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Energy-information Concept of Value

Abstract. Introduction. The «value» category belongs to fundamental categories, it is basic in the economy. As opposed to the well-known labour theory of value, marginalist theory of value (marginal utility theory) and value theories of neo-classic approach, this paper studies value from its energy-information nature's (its genesis) point of view. Building on theoretical physics and philosophy conceptions regarding «energy» and «information» categories and energy-information duality, the energy-information nature of value has been studied in this research, appropriate features of value have been revealed, as well as its performance (movement) in modern economy (in finance, more precisely, which are the economic domain, where exchange value operates), the nature of financial risks and financial crises.

Methods. The main principle, placed in the foundation of study of value concept within economic relations, laws of its movement in economy, role of finances in realization of value (money value and money capital, and further - price) is the following: financial and economic science, in general, must not be based on statements, created by economic science only, but additionally, on fundamental philosophic achievements and other results and achievements by sciences, which are relevant to finance, theoretical physics first of all.

Purpose: to study energy-information nature (genesis) of value, and reveal value's features and laws of its movement in economy from that foundation, which grants a deeper understanding of nature of financial risks and financial crises, as well as sources of value enlargement and economic growth.

Results. It was substantiated that value is a type of, let us define this as «central» energy. Value is the economy's internal energy, which is necessary for its development. Operating in unbreakable value-information interconnection, which is an analogue of energy-information interrelation in the economy, value intertwines all economic relations, shapes relevant value-chains, connects them into a single economy. Energy-information nature (genesis) of value emerges in the following: firstly, consumer and exchange forms of value form and exist as a result of processes, which are possible due to unbreakable connection of energy and information; secondly, information is a carrier of energy as economic resource; it has consumer and exchange values, which are reflected on products, which are produced with this information's participation; thirdly, on the surface of economic relations, consumer and exchange values are revealed in appropriate information, due to information exchange. Finance is the domain where money (exchange) value and money capital are functioning. The following three features of value were analysed: (1) value operates within value-information interconnection system only; (2) value does not appear from emptiness nor disappear, but transforms from one state to another, intertwining processes, events and things in the economy; (3) value's quantity is relative. These features of value concern the following: (a) its operation mechanism; (b) its sources; (c) system of coordinates and reference systems that employ value, and quantity of value is defined according to them.

Conclusion. Certain statements regarding energy, formulated by theoretical physics, transform logically into value's characteristics, which are well-known to economic science and practice. This has significant practical meaning, as provides a possibility to reveal the energy-information nature of value. Consequently, there is the possibility to reveal value's peculiarities and laws of its movement in the economy, which provides us with a unique opportunity to deepen the knowledge of financial risks' nature and financial crises' nature, sources of value enlargement and economic growth, on this particular foundation.

Keywords: Theory of Value; Value; Energy; Energy-Information Concept of Value; Monetary Capital; Value-Chain; Finance

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Енергоінформаційна концепція вартості**Анотація**

Базуючись на положеннях теоретичної фізики та філософії стосовно категорій «енергія», «інформація» та енергоінформаційного дуалізму, у статті досліджено енергоінформаційну природу вартості й закономірності її функціонування (руху) в сучасній економіці, а точніше – у фінансах. Розкрито властивості вартості, які, у свою чергу, дають глибше розуміння природи фінансових ризиків і фінансових криз, джерел збільшення вартості й економічного зростання.

Ключові слова: теорія вартості; вартість; енергія; грошовий капітал; ланцюжки вартості; фінанси.

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Энергоинформационная концепция стоимости**Аннотация**

Базируясь на положениях теоретической физики и философии относительно категорий «энергия», «информация» и энергоинформационный дуализм, в статье исследовано энергоинформационную природу стоимости и закономерности ее функционирования (движения) в современной экономике, а точнее – в финансах. Раскрыто свойства стоимости, которые, в свою очередь, дают более глубокое понимание природы финансовых рисков и финансовых кризисов, источников увеличения стоимости и экономического роста.

Ключевые слова: теория стоимости; стоимость; энергия; денежный капитал; цепочки стоимости; финансы.

1. Introduction

Value is the key event for economy and finance, the term «value» itself seems to be well-known and well-explored. Actually, nature (genesis), essence and peculiarities of value have not been explored enough by economic science, laws of its movement in modern finance have not been studied extensively, and finance is the operation domain for value.

While studying the occurrence of value, we shall attempt to answer two pragmatic questions first of all: how value theory is useful and necessary for the practice of modern economic relations? Why existing theories are not sufficient for modern practice?

Answering the first question, we shall note that value is present in all things, events and processes that become involved into a circle of economic relations, and it is precisely the value that defines their goal and mission in a significant extent, defines peculiarities and results of financial relations and economy in general. Value has two main forms - consumer and exchange value, the latter transforms into a money value, which depending on calculation methodology, has various forms, among them market value, estimation value, initial value, planned and actual value.

All processes in the economy are brought together through exchange (money) value: economic relations, proportions and scales of the economy are defined directly or indirectly through money value's preferences of engaged economic resources and produced products. Money value, let us say, «comes through» all things, processes, occurrences and participants of economy, creating appropriate value chains.

The concept of value chains was described by an American scientist, famous for his studies of business strategies, Michael Porter in his book «*Competitive Advantage: Creating and Sustaining Superior Performance*» (1985). Modern science continues to study processes of value chains' formation, their peculiarities and role in the economy. For instance, global value chain is studied using decomposition technique, which became possible recently thanks to development of World Input-Output Database (Timmer, Erumban, Los, Stehrer & Vries, 2014); on the firms' level, the internalisation of global value chains is being studied (Alfaro, Antras, Chor & Conconi, 2019); factors, which are located in the foundation of growing disparity between gross export quantity and added value, during conditions of global value chains' development, are being reviewed (Johnson, 2014). We are of opinion that appropriate understanding of value's nature and knowledge of its essential basics is the foundation of successful economic practice, its sustainable development.

Regarding the second question, even considering that existing value theories significantly enriched economic theory and favoured development of economic activity's practice, nevertheless, they cannot be counted as universal, as they do not reflect analysis of all sides of the goods-market

economy. In particular, labour theory characterizes value formation processes from a producer's position, the marginal utility theory - from a consumer's position.

Apart from that, even in their respective spheres, these theories do not work always, which has been proven multiple times. Labour theory of value is not relevant to value estimation of assets, which were created without human labour, such as land shares, soil, raw materials, water resources, environment energy, solar energy, etc. Simultaneously, such assets are beginning to be highly esteemed due to resource efficiency and energy efficiency hypes, and modern economic thought has been developing methods of quantitative estimation of the economic value of renewable energy sources (Gowrisankaran, Reynolds & Samano, 2016). Marginalism theory does not work, in particular, for goods and services, if money value and prices are state-controlled. There is a lot of them - for instance, social goods, or state-subsidized production (for instance, encouraging people to produce power from renewable sources with feed-in-tariff).

Apart from that, existing theories more or less reveal practical mechanisms of goods and services' price formation, but they fail to provide an exhaustive answer to the question about nature (genesis) of value and operation laws in the economy. We may state that money value's formation and movement processes in the 21st century's economy go far beyond existing theories of value. All these things condition necessity of searching for new approaches to discovering nature, peculiarities and laws of value's occurrence.

2. Brief Literature Review

Desire to grasp the mechanism of movement and growth of value happened throughout whole economic science's history. Representatives of the classic political economy created the famous labour theory of value, which is well-known nowadays. William Petty formulated its main statements in his paper «*A Treatise of Taxes & Contributions*» (1662, cit. by Hull, 1899). Adam Smith in his work «*An Inquiry into the Nature and Causes of the Wealth of Nations*» (1776, 2007) and David Ricardo in his work «*On the Principles of Political Economy and Taxation*» (1817, 2001) developed basics of labour value theory.

Distinguishing consumer value as a utility, product's ability to satisfy human needs, and exchange (money) value as product's ability to be exchanged for other goods, Adam Smith and David Ricardo dedicated special attention to the analysis of exchange value's nature. Labour value theory became complete in the second half of the 19th century in fundamental work by Karl Marx and Friedrich Engels «*Das Kapital. Kritik der Politischen Oeconomie*» (1867), according to this theory, each product is exchanged for another depending on the quantity of community labour, used for its production.

Marginalist value theory (marginal utility theory), which appeared in the second half of the 19th century, became an alternative to labour theory. Its key statements were formulated in works of Austrian economists: Karl Menger's «*Grundsätze der Volkswirtschaftslehre*» (1871), Eugen von Böhm-Bawerk's «*Capital and Interest: A Critical History of Economical Theory*», Friedrich Wieser's «*Der Natürliche Wert*» (1889, 1893), as well as by French economist Leon Walras in his «*Elements d'économie politique pure*» («*Elements of Pure Economics or The Theory of Social Wealth*») (1874).

According to marginalist theory, product's value is not formed by labour, but through consumer's subjective-psychological estimation about its utility, and two factors - scarcity of a good (its present capacity) and stage of its necessity's saturation - define product's (good's) utility. Product's utility here is defined by the utility of its marginal (last) unit, which satisfies the lowest subject's demand. Marginalists defined this connection as a law of diminishing marginal utility, where marginal utility is an additional utility, acquired by a consumer with an additional unit of product or service. Marginalists assumed that analysis of economic processes must begin from studying people's needs, searching for criteria of an estimation of goods' utility degree, not from production. So economic studies were facing the people, their necessities, demands, motives of economic behaviour.

Labour theory and marginal utility theory do not deny each other - the first one defines a product's value by labour costs only, the second - by its utility degree for a consumer only. At the end of the 19th century, then at the beginning of the 20th-century economic science attempts to connect them. The first one to do that is a well-known English economist, founder of the neo-classic arm of economic science, Alfred Marshall in his book «*Principles of Economics*» (1890, 2013). Considering that the product's market value is defined by the balance of its utility and production costs, he connected costs theory with marginal utility theory based on offer and demand. Mykhailo Tugan-Baranovskiy maintained a similar position during the same time, in Ukraine. In his paper «*Doctrine*

of marginal utility of economic benefits as reasons for their values» (1890) he reviewed theories of labour value and marginal utility as complementing one another, seeing labour and marginal utility, respectively, as objective and subjective factors, which shape value.

Revealing nature and peculiarities of value was and remain one of the priority directions for economic science in general and financial science in particular. Nowadays, at the end of the first quarter of the 21st century, during unthinkable information exchange and human worldview, the global economic dependence of countries and evident connection of their economies with general environment laws, the studying of value's nature becomes current, finding foundation in theoretical statements of philosophy and physics. Such an approach enables us to begin to understand genesis, peculiarities and laws of value's movement, which is adequate to necessities of modern economic practices.

3. The purpose

Study energy-information nature (genesis) of value, and on that foundation discover features of value and laws of its movement in economy, which in its turn grants a deeper understanding of nature of financial risks and financial crises, as well as sources of value enlargement and economic growth.

4. Results

4.1. Methodology of research

Society's development in the first quarter of the 21st century is characterized by global distribution of new information technologies, and due to that fact, volumes and speed of information exchange, which engulfs additional economy sectors continuously, are increasing unthinkably fast. Such processes favour expansion of human worldview: objectivity of the fact that everything is interconnected, becomes evident; everything is dependent and related (human economy included) with general laws of Universe; important economic (and financial) occurrences and terms (value in particular), which appeared to be well-known and usual, are being re-considered from new worldview positions.

The following key methodological statements for revealing the energy-information nature of value are present in this paper:

Firstly, the community's economy - open system, attached to general objective laws of the material world, which existence and development are defined by fundamental duality «energy-information». Modern theoretical physics and philosophy accepted this duality as a postulate, objectivity of its existence is recognized by science and proven by practice; it is constant in research toolbox of philosophy, theoretical and applied physics, as well as other natural sciences.

The research of value's nature (genesis) and transformation of consumer value into monetary value and price is based on the argument that there is unbreakable unity of energy and information's occurrences, an objective energy-information connection. Energy and information are «intertwined into one another», realized in unity only, in non-breakable interconnection: information reflects data about energy, the fact of its existence, parameters, movement, etc.; simultaneously, energy is the specific shape of information's existence.

Economy is a social institute, activity, which is organized and managed for utilisation of existing resources (machinery and equipment, buildings, land shares, raw materials, human-made materials, other materials, energy resources, human capital, information, as well as money capital) to produce necessary (for society) products, their distribution, exchange, sale and consumption (usage). All mentioned in the definition of «economy» is objectively attached to «energy-information» duality. This duality transforms into «value-information» duality in economy and finance, and energy-information connection (exchange) - into value-information connection (exchange).

Secondly, information is inherent to matter, so it is matter's attribute (Arutiunov, Mishyn & Svintitskiy, 2008). All interactions are built on information. Information, along with energy, information defines parameters of the material world's movement, revealing itself in its direction and creation of an organised form of matter's existence as a result of information interaction.

In such a way, the information is inherent to finance and financial relations, to the economy in general. Everything in economy and finance (including value) is built on information exchange, information exchange. Information, along with energy, defines movement parameters of everything in economy and finance, revealing itself in their direction, as well as in organised

forms' creation of things, processes and occurrences in economy and finance as a result of information interaction.

Thirdly, category «energy»¹ is defined by modern physics as a single measure of various movement forms and interaction of matter, level of matter's transfer from one form to another. Simultaneously, humanity lives in the world of various forms of «main» energy, which is the source of Universe's creation, including our planet, everything alive and not alive on the planet. Currently, science has discovered an only small part of the manifestation of such «main» energy.

The author of this paper has an opinion that value is a kind of energy in the economy, takes this as a basis for further research. Value, intertwining economic relations (production, exchange and others), shapes appropriate value chains, connects them into the complete economy. Value operates in unbreakable value-information interconnection, which is an analogue of energy-information interrelation in the economy. Value as a kind of energy is, let us define it like this, the internal energy of the economy, which is necessary for dynamic balance and economy's development.

Fourthly, understanding of consistency and harmony of everything, which was created and exists in this world, leads to the conclusion that financial crises are the result of the absence of appropriate knowledge and undermining of natural and economic laws.

Financial crises are destroying economic gains of society, forcing participants of the economic process to understand the mechanism of the delicate dynamic balance of economy as an open system. Insufficient understanding of value's nature and peculiarities, their conscious neglect cause inadequate formation of money value, then - prices as its reflection in goods-exchange processes. Modern economy features frequent cases of distorted money value and prices: while chasing high profits, money value (prices) of goods and services are established significantly higher, than their actual exchange and consumer value. Such distortions, largely a consequence of financial egoism (some participants of economic process wish to receive profits while undermining interests of others), become sources of financial risks. In order to minimise such risks efficiently, it is important to build upon the knowledge of value's nature (genesis), peculiarities and preferences. It is necessary for financial risks' estimation, providing dynamic economy's balance as an open system and its sustainable development.

In the 21st century, finance and economics, in general, must find foundation (in addition to statements, formulated by economic science) in fundamental achievements of philosophy and others, relevant to finance, sciences and practices. This statement is key in an approach to an understanding of the occurrence of a value in economic relations, as well as laws of its movement in the economy, also the role of finance in the realization of value, money value, and, further, price.

Such a methodological approach enables us to reveal that value in the economy is an analogue to energy in physics, and precisely, value is a type of energy in economic relations. Value is realised in all its forms due to unbreakable value-information interconnection, intertwining all processes, occurrences and things in the economy into value chains.

History of economic thought indicates that studying the value's phenomenon is not an easy task. For example, the study of the phenomena of energy and value, as well as their relation to human labour, was studied in the second half of the 19th century by Sergei Podolynsky (Sergiy Podolynskiy) in the monograph «*Human Work and its Relation to the Distribution of Energy*» (1880). The same direction of research in the late 20th century continued Mykola Rudenko in the monograph «*The Energy of Progress. Essays on Physical Economy*» (1998, 2004). At the beginning of the 21st century this topic is raised by Yuriy Kanygin in the monograph «*Physical Economy (Energy of Historical Progress)*» (2016). However, «a journey of a thousand miles begins with a single step», in other words, «viam supervadet vadens».

Current Ukrainian financial science, considering studying financial theory an important direction of its work, in particular, their role in money value's operation and money capital's operation, is willing to perceive value's nature, its peculiarities and mission in economy extensively. This has

¹ It is believed that the concept of «energy» was introduced by the ancient Greek philosopher Aristotle (IV century BC) in the Treatise «Physics», where physics was for the first time considered not as a doctrine of nature, but as a science of motion. In ancient Greece, this concept meant action, activity, power and strength. Over the centuries, the concept has evolved and its understanding has changed. In the modern physical sense, the term «energy» was first used in 1808 by the English scientist Thomas Young. Before that, the term «life force» (Latin *vis viva*) was used, which had been introduced in the seventeenth century by the German scientist Gottfried Leibniz, defining it as a product of its mass times the square of the velocity at which it was moving.

to support the search for solutions to challenges that emerge in front of the modern economy's (economy of the information society) finances.

The scientific practice of current Ukrainian financial science possesses several works, which target the problem of finances in information society's economy in the particular context (Fedosov & Ryazanova, 2013; Ryazanova, 2017). There are certain mentions of equality of «energy» and «value» terms (in some context event the «capital» term) in papers of current Ukrainian economists. For instance, the book «Who to be» by the Ukrainian economist Oleksandr Paskhaver mentions the «energy of capital».

4.2. Value as energy type: its preferences

The author is of opinion that while researching occurrence of value, its peculiarities and role in economy, it is logical and rational to study it through generally known statements in theoretical physics as a science, which studies general preferences of matter and occurrences in value, also revealing general laws, which control such occurrences. Such approach provides results, which allow us to state that value as an economic category has energy-information nature (genesis), which conditions preferences (peculiarities) and features of value, as well as its mission and laws of motion in the economy.

Current theoretical physics proves that humanity lives in the world of various forms of «main» energy, which is the source of Universe's creation, including our planet, everything alive and not alive on the planet. Currently, science has discovered only small part of the manifestation of such «main» energy. Under the «energy» term there is a meaning of single measure of various matter's forms of movement and interaction, level of transfer from one form into others (Fedorchenko, 1993). While studying the occurrence of energy, physics distinguishes the following preferences:

1. Different forms of matter movement mean different energy types: mechanical, heat, electrical, magnetic, electromagnetic, chemical, nuclear, gravitational, vacuum energy, etc.
2. Energy division on types (forms) is provisional. Various energy types may transform from one to another in some physical processes. The list of transformations, their interconnections and components, is infinitely long. For instance, chemical energy consists of the kinetic energy of electrons, their interactions and interactions with atoms; internal body energy - from the kinetic energy of chaotic molecule movement, potential energy from their interaction and intermolecular energy.
3. Energy is a physical body's (system) ability to perform certain work, a body is losing energy partially, utilising it to alter surrounding bodies.
4. Energy does not appear from emptiness and does not disappear without a trace, it cannot be created or destroyed - this is the first law of thermodynamics (law of conservation of energy). The «energy» term connects all natural events due to the law of conservation of energy's existence².
5. According to the second law of thermodynamics, heat cannot flow from a colder object to warmer. Hence, all actual engines require constant energy supply, no heat machinery cannot transform the whole heat into useful activity (which proves the impossibility of eternal engine's existence).
6. According to the theory of relativity, there is a connection of energy with mass, as well as its dependence from the reference system. The energy of any system depends on parameters that characterise its state. It is not equal to different spectators.
7. Internal energy is a single-valued function of the system's balance state (a state which features constant parameters of all bodies within the system during the significant time). When a system finds itself in a balanced state, its internal energy acquires such definition that is inherent for this state, independently from the system's previous history. In such a way, change of internal energy during the transformation from one state to another will always equal the difference of figure in such states, independently from the transfer method. Internal body energy cannot be measured directly, but a change in internal energy can be defined.
8. Energy is a scalar quantity: each value can be presented by a single real number. Length, surface, time, temperature are also scalar. In physics, different measuring units are used, depending on

² The law of conservation of energy was discovered independently for various types of energy by many scientists, including Gottfried Leibniz - for kinetic energy, James Joule - for internal energy, John Poynting for electromagnetic energy. These discoveries made it possible to formulate the first law of thermodynamics (the law of conservation of energy). The concept of energy has become central to understanding physical processes.

the type of energy. For instance, electrical energy is measured in kilowatts per hour (kW*h); heat energy is measured in joules (J) and calories (cal).

It is important to mention that everything mentioned above is completely relevant to the occurrence of value and its operation in economic relations. Statements regarding energy, formulated by theoretical physics, are logically transformed into well-known to economic science and practice value's characteristics, which are listed below:

Firstly, value - just like energy - is in continuous movement. It is being formed, transformed (transferred) to other objects, distributed, accumulated, invested, utilised. Value's movement happens during production of goods, necessary for humans, their distribution, exchange, sale and consumption: during the process of usage of economic resources and creation (out of them, with their engagement) of products, part of those become goods and services; further along the way goods, products and services may also become economic resources - value is moving simultaneously.

Secondly, value is a type (form) of energy, which corresponds to matter's motion within economic relations. Value in its turn has two main types of manifestation - consumer and exchange values³.

Existence of consumer and exchange values as two main types of energy's manifestation within economic relations - is the result of the fact that in the economy all things, processes and occurrences have two forms of manifestation: natural and abstract.

The abstract form of value (exchange value form) is represented in finance, which is the system of economic relations, which realise the movement of value in the economy (its formation, distribution, exchange, trade, accumulation and usage). Within finance, exchange value gains a form of money value due to special product-equivalent, which is money.

The natural form is represented by other branches of economy, where actual economic resources are utilised, distributed, exchanged and consumed to produce products. The value here is consumer value, the significance of economic resources, products, goods and services, engaged in economic relations, their production energy, aggregation of their useful properties, which enable them to satisfy needs of economy's participants.

One may find proof that all things, processes and occurrences in economy exist and manifest themselves in natural and abstract (financial) forms, in the current investment business and corporate finances.

During investment portfolio formation, assets are graded: real and financial. Real assets are physical assets that are worthy due to their content: precious metals, goods, real estate, agricultural land, machinery and equipment, raw materials. Such assets are acceptable for the majority diversified portfolios, as they have relatively low correlation with financial assets, like stocks and securities. Describing markets of real and financial assets, American economists Alan Shapiro and Balbrirer Sheldon mention in their paper «*Modern Corporate Finance: A Multidisciplinary Approach to Value Creation*» (2000) that as opposed to real assets, which requirements are linked to their physical properties, financial assets have value due to demand for certain money flow or emission.

Consumer value is an aggregation of useful properties of economic resources and products, created by them, it is possible to satisfy the economic needs of various economy's participants due to them. The meaning of economic resources' quality and created products is linked to consumer value form.

Exchange value is a visible quantifiable interrelation, which is utilised by exchange values to operate. Since each product may be potentially exchanged for several others in various proportions, meaning that it can possess several exchange values, money emerged gradually as universal product-equivalent. The emergence of such a product-equivalent was an objective process, necessary for providing development and efficiency of product trading operations. As a result, exchange value transformed into a money value, since then economy's energy is represented «on the surface» (in economic relations) in the form of monetary value. Finance is the branch of economic relations, which hosts money value within the economy. The unique role of finance in securing the movement value and the value of financial intermediation in the allocation of resources in the economy is widely explored by modern economic science, in particular in the context of the recent financial crisis, as a consequence of which the need to model financial performance in a way that is better suited to contemporary institutional realities has occurred (Woodford, 2010).

³ The terms of consumer and exchange values were analysed in IV century BC by Aristotle, then, significantly later, by Adam Smith and David Ricardo. Both forms of value were studied in great detail by Karl Marx and Friedrich Engels within the labour theory of value.

We should note that in the definition of exchange value, given above, a special meaning is in the words «visible quantifiable interrelation»: they are underlining obligatory information for economy's participants, which enables visibility of such quantifiable interrelation. So value as a form of energy manifestation operates in the economy and fixed by its participants only due to information about such energy. The process of energy-information interaction is present.

Thirdly, money value - just like energy - is a universal measure of various forms of matter's movement and interaction in the economy. Money value can be used to measure and compare all economic resources, created goods, as well as to estimate and to forecast production processes, distribution, exchange, accumulation, investment and utilisation on macro and micro levels.

Money value acquires various forms along with the development of finance. They vary by calculation methodology, there are, for example, such values as initial value; residual (balance); recoverable; planned; real; estimated; market; fair market value. The problem of the methodology of money value estimation takes significant attention in international obligatory accounting standards (IFRS 13, 2012).

Fourthly, consumer and exchange values are linked with each other, so they are flowing into one another just like energy. Due to such «flow» of value interaction and kind of matter movement is happening in economic relations from one form to another: from a material form in abstract (financial) and vice versa.

Quite an evident example of the interaction between consumer and exchange value and providing through their interaction of matter motion in the economy is obligatory accounting, which displays appropriately various economic resources, products and services. In particular, elements of the balance sheet of economy's participant show specific figures of his assets, liabilities and own capital - meaning characteristics of resources, that correlate to their consumer value's criteria. Simultaneously, money (exchange) value of each such resource is fixed for the beginning and the end of the inquiry period. During the inquiry period, certain balance sheet figures are flowing into other figures (their consumer and exchange values).

Fifthly, economic resources' value - just like energy - transfers to products, which are created. Value transfer is accompanied by processes of withdrawal and deposits of money value, depreciation itself and depreciation reserve.

Certain economic resources - machinery and equipment, buildings - can restore their consumer value from time to time, even increase it sometimes, utilising (consuming) other economic resources. This takes place in case of their maintenance, operating and major repairs; as a result, the money value of such resources increases for the corresponding figure.

If the restoration of consumer value of economic resource does not take place, such resource leaves the production cycle. This is typical for such resources, as raw materials, production materials and power sources, where consumer value is completely transferred throughout a single production cycle. Their money value is also completely transformed into products, which are being created.

Economic resources that lose their consumer value, are considered physically and (or) morally obsolete, unusable for industrial application in the present form, so they are sold for depreciated money value or simply salvaged.

Human capital is unique as an economic resource, as it is capable to replenish and increase its physical energy, knowledge and special skills, thus increasing its consumer value (production energy) and money value. Growth of useful production capabilities of a human (knowledge, special skills, health, physical force) is the capitalisation process of human economic resource. Usually, this is an argument to increase salary for such person (i.e., the money value of human economic resource), transfer for another position (one which requires higher qualification).

Information capital is directly linked with human capital as an economic resource. Knowledge and special skills of humans is a single part of the information resource (information capital). The rest of information capital's parts, as information goods and services, information exchange, information infrastructure, is also created with the direct participation of human capital.

Sixthly, the value of an economic resource and produced goods, and further products and services - just like energy - depends on qualitative and quantitative parameters of the corresponding economic resource, product or service.

This is manifested in a price (money value) of products and services: products and services of the same type may be priced differently, it depends on quality and quantity of such products and services, i.e. from their capability to be useful.

Seventhly, value - just like energy - is a measure of economic resources to perform the required work in economic relations.

The exchange value of certain products usually demonstrates its quality, its capability to meet the appropriate needs of the economy's participants. The theory of relativity works here: product's worth depends on, let us say, reference system, it is not equal for various economy's participants.

Eighthly, value, just like any energy, is a scalar physical amount, each its quantity is represented by a single real number. In order to measure exchange value, money units are used, according to their purchasing capability the amount of exchange value of an economic resource (product or service) is established, i.e., its money value, price, is defined.

4.3. Energy-information nature (genesis) of value

The value's characteristics, mentioned above, lead us to the logical conclusion that value as a fundamental economic category is one of types (forms) of energy: that «main» energy, which is the source of everything alive and not alive on Earth and across the Universe.

So, value as energy type is a measure of various forms of matter's movement and interaction within economic relations. Intertwining all processes, occurrences and things in economic activity, value links them through appropriate value chains. Also, value, being an energy type, performs (exists, manifests itself) in interaction with the occurrence of information only. There is no value without information for economy's participants.

We are of the opinion that it is quite logical and substantiated to state that value has energy-information nature (genesis), which manifests itself in the following:

Firstly, consumer and exchange forms of value are formed, exist and manifest themselves as a result of processes, which are enabled due to the interaction of energy and information, in particular:

- Connection and synergy of consumer values of economic resources, which directly or indirectly take part in the creation of products, are possible if there is information about them, i.e. if appropriate information exchange is present.
- Transfer of corresponding consumer and exchange values of economic resources to created products is only possible, in case there is appropriate information if there is an information exchange.

Secondly, information as economic resource is energy source itself. It has its own consumer and exchange values, which are transferred⁴ to products, which are produced with its participation.

Thirdly, consumer and exchange values fix themselves (manifest themselves) on the surface of economic relations, i.e. appropriate informing and certain information exchange take place: economy's participants compare data regarding consumer and exchange values of economic resources and created products, which defines their monetary values and prices. This is enabled due to appropriate information exchange, based on present information about the following:

- quantitative and qualitative characteristics of the specific economic or created product, as well as other similar or linked economic resources or created products for comparison;
- demand and offer for the specific economic resource or created product and similar economic resources or created products;
- money as universal equivalent, in particular - data regarding their current and expected purchasing capability;
- current and prospective state of the economy in this country, on a specific market and within the region and in the world in general;
- state price policy regarding specific economic resource or product and linked resources or products;
- risks that may come along with specific economic resource or product;
- any other information, which is necessary for making financial or other economic deals.

Energy-information nature of exchange (money) value is realised within finance in practice of economic relations. Money as a universal equivalent has a significant role in this process; state of money turnover, originating from economic status and state control, simultaneously, influences the realisation and movement of money value.

State of money turnover is under influence of subjective factor, which is the source of risk: first of all, risk of generating of information, which favours alienation of monetary value from real exchange

⁴ We should note that the «providing with value» expression is more adequate than «transferring value» while using it with «information» as economic resource. This is conditioned by information's peculiarities as economic resource: as it is being used, it does not lose its informational content; it increases in quantity while being connected with other information.

(and consumer) value, reaching far above them. The result - the volume of money liabilities (nominal money values) can be significantly higher than the volume of exchange values. If such surplus reaches a critical level, the financial bubble transforms into financial crises⁵.

4.5. Money value: its essence and peculiarities in the modern economy

Further research in the present paper is based on the understanding of money value as type (form) of value, which corresponds matter's movement in financial relations. Finance is the sphere of economy, where money value and money capital are operating.

Describing the money value's essence, it is important to stress the following: in economic relations, it is the form of precisely exchange value, which is the type of energy manifestation along with consumer value in economic relations. Exchange value is represented as the money dimension within economic relations. Money value is a form of motion within economic (precisely, financial) relations of any economic resources and created products. Alternatively, money value is a parameter of value, which measures and characterises the exchange value of any economic resource and (or) created product. To conclude this: in financial relations (and in the economy in general) money value is a form of movement of economic resources and created products and simultaneously, their quantitative parameter.

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During certain historical stage of goods exchange relations, the product-equivalent was distinguished (money) in the economy, exchange value of various economic resources and created products began to be measured by money. This became possible, because one of the money's functions is value measurement, which means that money is the means of exchange value's measurement for all economic resources and created products, providing it with the price form. This is how exchange value transforms into money value.

In comparison to exchange value, money value's peculiarities on the current stage are caused by the fact that money value is under significant influence of subjective factor. The basis of money value's subjectivity is its dependence of (a) purchasing capability of credit money, which is obligatorily granted by issuing country; (b) scale of prices, established by a state. In the market economy, the market has a significant influence on the scale of prices also.

During early stages of money development, full-fledged money was in turnover, nominal value (i.e. value, which is declared as purchasing capability) was equal to their real exchange value (livestock, grains, fur, etc., later - money, made of precious metals). Even later, full-fledged money was replaced by defective money, money notes, which do not have their substantial exchange value, because they are provided by «forced» purchasing capability (price, rate).

Defective money is credit money and representative money, coins (billon), the latter do not measure value but perform the role of turnover means and payment instrument. Apart from that, state as an issuer of money sometimes resorts to issuing paper money to cover budget expenses. It should be noted that new money in the form of cryptocurrencies has emerged due to the development of information technologies. Development of cryptocurrencies turnover reveals that although utilisation of such new money is a perspective step of economic development, there is a risk of their usage in the financing of a transnational criminal organisation; state must control turnover of cryptocurrencies strictly (Lukianchuk, Grebeniuk & Cherniak, 2017).

Credit money rules the current commodities turnover. The law, which has to regulate credit money turnover, was described in the middle of 19th century by English philosopher, John Mill, in his

⁵ The «critical level» term is defined by one of EU directives as level fixed on the basis of scientific knowledge, above which direct adverse effects may occur on some receptors (Directive 2008/50/EC). Considering this, financial science and practice has yet to determine, for economy, precise figures of exceeding level of money liabilities volume (nominal money values) over real exchange volume, or exceeding market prices of bonds over their real exchange value.

work «*Principles of Political Economy with Some of Their Applications to Social Philosophy*» (1848). According to this law, conditions of issuing credit money must include conditions of their backflow; i.e., obligatory nature of the support of money issue and providing credit system, which guarantees loans only if there is a growing demand for money from product turnover. The period of existence of credit money within turnover is defined by their support.

Despite that according to the law of credit money turnover, their quantity must be defined by the real volume of commodities turnover, correspondingly forming their purchasing capability, there are significant «gaps» of money's quantity from their cover in the real-life economy. These gaps are the result of subjective factor's action: state regulation of the financial market and its professional participants' actions are not free from subjectivity. The foundation for such subjectivity begins, because the state as an institute and economy's participants are subordinate to political and private egoistic interests, possess the different (frequently insufficient) level of financial expertise and insufficient information technologies support.

So, money value is under significant influence of a subjective factor, credit money of equal nominal value may have different purchasing capability now and then. If all other conditions are the same and credit money volume is increasing within turnover, then exchange value of money unit is decreasing for the appropriate quantity (loss of value), prices for goods and services are growing simultaneously (inflation). So total volume of money value is increasing in the economy (sum of prices for economic resources and created commodities) in comparison to their real consumer value. If such exceeding of money value volume over the real volume of consumer value reaches a certain critical level, there is a risk of «financial bubble» formation, which can be solved only through the financial crisis. So finances as a domain, where money value's movement takes place, specific disruption appears, which is a challenge, the reason of risks for the whole economy.

4.6. Money capital: its essence and peculiarities in the current economy

Money capital is much more complex (multifaceted) term in comparison to monetary value, which is the form of movement and quantitative parameter of economic resources and created commodities in the economy.

Firstly, money capital is a specific product, one of the types of economic resources. In the modern economy, it is represented by money (special product-equivalent), and additionally, by quasi money, which include liquid securities.

Secondly, money capital is a value, which has the property to grow. One may say that the consumer value of money capital is its ability to increase in value. Money capital is different from other capital types (land, human or information capital) in a way that is associated with the exchange value's growth of money as an economic resource.

Thirdly, money capital, as any economic resource and product, has consumer and exchange value, so it has corresponding money value.

At the end of 19th-century money capital as a form of industrial capital was thoroughly studied by Karl Marx and Friedrich Engels in the book «*Das Kapital. Kritik der Politischen Oeconomie*» (1867-1894). Current economic science continues to study various aspects of money capital: for instance, capital's dispersion on the level of a firm (David & Venkateswaran, 2019).

In the economy of the 21st century, money capital physically acquired new manifestation forms due to financial market development and its financial instruments⁶ as intermediary assets in exchange-distribution operations. Presence of quasi money (which include liquid securities that can be sold quickly and with no loss), along with classic money, is characteristic for the modern economy, and it is also characteristic that securities volume is increasing within money volume. As opposed to usual money, securities cannot perform the measuring function of the value, but they are utilised as payment means, exchange and accumulation. Apart from that, within conditions of global integration of the securities market, some of them are spinning freely on foreign markets, performing mentioned three functions on the international level.

Money capital has a property to grow, so the economy's participants utilise it as a means of accumulation. International currency reserves are a typical example. They are being formed on

⁶ According to the international accounting standards, a financial instrument (financial market instrument) is any contract between economic subjects, which causes by its actions changes in assets for one side of the deal, and for another - in liabilities or basic capital (IAS 32, see: Deloitte, 2003).

the account of bank metals; highly liquid securities; foreign currency; stand-by position with IMF; Special Drawing Rights (SDR).

Money capital's peculiarities in the modern economy are the following:

1. Money capital is non-uniform in its physical shape, as money are represented by multiple shapes in the modern economy. The modern money capital's components are full-fledged money; credit (national and foreign currencies); quasi money, which is represented by liquid securities.
2. Mechanism of capital's growth is different, as its components are plural. In the modern economy, these mechanisms are the following:
 - Money capital as bank metals is capitalised through increasing its market value (market money value).
3. Money capital value, represented by credit money, may increase due to the following:
 - Investing in economic resources and industrial processes organisation, so new (added) value of products is created. Realisation (sale, rent) of such products provides profit (growth of money value) for an owner or manager of money capital.
 - Apart from that, market value (rate) of some credit money may increase over time. This is characteristic for those currencies, which in addition to being freely convertible, are defined as marketable currencies due to especially high demand. For example, the US dollar, Euro and British pound are such currencies.
 - Credit money may provide income in the shape of interests.
4. Money capital value, represented by securities, may grow the following way: securities provide income to their owner in the shape of interest or quota of profits; the market value of securities may grow as market price enlargement of such securities (capital enlargement).

Concluding the mentioned above content regarding money value growth (money value of money capital), the following should be noted:

- Market value (rate) of full-fledged money (bank metals), credit money (market currency) and securities grows over time and driven by the favourable market environment.
- Value growth of money form of industrial capital takes place owing to the creation of new products and services (creation of new, added value).
- Value increases as a result of counted interests, a quota of profits, fees, etc.

Hence, usually a growth of money capital value anticipates that such economic resource is in motion: invested or traded on the financial market. This is not obligatory: for example, full-fledged money value (bank metals) may grow even without motion. The same thing can happen with marketable currency and securities.

Regarding market value growth of money capital, represented by securities, special attention should be given to possible risks: under the influence of subjective factor market price (money value) of securities may significantly exceed consumer value, which is represented by such financial instruments. This is characteristic for speculative markets, happens frequently within other sectors of the financial market, so state control and financial market oversight must be a priority in modern economy management.

4.7. Properties of value

Building upon the energy-information genesis of value, which is mentioned above, it is justifiable to distinguish three properties of value, which are realised in modern finance:

Firstly, value operates exclusively within value-information interaction system.

Secondly, value does not appear from emptiness and does not disappear without a trace, it transforms from one state into another, intertwining all processes, occurrences and things in the economy.

Thirdly, the value's quantity is relative.

Properties, mentioned above, concern the following: (a) mechanism (method) of value's operation; (b) sources of value; (c) coordinates and reference systems, which involve value operation and define value's quantity.

Possibly in future, as studies of nature, characteristics and the manifestation of value in finance make progress, given the list of value's properties will be expanded. Experience of theoretical physics, which studied the occurrence of energy, stipulates such conclusion.

Peculiarities of realisation each of value's properties within modern finance we will review further.

4.8. Value-information interconnection as a value operation method

We are of opinion that in the economy the mechanism that is driving existence and manifestation of exchange and consumer values is precisely value-information interconnection. Such property of value is the result of energy-information nature of value, as well as a fundamental postulate, according to which everything in the world exists in energy-information interaction and is defined by that.

Since all things, processes and occurrences in the economy have two manifestation forms - natural and abstract, value is represented by two forms in economic relations: consumer value and exchange value.

Finance is an abstract manifestation form of the economy as a system of society's economic relations, where exchange value is operating, which transforms into money value through the money value. Finance is where formation, distribution, exchange and utilisation of precisely money value takes place. Money value operation takes place owing to value-information interconnection, during appropriate information exchange. Alternatively, money value (information exchange) cannot operate without information (information exchange): money value of economic resources and created products is formed, distributed, exchanged, accumulated and utilised (consumed) as a result of information (information exchange).

Value operation process in value-information interaction and realisation of value in finance can be described as the following:

- At the beginning each thing, process and occurrence have their consumer value (consumer significance) potentially, which is estimated (defined) by economy's participants during information exchange, as it is brought into economic relations.
- As a thing, process or occurrence are brought into economic relations, they begin to be involved in finance as well, where they are estimated, owing to information, for their money (exchange) value.
- Further, owing to a money value, the product-exchange process is enabled (which is accompanied with information exchange as well), and certain economic resources are connected in the production process for commodities generation with necessary for economic agents' consumer values. Simultaneously (overlapping with production process), the money value of products is being formed, basing upon information about value transfer of engaged resources in the production process.
- Exchange-targeted (sale) products receive a price by economy's participants, basing upon extensive information field, during information exchange. Such information field engulfs the following data: (a) consumer and money value of such products; (b) current state and perspectives of economy, industry, etc.; (c) current state and environment of the market; (d) state policy; (e) requirements of specific economy's participants.

The price (money value) of a product through market mechanism or under the direct influence of state price policy (for example, policy regarding social products and stimulation of certain activity types) or according to an agreement between specific buyer and seller of a product or service. All of it takes place owing to information exchange.

There are two important conclusions to be made out of value's property to operate exclusively within unbreakable interconnection system with information:

1. Deviations in value-information interconnection as value's operation method may cause significant exceeding of money liabilities (nominal money value) over a real volume of exchange and consumer value in finance. Such balance distortion, if it reaches critical level, causes financial bubble, which can be followed by financial crisis.
2. The sophistication of modern finance is defined by their adequacy to digital economy's demands, which depends on information sub-system of finance (accounting); it is precisely information sub-system of finance that enables value-information interconnection and proper operation of money value and money capital within.

Revealing contents of the first conclusion from mentioned above, it should be noted that money (exchange) value operates in finance as information during information exchange. Exchange value falls under the significant subjective influence during operation of money value (as mentioned above), while being objective by nature.

Certain situation is possible under influence of subjective factor, where money value motion is in contradiction to the objective mechanism of value-information interconnection: information about the monetary value of an economic resource or (and) created commodities «begins

its journey» from their real exchange and consumer value. Consequences: money liabilities volume (nominal money value) exceeds the volume of real exchange and consumer values in the economy.

Credit money turnover must function in value-information interconnection, which means that declared by state information regarding their purchasing capability must be supported (covered) by appropriate quantity (volume) of exchange (consumer) value. The state must control these processes non-flexibly, no gaps are allowed between them. Sadly, such gaps take place in life, which is proven by the history of mortgage and consumer credits in the USA at the beginning of the 2000s, which allocated foundation for a financial bubble, which concluded in the financial crisis of 2007-2008. It was caused by mortgage bonds, issued at the beginning of the 2000s under unsecured mortgage credits from banks, loan unions and mortgage companies in the USA. I.e., information regarding security of such credits was not covered by real value. The practice of bank loans, which takes place across many countries, can be considered as another example: bank loans are not covered by the adequate product, which happens frequently if loans are granted to well-connected people. There are many studies of the last financial crisis in modern economic science. In particular, it is being studied in the context of two distinct phases: the first one, which was limited to a relatively small segment of the financial system (the US mortgage market), and the second one, much more difficult phase, which, since September 2008, turned into a full-blown global financial crisis (Mishkin, 2011).

Modern economic science studies various angles, connected to deformation risks of value-information links and creation of crises on financial markets. In particular, there are three branches in the works, which are directly connected to financial crises - bank crises, problems on credit and interbank markets, currency crises (Goldstein & Razin, 2015); systemic risks, which caused the 2007-2008 crisis, its lessons and post-crisis modifications of state policy are analysed (Swagel, 2015); state of post-crisis regulation base of banking activity, including gray banking (Tarullo, 2019); various financial factors of Great Recession, in particular, troubles, which rose in front of households, banks, as well as non-financial firms (Gertler & Gilchrist, 2018); direct and return links of influence of price informativeness of financial market are studied, links of changes, implemented by policy's developers, applied to the market and assets' value fluctuations (Siemroth, 2019).

Nowadays, the market's role of mechanism of objectivity providing to economic processes is absolutised. Although interests of market's participants (subjective) have a significant impact: situations, when under the influence of subjective and distorted information market price (money value) of securities increases, exceeding real exchange and consumer values, which it is supposed to represent, are frequent. When the volume of such exceedings reaches critical level, the financial crisis begins, which forces economy's participants to come back to obligatory support of fault-free of value-information interconnection within motion processes of securities' money values.

There are numerous examples in the modern economy of state social policy and stimulation policy of certain activity, based upon disconnection of monetary value from a real exchange and consumer value: state consciously breaks value-information interconnection as value existence method. For instance, prices for social goods: they are tightly controlled by the state, so the market price for such goods is lower, than their real exchange and consumer values. Another example, quite opposite, could be goods, which production is stimulated by state: in particular, «feed-in tariff» system (in Ukraine it is known as «green tariff»), which is the following: electric power, produced from renewable sources, is paid for to a producer by a significantly higher rate, one which exceeds real exchange value of such power. In general, disconnection of monetary value from a real exchange and consumer value is negative for the economy. However, if the general volume of such disconnections, «gaps», does not exceed critical level and they do not stay active throughout long periods, such policy may have a positive effect.

The second of the mentioned above conclusions states that sophistication of finance and their adequacy to the 21st century economy's demands is defined by effectiveness of finance's information sub-system. This information sub-system, accounting, must enable appropriate value-information interconnection, as well as operation of money value and money capital within. Accounting as finance's information sub-system is an activity, which includes the system of information's accumulation, analytical processing and preparation regarding finance: first of all, information about money value and money capital. Signs of accounting's sophistication in the national economy as information sub-system of finance is the presence of the following:

- financial accounting and managerial accounting, as well as their sub-systems as tax accounting, customs accounting and budget accounting;
- accounting infrastructure, which is represented by bookkeeping and statistics, legal support and corporate management;
- sophisticated scientific, theoretical and educational basis of accounting;
- a competitive and diverse network of institutions, engaged in accounting, equipped with top-notch information technologies, work on micro and macro economy levels, represented by private and state institutions that bring the best analysts.

Finance's information sub-system must enable the following:

- the realisation of value-information interconnection mechanism and appropriate performance of money value and money capital within the economy;
- bringing up to speed all economy's participants on all problems, which concern money value and money capital, current economy's state and its prognosis, an overview of the national and international market, etc.;
- early detection of possible financial risks and threats to the economy on macro and micro levels;
- an efficient system of financial and general economic education of the economy's participants.

4.9. Value sources according to law of conservation of energy

The second property of value is the fact that value in the economy - just like any other energy type - does not appear from emptiness, nor it does not disappear into nothingness, it just transforms from one state into another, intertwining all processes, occurrences and things.

Such property of value is explained by the law of conservation of energy. Apart from that, it is derived logically from theoretical physics statement that the initial source of everything on our planet is the «main» energy, which is the starting point of Universe's creation; energy cannot be neither created nor destroyed.

This property produces important conclusions about possible sources of value creation for applied economy and finance. There are three sources of creation (enlargement and improvement) of value objectively in the economy:

1. Extraction of larger and high-quality consumer value (and creation of exchange value) from existing economic resources, owing to their: (a) more efficient exploitation; (b) deeper processing, including through reducing waste; (c) waste utilisation as an economic resource, as recycling material and source of electric power.
2. Engagement of unused resource into the production process.
3. Development of human resource (human capital) through (a) appropriate education of economy's participants; (b) expansion of their knowledge and improvement of their professional skills; (c) science development; (d) information exchange development.

Consequently, the first source of enlargement and improvement of value is more efficient exploitation of existing economic resources, their deeper processing and utilisation of waste as an economic resource. In a modern economy, this is carried out under the banner of resource efficiency policy (including power efficiency) and no-waste economy, known also as closed-loop economy, circular economy. Such variant of economy is guided by rational resource consumption, anticipates minimum human influence on the environment and favours sustainable economic development.

For instance, the European Union by Directive on waste framed principally new approach to understanding waste - by viewing them as a side product, raw material of sorts, which can be used. This Directive introduces a five-stage hierarchy of waste handling, in particular:

- 1) prevention of waste creation;
- 2) waste preparation for repeat usage;
- 3) waste recycling;
- 4) another waste utilisation, for instance, power generation;
- 5) waste liquidation.

Such waste concept is being realised in finance, in particular, through the increasingly active implementation of new financial instrument - Green Bonds. Five-stage hierarchy of waste handling is placed into foundation of selection and estimation of projects, which are financed at the expense of funds, accumulated through Green Bonds, which is reflected in the Green Bond Principles (GBP) (International Capital Market Association, 2018).

Introduction of unlimited product life cycle concept becomes crucial in the 21st century's economy. This concept is based on a fundamentally new understanding of waste - they must be

considered as side-product, raw material, instead of something that has to be destroyed. Modern waste treatment anticipates their complete immersion into the production process. For example, utilisation formula of hard domestic waste in EU countries anticipates their 100% usage: approximately 35% is recycled through separate collection and sorting, 15% is recycled into fertilizer and biogas; approximately 50% is incinerated, producing heat and electrical power.

The second source of increasing and improving value in the economy is bringing previously unused resources.

At the beginning of the 21st century, usage of alternative energy sources is an example of wide-scale implementation of new resources into production process: solar, geothermal, hydrothermal, aerothermal, wave energy and tide energy, gas from organic waste, sewer system gas; also such secondary power sources, as blast-furnace and coking gases, methane from coal mines, waste energy potential of technological processes. As an example: implementation policy of resources, mentioned above, is already established as law in Ukraine (The Verkhovna Rada of Ukraine, 2003).

The third source of enlargement and improvement of value in the economy is a human resource. It is a limitless human capital, which is formed through education of economy's participants, expansion of their knowledge and improvement of their professional skills, development of science and information exchange.

This source of enlargement and improvement of consumer value is decisive essentially because the realisation of two mentioned above sources is impossible without it. Only by possessing the appropriate knowledge, professional skills and adequate equipment and technologies, it is possible to provide extraction of larger and supreme consumer value out of traditional economic resource, as well as bring previously unused resources into the production process, which are going to create consumer value.

National economies, which are granting appropriate attention to human upbringing, development of its knowledge and professional skills, as well as machinery and other connected things, are «destined» to be advanced. Developed countries or those that feature high and stable economic growth are among such countries today. It should be noted that the topic of human capital is actively studied by modern economic science. In particular, human capital is viewed as a crucial factor of the modern development of the financial market and the whole country's economy (Mahmood & Alkahtani, 2018).

4.10. Relativity of quantity of value

Modern theoretical physics reveals that the quantity of energy is relative. These conclusions are based upon the theory of relativity, which was formulated by Albert Einstein. We are of opinion that theoretical physics' statements regarding the relativity of energy's quantity are relevant for economy and value within. Such an approach enables us to state that the quantity of value is relative and it is one of the main value's properties.

Relativity of value's quantity manifests in the following:

- Quantity of value is directly linked to the economy's mass it represents, so it depends on parameters, which characterise the state of such an economy.

Internal energy is a single-valued function of the system's balance state (state, which features constant parameters of all bodies within the system during a significant time). When a system finds itself in a balanced state, its internal energy acquires such definition that is inherent for this state, independently from the system's previous history. In such a way, change of internal energy during the transformation from one state to another will always equal the difference of figure in such states, independently from the transfer method. Internal body energy cannot be measured directly, but a change in internal energy can be defined.

- Quantity of value depends on the reference system. For different economy's participants' real value of a certain economic resource and the created product is different.

Statements, mentioned above, reveal that there are different coordinates, which is where value and various reference systems are operating in the economy, the quantity of value is determined concerning them. Confirmation of relativity of value's quantity is the processes of money value motion in modern finance.

Regarding the statement that the quantity of value certainly depends on parameters of the concrete economy's state, it is general knowledge that national economies feature different parameters. The volume of gross domestic product (GDP), national income, foreign trade, etc., are different in each national economy. Quantities of values are correspondingly different, which are in the foundation of national currencies' (credit money) purchasing capability.

As a result, countries that are similar in territory size and population, but differ in features of economies, have different values' quantities, so different real purchasing capability of national money. Modern financial science studies the national money topic extensively (Lastrapes & Selgin, 2012; Cooper & Konings, 2016). Apart from that, products that are similar, but produced in different countries (economies), represent a real quantity of value if parameters of these economies are different. Hence, the exchange values of such products vary as well.

Fluctuation in quantity of value in the economy before and after a crisis is considered as proof of the fact that the quantity of value is a single-valued function of a balanced economy. The economy of such a country before and after the crisis has, naturally, different parameters, different balanced states. So a quantity of value, representing the economy, acquires such definition that is inherent for this state, independently from the previous history of economy. For instance, the quantity of value that represents the economy before a crisis is usually higher than after the crisis.

Regarding the dependence of value from a reference system, quite colourful is an example, when a single product is appreciated differently by different economy's participants, on different markets.

5. Conclusions

Firstly, statements, which were formulated by theoretical physics regarding energy, are logically transformed into well-known to economy value preferences.

Secondly, energy-information nature (genesis) of value manifests itself in the following:

- a) exchange and consumer forms of value are formed, exist and manifest themselves owing to processes, that are enabled by unbreakable interconnection of energy and information;
- b) information as economic resource is energy carrier itself, it has consumer and exchange values, which are transferred to created products;
- c) consumer and exchange values fix themselves (manifest themselves) on the surface of economic relations, i.e. appropriate informing and certain information exchange takes place.

Thirdly, energy-information nature of exchange (money) value is realised precisely within finance. Finance is that part of the economy, where money value and money capital are operating.

Fourthly, study of energy-information genesis of value enables us to reveal some value's properties, which are realised in modern finance:

- a) value operates exclusively within value-information interaction system;
- b) value does not appear from emptiness and does not disappear without trace, it transforms from one state into another, intertwining all processes, occurrences and things in economy;
- c) value's quantity is relative.

Mentioned properties of value concern mechanism (method) of value operation, sources of value and coordinates and reference systems, where value is operating, a quantity of value is defined concerning them. Such preferences are manifested in money value and money capital, define laws of value operation within finance. Dedicated utilisation of value's preferences should favour sustainable economy's development.

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