix model of investment process characteristics in the securities market based on generalizing indicators, such as capitalization of the securities market (depth), concentration (availability), liquidity of the securities market (stability) and productivity of the securities market (efficiency).

We also believe that the specifics of investment processes in the Ukrainian securities market are best reflected in local stock indices. there is an urgent need for issuers and investors in the securities market, and these are the main entities without which the market cannot exist. The results obtained using statistical inference methods indicate a high influence of both external macroeconomic factors that inhibit the development of the securities market and domestic. Also, no clear legal regulation of the activities of financial institutions of the securities market has been developed so far, and a mechanism for clear interaction and cooperation between the state and other market participants has not been established.

Therefore, the analysis of the indicators for evaluating the effectiveness of investment processes in the securities market of Ukraine, taking into account scientific and basic management information systems, show that the potential of the securities market does not yet provide the full measure of economic growth in Ukraine. The reasons should be sought in inefficient corporate governance, insufficient number of financial instruments acceptable for investment, low financial culture, mental norms, etc.

Conflict of interest

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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