Y. Pozdnyakov
Leading expert appraiser, Ukrainian Appraisers Association (UAA) Member,
UAA Expert council deputy in Lviv district, Ukraine,
E-mail: jerzy.pozdniakow@gmail.com,
ORCID: 0000-0001-5849-7345.

M. Lapishko
Lviv Polytechnic National University, Ukraine, PhD, Professor
E-mail: lapishko@i.ua,
ORCID: 0000-0002-6690-3080.

Z. Skybinska
Lviv Polytechnic National University, Ukraine, PhD, Associated Professor
E-mail: szm@ukr.net
ORCID: 0000-0001-8959-1393

CROSS-CORRELATION RELATIONSHIP BETWEEN INTELLECTUAL PROPERTY OBJECTS VALUE AND ITS PRICE-FORMING FACTORS

Abstract. Valuation/appraising of intellectual property rights objects, such as brands and goodwill, using the Costs Approach, is based on different economic indicators of enterprises business activity. These indicators are used as a primary data for market value determination. These indexes are differently related to the cost of brands, and statistical relationship between these parameters researches, indisputably, presents both theoretical and practical interest. Because of the cross-correlation relationship closeness between assets market value and these primary data parameters directly depend estimation results accuracy and reliability. The work is verification of basic hypothesis, in obedience to that at the valuation/appraising procedure performing as primary data may be recommended to use those indicator parameters, which are characterized with the closest statistical relationship and, respectively, the highest cross-correlation coefficient. We assume that these intangible assets are able to change value characteristics in both directions and change the annual depreciation sign during the separate periods of economic life, made it positive or negative. The purpose of the article is to define the quantitative estimations of cross-correlation coefficients, which determinates statistical relationship closeness between primary data economic parameters in

Costs Approach. To analyze the question of selling, general and administrative (SG&A) expenses part choice, which must be attributed to the trademark value; to execute this index optimization. To perform the comparative analysis of cross-correlation relationship between the intellectual property objects value and most widely used price-forming factors. To execute the got results interpretation; to execute the analysis of economic measurements reliability improving possibilities, performed by independent expert appraising/valuation methods, by its accuracy increasing. It means researching and determination the most suitable primary data indexes for the market value and depreciation/obsolescence dynamic time changes indexes of intangible assets special kind, such as trademark and goodwill. The general methodological base of the article is scientific and special for the subject sphere of knowledge methods of scientific cognition. The choice of methodological approaches is conditioned by the specific of the economic measurements which are executed by independent expert appraising/valuation methods. The research is grounded on mathematical simulation and mathematical statistic quantitative methods. Research methodology also envisages generalization of previous publications results from scientifically-research sources and open information

reports about the enterprises economic indicators. Base principles of independent expert appraising/valuation made the general methodological basis of the article, in particular - principles of Utility, Substitution and The Highest and of The Best Use. To the certain methods of research belongs the method of cross-correlation analysis and specialized methodologies of optimization with the use of results error minimization criterion. The time value of money theory implementation, in particular, is well-proved for the past periods cash-flows transforming to the modern valuation date, by compounding operation performing. It is set that the closest is statistical relationship between the appraised trademark value indexes and accumulated costs of advertising expenses, which are the part of selling, general and administrative (SG&A) expenses. At brand appraising/valuation procedure is not recommended to apply any accounting book-keeping amortization indexes, as they are not the reliable indicator of Depreciation/Obsolescence. It is educed that these types of the researched assets depreciation sign depends on their information support and development expenses cash flows, invested by owner. It is set that during the period of trademark existence a multiple change of depreciation sign on the separate time periods is possible. It depends on sufficient informative and advertisement support implementation. Certainly the list of these price-forming factors must be taken into account at market value and Depreciation/Obsolescence determination procedure. It is well-proven that this class intangible assets estimation value in general case of normal profitable enterprise activity must be determined with application of increasing market value model with negative Depreciation/Obsolescence.

Key words: intellectual property rights object; brand name; trademark; goodwill; independent valuation/appraising; accounting; market value; intangible assets; sign-changed Depreciation/Obsolescence; estimation error; estimation accuracy; methodical approaches.

Introduction

Performing economic measurements of intellectual property objects market value is one of the most difficult tasks of an independent expert evaluation, the methodological basis of which has not been adequately addressed so far. This is due, first of all, to the existing contradictions between the actual their value in time changing functions and assumptions, regulated by the standards of financial accounting. In particular, the latter only provide the possibility of objects' that are valued and accounted as intangible assets cost decreasing over time - while, in fact, brand value of successful companies is growing rapidly during their economic life. This testifies the presence of negative depreciation occurrences in intellectual property objects of this class, along with the traditional generally accepted positive depreciation in certain periods of time. As our previous studies have shown, the particular depreciation sign can be manifested in certain periods of brands' existence, and the depreciation sign may change many times, in strictly accordance with changes in the trend of these assets value increasing or decreasing.

Applying Costs Approach to brand evaluation is based on the use of different economic indicators of enterprises activity, which are the primary data source for market value determination. These indexes are differently related to the brands value, and statistical relationship between these parameters researches, indisputably, presents both theoretical and practical interest. The work is verification of basic hypothesis, in obedience to that at the valuation/appraising procedure performing as primary data parameters may be recommended to use those indicators, which are characterized with the closest statistical relationship to measured intellectual property object value. Because of strength of the cross-correlation relationship between assets market value and these primary data parameters directly depend estimation results accuracy and reliability.

Relevance of the chosen topic. Identification of previously unsettled parts of the general problem

In determining intellectual property objects value with alternating sign-changeable depreciation by methods of independent expert evaluation various processing methods of primary data selection and transforming are used. A systematic comparative analysis of primary data different types relevance in Costs Approach applying to the intellectual property objects evaluation has not been implemented yet; results' accuracy evaluation dependence on primary data type choice, processing methods, the method of depreciation indicators consideration are not clearly established by evaluation standards. The quantitative appraisal of relationships' strength determination between economic parameters, which are most often used as

primary data source in the Costs Approach, and the estimated objects' value, thus, is an urgent task for the further development of an independent evaluation methodology. The subject of a study in this work is a research of the mentioned above problem aspects, as well as the consideration of the specific part of annually declared selling, general and administrative expenses (SG&A) in companies' financial statements reporting, which should be attributed to the brand value at evaluation procedure performing. The above indicators have a direct impact on the economic measurements results errors size for this class of intellectual property objects. So, their research on a concrete example of similar intangible assets evaluation is an actual nowadays task, in particular - within the framework of the methodology improving for brand value objective quantitative characteristics determination.

Purpose of the article

The purpose of the article is to define the quantitative estimations of cross-correlation relationship strength between economic parameters, which are used as primary data source in Costs Approach, and estimated brand value. To investigate on a concrete example the part of selling, general and administrative (SG&A) expenses, which according to the Costs Approach should be attributed to the brand value, and perform optimization of this indicator. To perform the comparative analysis of cross-correlation relationship strength between intellectual property objects value and most widely used price-forming factors, on an example of brand evaluation. To set the parameter, for which the correlation coefficient is the highest, and which is most expedient to use as primary data source in economic measurements performing. To execute the received results' interpretation; to analyze reliability improving possibilities of evaluation results for intellectual property objects on the example of a trademark; to formulate practical recommendations on the priority directions of further researches.

Literature review

Zlenko S. M., Tymchyk I. S., Tymchyk S. V. state that evaluation of intellectual property objects, which were created by the enterprise, in foreign practice is mainly based on the Costs Approach, namely, on the use of initial primary cost of these objects, basing on costs of its development and preparing to commercial use, taking into account depreciation level. Main price-forming factors, which determine the value of industrial property objects, are: the costs of intellectual rights object creation; exclusive rights owners' costs to create, develop and patent protection of industrial property object (including duties, fees and other expenses for ensuring the legal protection document power); organization costs for the use of intellectual property object (including costs of its information, advertising support and marketing); costs for intellectual property object risks insurance; validity period of the legal protection document (license, patent, certificate) at evaluation date; exclusive rights owner's costs to resolve legal conflicts regarding intellectual property object, including those consideration in court/trial; expected income cash flows in the form of compensatory fines, receipts in the case of owners exclusive intellectual property rights violation; object's full-term usage period; obsolescence (depreciation) factor; inflation factor; other factors related to the evaluated intangible asset profitability and riskiness indicators. These are main factors in the intellectual property objects evaluation, which are the part of intangible assets [1, p. 74].

The classic evaluation algorithm for expenses accumulation, used in the Costs Approach, is based on the well-known methodology, according to which brand market value can be calculated as an aggregate summation of owner's marketing costs expenses for brand creation and its further support, during the whole brand existence history, taking into account time value of money changes. The advantage of this method is that it enables to calculate reliably all incurred accumulated costs expenses – unlike of the Income Approach methods, based on forecasts, which are not always reliable [2, p. 116]. Also the variant of the Costs Approach methodology using is known, according to which the value of intellectual property object is defined as the sum of annual invested in its support funds components in every year of the calculation period, multiplied by the corresponding coefficients of the various

previous time cash flows, to lead it's values to the evaluation date [3, p. 56]. The modern methodological basis for trademarks' independent evaluation also uses the concept of brand equity, which is considered as the capitalized value of all presented before the valuation date cash flows of expenses invested in the creation and information support of this class intellectual property objects [4, p. 5].

Foreign authors also confirm the appropriateness of taking into account all types of costs, associated with intangible assets maintenance: "Sometimes companies develop intangible assets for which they spend their money, and all these costs are associated with the development of these assets" [5, p. 244]. The use of certain intellectual property objects finds its synergistic combination of these intangible assets components value in total enterprise value goodwill, embodied in the brand. Gordon V. Smith and Vladimir Yossifov give examples of synergy, while few different intellectual property objects types are used at the same time. In particular, considering the synergistic combination between protected technology and a registered trademark, they show that due to this, the economic lifetime of these intellectual property rights objects increases. The authors believe that such a strategy may be applicable to other combinations of intellectual property objects of different classes, for example – to a combination of copyrights and trademarks. An important conclusion of this study is the idea that the joint use of intellectual property objects various forms increases the total market value of company's intangible assets, by future economic benefits increasing, as the period, during which it is possible to obtain them, is growing – and the risks are reduced [6, c. 65]. At the same time, they argue the fact of expanding the possibilities of intellectual property rights exploitation, indicating, in particular, the importance of taking into account the measured costs of the souvenir products production and distribution and advertising campaigns conducting. These funds are considered as a part of the costs, invested in the development and support of the company's brand. Gordon V. Smith also points to the significant link between profits of the enterprise and the value of intangible assets that it owns. If the business does not receive

adequate returns on funds invested in its intangible assets, then it is more appropriate to consider the value of these assets by the evaluation liquidation base. If profits of the company grow, the estimation value of its intangible assets will be maximal. The value of an enterprise increase, from this point of view, is an indicator of its newly created intangible assets value and goodwill cost growth. So, it is very important in evaluating to keep in mind this link, and to test constantly the ratio of estimated value of specific intangible assets monitoring data and the total cost of business enterprise. The sum of individual components' values should correspond to the value of the total [7, p. 26].

Aswath Damodaran's article describes the methodology for determining the value of the Coca-Cola trademark, in which, as the primary market information for evaluation by Costs Approach annual Selling, General and Administrative Expenses (SG&A) indexes are used. The author assumes that two thirds of these annual SG&A expenses are represented by sales and advertising costs, and half of those sales and advertising costs were related to the creation and development of the trademark [8, p. 15]. The balance of this indicator with the amount of income generated in the current year is confirmed. In this case, the annual "This year Amortization" indicator is also calculated as the amortization rate of the current year at 4 % of the last indicator, i.e. half of sales and advertising costs that were associated with the creation and development of the trademark. Next, annual "Unamortized Expense" for the current period is calculated, as the product of two factors: the annual "This year Amortization" indicator, multiplied by the previous period number. In the example presented in this paper, the value of that "Unamortized Expense" – non-amortized part of current period annual expenses, accumulated during the entire retrospective period 1984–2008, and estimated in USD 31.9 billion in 2008, is considered by the author as the capitalized value of trademark estimation. It was calculated by Costs Approach through the amount of expenses, which company has invested in the trademark. This indicator is calculated on the basis of annual expenses amount associated with the creation and

development of the trademark, accumulated over the entire retrospective period, without of annual amortization size. The latter is calculated by a straight-line model of 25 years economic life of this intangible asset that is 4 % amortization per year.

Methodological approach

General and special for the subject area scientific knowledge methods formed the methodological basis for the work. The choice of methodological approaches is determined by the specifics of the economic measurements field, carried out by methods of independent expert evaluation. The research is based on methods of mathematical modeling simulation with the wide use of mathematical statistics apparatus which allowed achieving the above purpose of work. The research methodology also foresees the elaboration and synthesis of previous publications' results of research and open sources of information on enterprises economic indexes. The general methodological basis of the article became independent evaluation basic principles, in particular – Utility, Substitution and The Highest and The Best Use. One of three classical valuation approaches based on them, namely the Costs Approach, according to which, under certain prior conditions and restrictions, assets value will be proportional to the accumulated sum of previous expenses on evaluation object creating or reproducing. Specific research methods, which constitute the main methodological tool of scientific work, include the method of cross-correlation analysis and specialized optimization techniques, using the criterion of economic measurements results error minimizing, as a target function. In addition, the paper formulates and justifies recommendations for applying the method of previous cash flows present value determining, using the time value of money theory – in particular, bringing the past periods cash flows to the present valuation date with the help of a compounding operation.

Materials of the article relate to blocks identified by the JEL Code Classification in the field of scientific and economic research: C 13 – Estimation; C 49 – Econometric and Statistical Methods: Special Topics, which are included in the category C 00 – Mathematical and quantitative methods (economics); E 30 – Prices, Business Fluctuations, and Cycles; E 37 – Forecasting and Simulation, which are included in the category E 00 – Macroeconomics and Monetary Economics; O 34 – Intellectual Property Rights: National and International Issues, O 47 – Measurement of Economic Growth; Aggregate Productivity, which are included in the category O 00 – Economic Development, Technological Change, and Growth.

Conducting research and results

We will analyze the Costs Approach to obtain the brand market value, described in detail by Aswath Damodaran [8, p. 15]. An in-depth study of the link between SG&A costs and intellectual property object appraisal value determining the possibility of this indicator usage in valuation practice is useful. In the considered example the trademark value annual increase is assumed, by the amount of annual expenses on its advertising, what means the negative depreciation, on the one hand. On the other hand, annual amortization is charged on its increased value – and that is the opposite assumption about the positive depreciation of this asset. We believe that the economic life period of intangible assets in the form of a trademark must be considered as conditionally unlimited. There is a number of convincing arguments in favor of this statement truth – in particular, the existence of brands with more than 100 years history. Coca-Cola also in its financial statements annual reports describes trademarks as intangible assets with indefinite economic life. Charts of used indicators change in time are given in Fig. 1.

In general, in the financial statements reports of the company all its intangible assets are classified according to their belonging to one of three categories: (1) intangible assets with a specified economic life, which are subject to amortization charging; (2) intangible assets with indefinite economic life, which are not depreciation/amortization subject; (3) goodwill, with no amortization too. It is noted that for intangible assets with a specified economic life, their appraisal testing must be carried out in cases, when arise conditions, indicating the possibility of investments made non-return. For intangible assets with an indefinite economic life and goodwill, their valuation tests are performed at least annually – or

92

more often, if circumstances indicate that these assets may lose their value [9, p. 45].

The calculation showed that the evaluation result of the brand value, determined by this method, was distorted by a rather significant error. Compared to determine by the data [10, p. 1] estimated value of this brand in 2008 – USD 58.210 million, the value obtained in the analyzed evaluation example of USD 31.910.19 million is characterized by an absolute error of USD 26.299.81 million and a relative error of 45 %. It can be assumed that the use in evaluation procedure of two above-mentioned mutually controversial assumptions, concerning depreciation sign, is unreasonably inappropriate. Accordingly, the

use of accounting depreciation/amortization indicators in negative depreciation intangible assets evaluation procedure, the value of which increases annually, seems to be completely unreasonable. A significantly better result would be provided by the refusal of accounting depreciation/amortization indicators, and use as an indicator the accumulated costs of amount of annual expenses for the trademark advertising during the whole retrospective period, without any annual depreciation deducting. In this case, the value in above mentioned example would reach USD 53.760 million, which is characterized by a significantly lower absolute error of USD 4.450 million and a relative error of 7.6 % only.
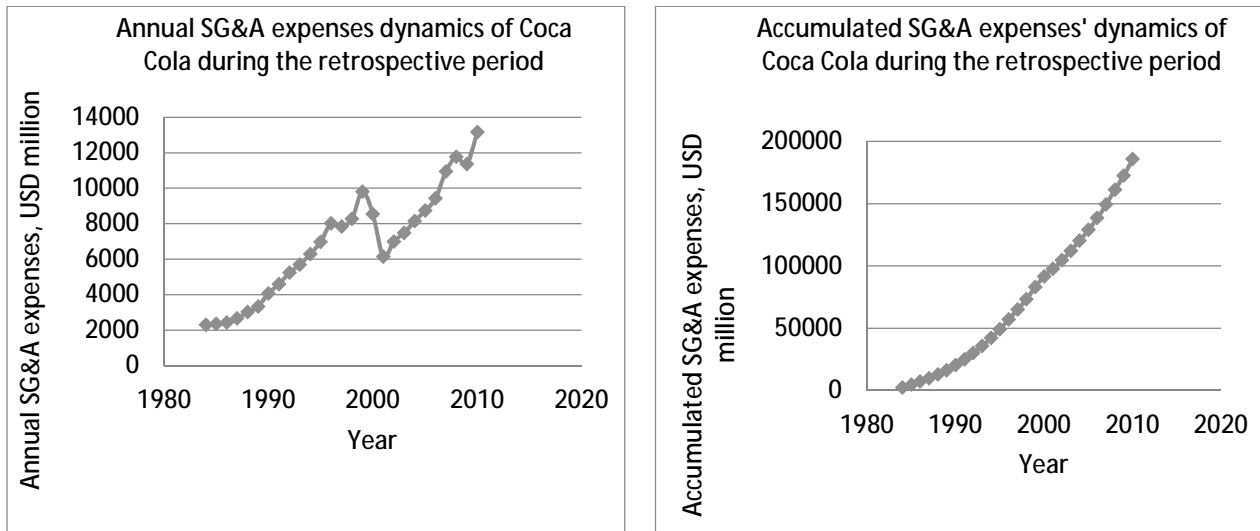
Fig. 1. Dynamics of changes in annual and accumulated SG&A expenses of Coca-Cola

The theoretical substantiation of the refusal to take into account of annual trademark depreciation indicators in the evaluation procedure is as follows. The market value of certain specific types of intangible assets – in particular, such as trademarks and goodwill – during the period of their useful use may vary in both directions, both in the direction of decrease (positive depreciation) and in the direction of increase (negative depreciation). Typically, for successful brands there is a general tendency to increase their value over time, which means that there is a negative depreciation. But the characteristics of the value change in time of assets listed above, used in accounting documents, do not correspond to the actual state – so use the calculation of annual

depreciation/amortization indicators suggests their value reduction over time, and does not take into account the possibility of their value factual increase, that in the negative depreciation presence [11, p. 725].

Accordingly, we can formulate the conclusion about the inexpediency to take into account the accounting data for depreciation/amortization in calculating the trademark value by the Costs Approach methods. These data are only the consequence of the completely conditional rules for assets accounting use, set by the regulatory framework for the financial statements of enterprises. They are not related to factual changes of intellectual property objects market value - what is fully confirmed by [11, p. 725; 12, p. 216] and

the example analyzed above. The enterprise accounting does not have any idea about the real market value of such intellectual property objects and their dynamics, if they were not independently evaluated by relevant specialists. Practice confirms the presence of completely paradoxical situations, when for a long time according to the accounting data, the current value of intellectual property objects is reduced, in accordance with normatively established amount of depreciation/amortization. At the same time, the results of independent valuation of this intangible asset undeniably testify the fact of its value multiple increase. This indicates the inadmissibility of using any accounting data for intellectual property objects depreciation in independent evaluation. Bringing the enterprises' financial statements data to the factual state would require the corresponding changes in documents of the current accounting normative base, in accordance with the international standards requirements to account the assets in enterprises' balances on their fair market value. But for this purpose it is necessary to introduce into the accounting normative base the negative depreciation concept of some special types of intangible assets. Neither developers of instructional documentation nor its users are apparently not ready for such cardinal changes at the moment [12, p. 216]. Instead, for the independent evaluation, when the Costs Approach is applying, we can state, firstly, the inappropriateness of considering the accounting data for intellectual property objects with alternating depreciation sign and, secondly, the critical importance of the correct choice of indicator, which determines the accounted part of owner previous expenses for the creation and information support of evaluation object. This primarily refers to the researched expenses indicator – Selling, General and Administrative Expenses (SG&A), which is used as primary data source for calculations in the analyzed example. The choice of this coefficient directly influenced on the final result of value determining, and it is advisable more detail considering of its relationship with the accuracy of valuation works results.

Our research has shown that brand value evaluation error can be improved by optimizing the part of owner previous expenses determination, which is used as primary data source for

calculations. The annual basic indicator for brand valuation (called as "Brand Name Advertising" in [8, c. 15]) is calculated as a part of company's annual brand advertising costs. In the analyzed valuation example it was estimated at 50% of annual sales and advertising costs (called as "Selling and Advertising" in [8, c. 15]), with the obvious assumption that the other half of these costs was not related to the brand creation and development. Respectively, annual sales and advertising costs are obtained as 66(6) % of general SG&A expenses. The research, using the above sources regarding the estimated brand value, has shown that optimizing the value of coefficient, which sets the part of annual amount of sales and advertising costs, makes possible to reduce the relative error level to less than 1 %. We have performed the calculation of estimated value of the Coca-Cola brand, using the data of the analyzed example, without taking into account false accounting depreciation indicators, which is not reliable indicator of the asset depreciation level, and the adoption of Millward Brown Optimor (MBO) data [10, p. 1] as its true valid value. Subsequently, in mathematical model simulation, a variation of the part of annual sales and advertising cost of Coca-Cola, up to choosing its optimal value, was implemented. The calculation results are given in a Table 1.

According to Table 1, the optimized value of the coefficient, which sets the part of the annual sales and advertising expenses during 2006–2008, is ranged from 0.44 to 0.54. The optimization was performed by the criterion of estimated brand value relative error minimizing, based on the estimated brand value in the relevant period, according to the MBO evaluation data [10, p. 1]. This fully confirms the correctness of the assumptions adopted by Aswath Damodaran [8, p. 15], according to which the accepted value of this coefficient is 0.5.

Significant theoretical and practical interest is the study of the relationship between indicators of annual SG&A expenses accumulated over the entire retrospective period and of estimated brand value. In analyzed example, the part of annual SG&A expenses attributed by Aswath Damodaran [8, p. 15] to costs, associated with the trademark creation and development, is constant and is

determined by the product of two coefficients, used by the author, namely – ⅔ and ½, that is 0.33(3). In open sources of market information [13, p. 1] data of the annual evaluation results for the same brand value over the comparable period is available. This opens up the opportunity to determine the optimal part of brand value in the accumulated amount of SG&A expenses by calculation way, which would ensure the estimated value compliance with factual data. The numerical values of this parameter are critical for this class intangible assets evaluation accuracy, because the evaluation result error depends directly on the choice of this part index. A result of the calculation of the part index, which is the estimated brand value ratio to accumulated SG&A annual expenses, is given in Table 2.

Table 1

The relative error of Coca-Cola brand cost evaluation with optimized part of annual sales and advertising costs

Indicator	Unit of measurement	Year		
		2006	2007	2008
Estimation of brand value (by calculations)	USD million	41568	43855	58061
Valid brand value (by MBO evaluation data)	USD million	41410	44140	58210
The part of the company's annual sales and advertising costs, taken into account in calculations	–	0.45	0.44	0.54
Absolute error	USD million	-158	285	149
Relative error	%	-0.38	0.65	0.26

Table 2

Retrospective analysis of the actual part of Coca-Cola brand value on accumulated annual SG&A expenses

Year	Estimated brand value, USD million	Annual SG&A expenses, USD million	Accumulated SG&A annual expenses, USD million	The brand value ratio to accumulated annual SG&A expenses
2000	72537	8551	91607	0,792
2001	68945	6149	97756	0,705
2002	69637	7001	104757	0,665
2003	70453	7488	112245	0,628
2004	67394	8146	120391	0,560
2005	67525	8739	129130	0,523
2006	67000	9431	138561	0,484
2007	65324	10945	149506	0,437
2008	66667	11774	161280	0,413
2009	68734	11358	172638	0,398
2010	70452	13158	185796	0,379

In Table 2 accumulated SG&A expenses are calculated according to the data presented in the above example, where annual Coca-Cola expenses since 1984 have been used, which is a forced constraint due to the lack of earlier periods data. Although theoretically the whole data set, since registration (or statement on the accounting balance) date of the appraised intellectual property object should be used. According to the principles of the Costs Approach in its application to brands valuation, in this case, the annual SG&A expenses should be taken into account throughout the full retrospective period, since the date of intangible asset creation up to the hypothetical valuation date. It is clear that taking into account annual expenses of previous unrecorded periods would increase

accumulated SG&A expenses in all subsequent periods. Thus, the shortage of annual SG&A expenses data at earlier periods is a source of methodological error occurrence, which distorted estimated basic indicators of the accumulated costs and, accordingly, the estimated brand value in the direction of their reducing. Fortunately, in valuation practice it is very rare to find cases, when

it is necessary to evaluate so old brands, that they have no any data about their creation and development costs from the earliest periods of existence.

Graphs of Coca-Cola brand value part index change in time, obtained by calculation estimated brand value ratio to accumulated annual SG&A expenses, are given in Fig. 2, left.
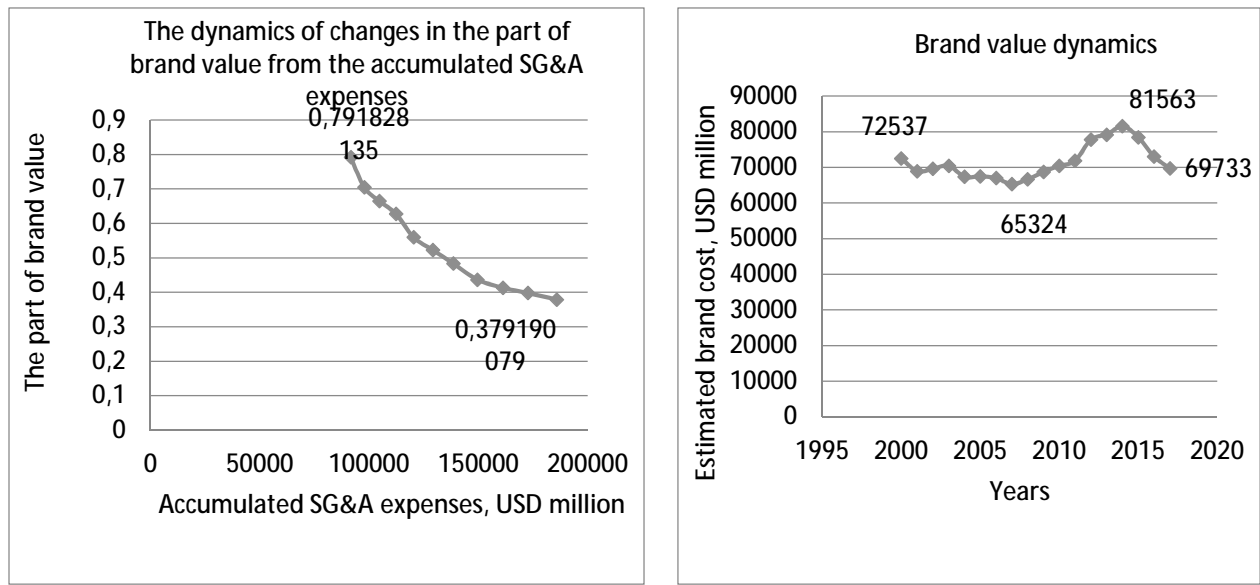

Fig. 2. Dynamics of the change in the brand's value part of the accumulated SG&A expenses (left, own author's development) and the dynamics of Coca-Cola estimated brand value change over time (right, according to [13, p.1])

Let's take a closer look at the dynamics of Coca-Cola's estimated brand value for a long-term gap. As shown at Fig. 2, right, according to estimation results [13, p. 1], during the period of 2000–2010 there were significant fluctuations of the brand value. From the above time period trend graph of estimated brand value changes, it is clear that periods of this intangible asset value decline changed with periods of its growth. The analysis of brand value change dynamics confirms the very special nature of this intangible asset and this class assets unique feature to demonstrate both positive and negative depreciation, in certain periods during their economic life duration. Those depreciation signs depends on brand value reduction or increase over time. In this case, the direction of brand value changes, that is, its reduction or increase in time, determines the sign of annual and accumulated depreciation quantitative indicators. For most successful companies, with the prevalence of their brand value growth trends, rates of their

depreciation indexes are in general negative; in periods of temporary brand value reduction, these depreciation indicators are positive. As shown by dynamics of the most expensive brands value analysis, in general case for enterprises that are characterized by stable rates of economic growth, the presence of a stable tendency to a permanent increase of these intangible assets estimated value is rather typical. This is primarily due to accumulation in brand value high investment funds of brand owners' expenses for their information and advertising support. This gives a reason to investigate more closely the correlation between advertising costs, which are part of SG&A expenses, and brand value.

The widespread is Costs Approach applying practice of using the indicator of accumulated costs for brands advertising support as primary data source. It is based on the fact that for the considered class of intangible assets with sign-changeable annual depreciation

indicators is characterized by high sensitivity of their value to factors of internal and external information influence. This feature provides the possibility of a purposeful influence on their value changes over time and, accordingly, on depreciation indicators, by the use of these price-forming factors. The most important of these factors is the systematic carrying out of advertising and information support activity of the enterprise' trademark and goodwill development, which are mutually related intangible assets. For an economically successful enterprise, a situation when high level cash flows are regularly invested into the brand development, is quite typical. Then the natural consequence of this is a rapid brand value increase, due to owner's activities of information and advertising support. We consider it as internal information influence price-forming factor, which provides negative annual brand depreciation. The opposite case is also possible – a sharp trademark value decrease, as a result of external information factors influence – for example, in the case of discredit campaigns in media. In such case, there may be possible great brand value loss, with its falling to zero and even negative indicators. This is considered as external information influence price-forming factor, which provides positive annual brand depreciation. In the first case there are manifestations of a negative moral, or functional, depreciation/obsolescence, and in the second case – respectively, evidence of positive economic or external depreciation. In the typical case, systematic internal information support impact on the brand's value usually results in its value increase and a negative functional depreciation/obsolescence, in which the owner of property rights is economically interested in this brand use and its further development. In the case of external information influence on these assets value the sign of external depreciation may be either positive or negative. After all, as shown above, these intangible assets value changes in the influence of external price-forming factors can be directed not only towards reducing their value, but also in the direction of its increase. The first case occurs when publishing information that compromises the

brand owner company is. The second case is observed in cases when the enterprise is occupying a high position in various ratings, receiving prestigious awards, disclosing in media facts of financial support for socially-oriented initiatives or charitable activities [11, p. 725].

The above example of the Coca-Cola brand is interesting because of alternating sign-changed annual brand depreciation indicators presence in the considered retrospective period of 2000-2010. It can not be said that this example is typical, but it is more informative in the point of view of brand possibilities to change direction of its value dynamics over time, demonstrating changes both in the direction of its growth, and in the direction of decline. Thus, according to the Interbrand international rating, during the retrospective period of 2012–2018, there is a steady tendency for the annual rapid growth of the world most expensive brands value. At short-term periods (lasting no more than 1 year) manifestations of positive depreciation were observed for 3 of the 5 most valuable global brands in the world in 2018 (Amazon, Apple, Google, Samsung, Facebook in order of decreasing value), namely – for Apple in 2017, Amazon in 2017, Samsung in 2016 [14, p. 1]. Thus, the more general and typical trend was the presence of negative depreciation, due to the monotonous growth of brand value over the long-term gap. Characteristically, the Google and Facebook brands during the investigated retrospective period did not reveal any features of even a short-term costs reduction, demonstrating a stable negative annual and accumulated depreciation.

The analysis of the research results showed that during the 10-year retrospective period of 2000–2010, the part of Coca-Cola brand value in accumulated SG&A expenses monotonously decreased from 0.792 in 2000 to 0.379 in 2010, while fluctuations in brand market value, with periodic growth and decline, were observed (Fig. 2). This indicates a weak correlation between these two indicators. Let's check this assumption by constructing the correlation field of these parameters and determining the characteristics of the regression line. The results are shown in Fig. 3.
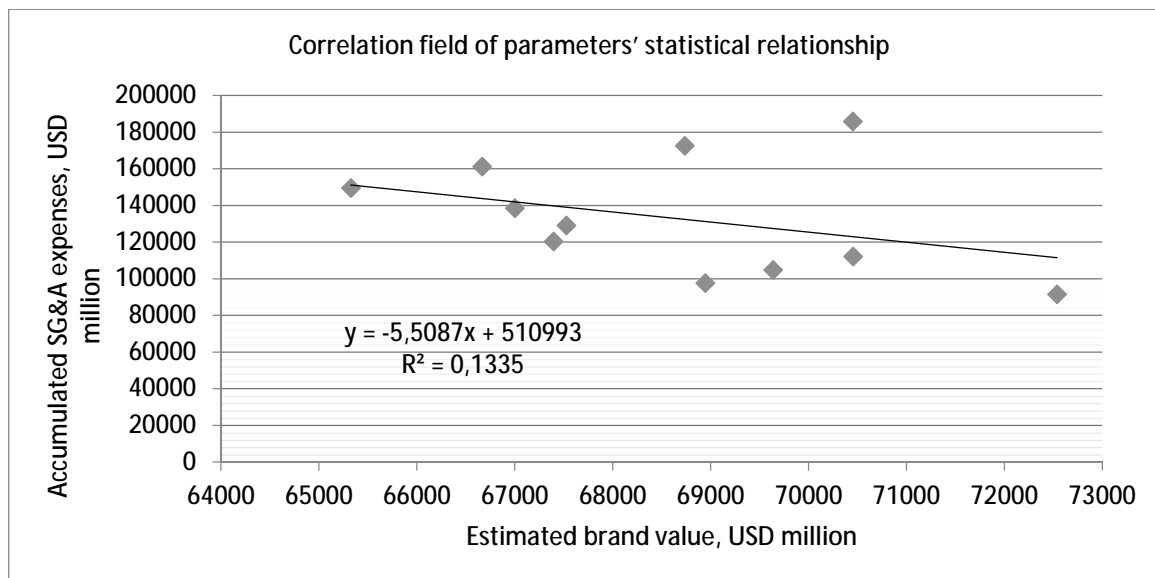
Fig. 3. A correlation field for the estimated brand value and accumulated SG&A expenses of Coca-Cola

The slope of the regression line indicates a negative correlation relationship; the negative value of the correlation coefficient indicates a reverse statistical relationship. The low negative value of the correlation coefficient R = -0.3365 and determination factor of investigated parameters $R^2 = 0.133$ confirm that the statistical relationship between accumulated SG&A expenses and the brand value is rather weak. The value of the correlation coefficient for annual SG&A expenses and brand value is even weaker: the correlation coefficient R = -0.234 and the determination factor of parameters under study $R^2 = 0.055$.

According to table "Quantitative criteria for estimating the relationship density" [15, p. 103], the values obtained above of the correlation coefficient give grounds to characterize the degree of statistical relationship density in the first variant as "moderate", since the value of R = -0.336 relates to the second interval of this table (0.3–0.5 in absolute value). In the second variant, it can be described as "practically absent, weak", since the value R = -0.234 refers to the first interval of this table (up to 0.3 in absolute value). The latter shows that it is unreasonable to use annual SG&A expenses figures as the primary data source for evaluation. The relevance of these data in the Costs Approach applying is too low, even when compared to accumulated SG&A expenses amount. So, it can not be recommended for the use because of the low accuracy of the results that will be obtained when such an evaluation is performing.

Note that while the brand value part in the accumulated amount of these expenses varies over time according to the function, which is close enough to the linear, despite the changing character of the annual brand depreciation in the retrospective period (see graphs in Figure 2). During 2000–2010, as the graph shows, the brand value changed the sign of annual depreciation several times, showing periods of decline (positive depreciation) and growth (negative depreciation). Nevertheless, the brand value part in accumulated SG&A expenses has monotonously decreased, by a function close to the linear. This opens up the possibility of reliable forecasting of the revealed trend by linear extrapolation of the trend chart for future periods. Thus, the task of calculating forecasted indicators of brand value may be solved, with the known trend of changes of brand value part in the accumulated SG&A expenses. For unknown subsequent annual amounts of these costs, their forecast rates may also be applied. Thus, it has been shown that indicator of accumulated SG&A expenses can be used as a baseline data for brand value calculating by the Costs Approach. This possibility is conditioned by the availability of a statistical information link between the amount of accumulated SG&A expenses and the amount of costs, invested in the trademark creation and development.

Let's consider possible directions for increasing the reliability of brand value evaluating results, taking into account consequences of the analysis above. Theoretical analysis for choosing

source data indicates that "Advertising Costs" indicator, which is only one component of SG&A expenses, is more informative. In Table 3 we will identify the significant components of SG&A expenses and consider the proportion of advertising costs in total SG&A expenses.

Materials of the analyzed example were supplemented by data of later periods, obtained from open sources [16, p. 62; 17, p. 53; 18, p. 54]. As can be seen from Table 3, Selling, General and Administrative Expenses (SG&A) is the sum of the following components: stock-based compensation expenses, advertising expenses, selling and distribution expenses, other operating expenses. Graphic interpretation of the results is presented in Fig. 4.

Table 3

Retrospective analysis of Coca-Cola's annual SG&A expenses components, as for the year end (31 December)

Components of annual SG&A expenses	Year									
	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Stock-based compensation expenses, USD million	219	258	236	209	227	259	354	380	241	266
Advertising expenses, USD million	3958	4004	3976	3499	3266	3342	3256	2917	2791	2998
Selling and distribution expenses, USD million	3257	5177	6025	6412	6419	8905	8502	3902	2627	2815
Other operating expenses, USD million	5062	5823	6190	7098	7398	5232	5310	5959	5699	5695
Selling, General and Administrative Expenses (SG&A), USD million	12496	15262	16427	17218	17310	17738	17422	13158	11358	11774
The ratio of advertising costs to total SG&A expenses, %	31.67	26.24	24.20	20.32	18.87	18.84	18.69	22.17	24.57	25.46
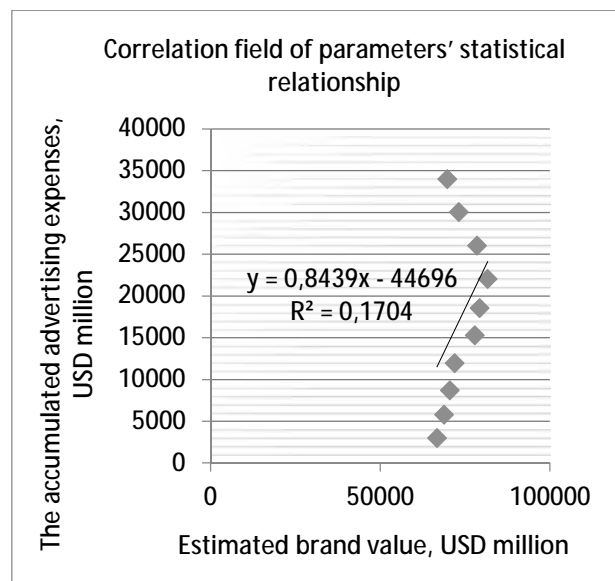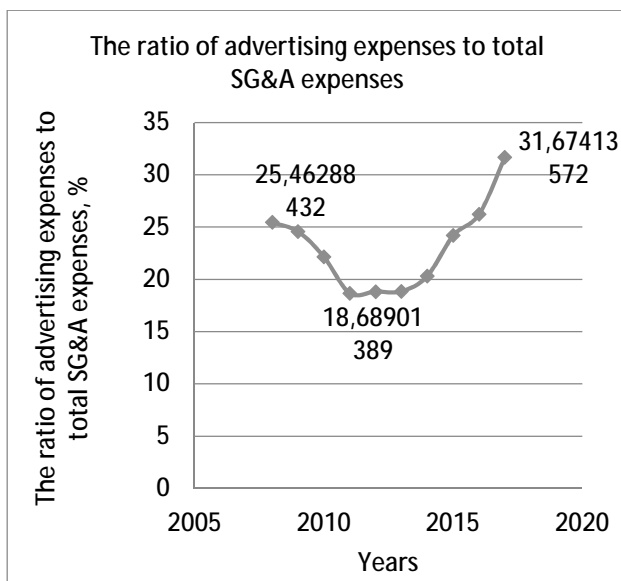
Fig. 4. Dynamics of changes in advertising expenses part in the total SG&A expenses over years of retrospective period (left) and the correlation field of the estimated brand value and accumulated advertising expenses (right) for Coca-Cola

99

During 2008–2017, as can be seen from Table 3 and Fig. 4, the advertising expenses part in total annual Selling, General and Administrative Expenses (SG&A) on this long-term gap was not constant: it dropped monotonously from 25.46 % in 2008 to 18.69 % in 2011, and then increased monotonously from 18.69 % in 2011 to 31.67 % in 2017. At the same time, for the above-mentioned period, the change in this expenses part amounted to 12.99 percentage points, which corresponds to a relative index of its instability of 56.2 % in relation to the average of 23.10 percentage points. It is unacceptable to neglect the investigated expenses part instability of such an order, if it is possible to use directly obtained data by company's financial statements reports, where available selected indicators of the annual advertising expenses are. If the amount of advertising expenses in a particular period is unknown, it is advisable to use linear interpolation or extrapolation methods, based on known up-to-date data and trend line forecast for future periods. For example, using the calculated above ratio of advertising expenses to the total SG&A expenses given in the last row of the Table 3.

Studies have shown that in the period under review, 2008–2017, the statistical relationship of the "Estimated Brand Value" indicator with the indicator of annual advertising expenses was too weak: the value of the correlation coefficient is $R = 0.368$; the value of the determination factor of parameters under investigation is $R^2 = 0.135$. Instead, the statistical relationship between the estimated brand value and the accumulated advertising expenses is related more closely. The value of the correlation coefficient for this case is positive, and is $R = 0.413$; the value of the determination factor of the parameters under investigation is $R^2 = 0.170$. This indicates their closer statistical relationship than the above analyzed relationship between accumulated total SG&A expenses and brand value. The positive values of the correlation coefficient, obtained for this case, give grounds to characterize the degree of statistical relationship density as also "moderate". Unlike accumulated total SG&A expenses, the correlation coefficient of selected accumulated advertising expenses has a positive and higher numerical value, manifesting direct and closer correlation relationship with the indicator "Estimated brand value".

The theoretical substantiation of the using selected part of advertising costs from Selling, General and Administrative Expenses (SG&A) as a primary data source advisability is the lack of logically verified relationships between brand value and other components of SG&A expenses. After all, general and administrative expenses significant components – such as stock-based compensation expenses, selling and distribution expenses, other operating expenses – do not directly affect either the brand value or the goodwill of the company. While the costs of information and advertising activities only obviously increase the degree of customers' brand recognition, form and maintain in the consumers' minds persistent positive stereotypes.

This confirms the priority of using the indicator of accumulated selected advertising costs, which has the above advantages compared with accumulated SG&A expenses for valuation purposes. From the above-mentioned indicators, the indicator of accumulated advertising costs is characterized by the highest and positive value of the correlation coefficient with the indicator "Estimated Brand Value", which is an unknown value in evaluation problems solving. For this example, use of this parameter was the most appropriate. A rather low absolute value of the correlation coefficient, probably, is due to the brand value in time changing function with alternating first derivative, for the case under consideration, with multiple annual depreciation sign changes. For brands with more stable trends of value changes in time (such as for the most expensive in 2018, the Amazon, Apple, Google, Samsung, Facebook), the correlation coefficient will probably be much higher – but we consciously analyze in this work the most difficult case.

It should be noted that in the domestic appraisal practice, at the moment, there is no accumulated so much experience in brands evaluating, and there are often cases, when the enterprise' trademark is evaluated for the first time. Consequently, the appraiser in this case is not aware of trends in brand value time changing, as there are no any results of previous evaluations. This makes the solving of such valuation tasks even more difficult, as compared to the regular annual monitoring of trademarks value of large

100

multinational companies. In any case, from results of the studies carried out, we can conclude the presence of the closest statistical relationship of the brand value and the indicator of accumulated advertising costs. This gives grounds to this parameter use as a most reliable primary data source for the trademark value determining by the Costs Approach – even if in each individual case there is an a priori unknown model for brand value changing in time. Depending on the type of this model, the correlation coefficient between the primary data used, and the parameter is measured, will be higher or lower – but in any case, the more reliable parameter for brand evaluating by the Costs Approach does not exist at this time.

By this intangible asset periodic revaluation data use, accumulated over a longer time period, it will be possible to identify and investigate this pattern. There is no other way to validate it in principle. When carrying out valuations of such assets, of course, it is also possible to use also accumulated amount of SG&A expenses as a data source, but only in those cases when it is impossible to distinguish expenses used directly on trademark informational and advertising support and development. Conducted studies of SG&A expenses part optimization opportunities, which should be taken into account in such cases, for the considered example of Coca-Cola has shown its change over 10 years in the range from 0.792 in 2000 to 0.379 in 2010. In our opinion, it seems more expedient to focus on higher values of the coefficient, which determines the size of this part - because it is difficult to imagine any expenses of advertising products or services that are not related to the trademark. In Ukraine it is almost impossible to find published information and promotions that ignore the trademark – in fact, no one advertises anonymous goods or services "in general", but always refers to the product of a specific manufacturer or service provider, which is identified by the brand. For this reason, in nowadays domestic conditions, almost all expenses of information and advertising activities, with very few exceptions only, can be considered as direct investments in brand and goodwill value growing. These cash-flows are directly aimed at increasing their market value, and are accumulating in it throughout the entire economic life of these intellectual property objects.

Other possible directions for increasing the reliability of the evaluation results are noticed in the work of Aswath Damodaran [8, p. 15]. It is noted that two potential refinements are possible that may improve the reliability of this evaluation. The first is to analyze the longer economic life period of an evaluated intangible asset and extend the retrospective period depth back in time, to get more data on past periods advertising costs. This can undoubtedly be accepted, since according to basic independent valuation principles, which are based on the Costs Approach, the present brand value on valuation date is determined by the sum of all costs for its creation and support, made in past periods. In theory, for the correct valuation, all associated costs during the retrospective period from the date of trademark creation (registration) up to the present appraisal date should be taken into account. In the example we examined, the author limited himself to analyzing the data of the 25 years retrospective period, noting that in reality the retrospective period should be going back a lot longer, to determine the trademark economic life duration, but primary data availability limitations makes it so hampered. This is, after all, quite understandable in the case, when the cost of a trademark with such a long economic life period is investigated: the company Coca-Cola uses its brand since 1886, with minor modifications to the logo. That's when the pharmacist John Pemberton invented the recipe for syrup. The name for a drink was invented by Pembertons accountant - Frank Robinson. He personally brought out on the paper the inscription "Coca-Cola", which later became the logo of the world-famous company. Along with Coca-Cola brand, the company's portfolio of brands now includes about 20 other brands, including such as Schweppes, Diet Coke, Fanta, Sprite, Coca-Cola Zero, Vitaminwater, Powerade, Minute Maid, Simply, Georgia, Dasani, Fuze Tea, Del Valle etc. [19, p. 1].

The second direction of reliability increasing is to adjust the nominal expense indicators of past periods and determine the current value of these dollar costs on the present evaluation date. Aswath Damodaran suggests performing this valuation procedure using inflation correction, illustrating the following example: the cost of $ 771 million in 1984 (calculated advertising cost of the Coca-Cola brand in the example) is indeed much larger than

the same dollar amount in 2008. In our view, it is certainly appropriate, but not sufficient. In this case, it is more appropriate, in addition to this, to use also the mathematical apparatus of the time value of money theory - namely, the method of determining the present value of past periods cash flows, with the help of a compounding operation. In determining the compounding rate by the cumulative construction method, taking into account premiums for additional risks to the base risk-free rate, the inflation rate will automatically be taken into account. Since the value of the base risk-free rate, used in calculations, necessarily must be adjusted to the inflation rate, according to the well-known Irving Fisher's method. For such a long economic life period of the intangible asset, which is considered in this paper, the application of the time value of money theory seems to be absolutely necessary – while the effect of past periods cash flows value changes in time, when they are brought to the present moment, will be very noticeable. Neglecting this procedure is only possible for very young-age trademarks, created and registered few years only before the valuation date. For them, taking into account the present value of past periods cash flows, it will not make a large difference with their present value and nominal values on dates of these expenses. Note that both of the above-mentioned potential refinements increase the obtained value of trademark capitalization.

Conclusion

The obtained results are useful for further improving of independent evaluation tools, since they provide a promising direction for further research of economic measurements errors. This, from our point of view, is a very urgent task of further methodological basis of an independent expert evaluation developing, in the direction of its informatization and algorithmization. Proposed approaches and results are the next step in the informational and metrological paradigm elements implementation into the current independent valuation practice, which is a key to improving the valuation work quality [20, p. 44].

1. At brand appraising/valuation procedure is not recommended to apply any accounting book-keeping amortization indexes, as they are not the reliable indicator of real Depreciation/Obsolescence level. The duration of intangible assets' economic life in the form of a trademark and goodwill should be determined as unlimited. According to accounting standards, such assets are not depreciated.

2. Such very special assets, under conditions of their adequate information and advertising support, demonstrate its value over time increase that is negative accumulated depreciation manifestation. The annual depreciation of this class intellectual property objects is characterized by a changeable sign, made it both positive and negative during the separate periods of economic life. This is grounded on the brand value in time changing function with alternating first derivative, with multiple annual depreciation sign changes.

3. It's recommended to use for evaluation the most relevant indicator for determining brand value, as the primary data source - the amount of trademark annual advertising costs, accumulated over the entire retrospective period from the date of trademark creation/registration, without annual asset depreciation/amortization deducting from these costs.

4. In order to reduce results errors in intellectual property objects in the form of brand and goodwill evaluating, we can recommend a procedure of optimizing the size of advertising costs part, used as initial primary data for calculations. It is shown that in the considered example of the Coca-Cola brand valuation, due to this procedure execution the obtained results estimation relative error can be reduced to less than 1%.

5. Valuation results uncertainty degree, based on most valuable worldwide brands rating lists, shows extremely high level of their absolute and relative errors [12, p. 216; 21, p. 161; 22, p. 192]. We suppose that the above mentioned methods and results of researches are the base for the further independent valuation methodology development in direction of the information and metrological paradigm wider use.

References

1. *Zlenko, S. M., Tymchyk, I. S., Tymchyk, S. V. (2012). Intelektual'na vlasnist' v naukovo-tehnichnij dijal'nosti. [Intellectual property in scientific and technical activity]. Retrieved from https://posibnyky.vntu.edu.ua/i_v/zm.htm. [in Ukrainian].*

2. *Jackevych, I. V. (2015). Ekonomichna diagnostyka: navch. posib. [Economic diagnostics]. Odes. nac.*

akad. zv'jazku im. O. S. Popova, Navch.-nauk. in-t ekonomiky ta menedzhmentu. Odesa: Bondarenko M. O., 291 pp. [in Ukrainian].

3. *Cybul'ov, P. M. (2002). Osnovy intelektual'noi' vlasnosti. [Bases of intellectual property]. Kyiv: ZAT "Instytut intelektual'noi' vlasnosti i prava", 104 pp. [in Ukrainian].*

4. *Pozdnjakov, Yu. V. (2005). The Trade mark of enterprise. Visnyk otsinky [Evaluation announcer], 1, pp. 5-22. [in Ukrainian].*

5. *Fishmen Dzhej, Pratt Shjennon, Griffit Klifford, Uilson Kejt. (2000). Rukovodstvo po ocenke stoimosti biznesa. [Guidance on business evaluation]. Trans. From Eng. L.I. Lopatnikov. Moscow: ZAO "Kvinto-konsalting", 388 pp. [in Russian].*

6. *Gordon V. Smith, Vladimir Yossifov. (2013). Monetization of copyright assets by creative enterprises. Creative Industries – Booklet No. 7. Retrieved from https://www.wipo.int/edocs/ pubdocs/ru/wipo_pub_955.pdf.*

7. *Gordon V. Smith (1999). Intellectual Property Valuation. Franklin pierce law center. Eighth Annual Advanced Licensing Institute. Retrieved from http://www.ipmall.info/sites/default/files/ hosted_resources/ALI_Presentations/ALI_1999/Pierce_Law_1999_Intellectual%20Property%20Valuation.pdf.*

8. *Aswath Damodaran. (2009). Valuing Companies with intangible assets. Retrieved from http://pages.stern.nyu.edu/~adamodar/.*

9. *Annual Report 2010 on SEC Filing Form 10-K. The Coca-Cola Company (28 February 2011). Retrieved from https://www.sec.gov/Archives/ edgar/data/21344/000104746911001506/ a2202147z10-k.htm p. 45.*

10. *Coca-Cola's brand value from 2006 to 2018 (in billion U.S. dollars). The Statistics Portal. Statistics and Studies from more than 22,500 Sources. Retrieved from https://www.statista.com/ statistics/326065/coca-cola-brand-value/.*

11. *Pozdnjakov, Ju. V., Lapishko, M. L. (2018) Trademark depreciation types influence on it's value time changes model choice. Shidna Jevropa: ekonomika, biznes ta upravlinnja [Eastern Europe: economy, business and management]. 6 (17), pp. 728–735. Retrieved from http:// www.easterneurope-ebm.in.ua/17-2018-ukr. [in Ukrainian].*

12. *Pozdnjakov, Ju. V., Sadovenko, Ju. P. (2018). Quantitative estimation of intellectual property objects evaluation accuracy. Ekonomika ta suspil'stvo [Economy and society]. 19, p. 216. [in Ukrainian].*

13. *Best global brands 2015. Interbrand. Retrieved from https://www.interbrand.com/best.../best-global-brands/2015/.../cocacola/.*

14. *Interbrand Releases: 2018 Best Global Brands Report. Interbrand. Retrieved from https:// business.financialpost.com/pmn/press-releases-pmn/business-wire-news-releases-pmn /interbrand-releases-2018-best-global-brands-report.*

15. *Sivec, S. A. (2001). Statisticheskie metody v ocenke nedvizhimosti i biznesa. [Statistical methods in the real estate and business evaluation]. Zaporozh'e. 320 pp. [in Russian].*

16. *Annual report pursuant to section 13 or 15(d) of the securities exchange act of 1934 for the fiscal year ended December 31, 2017. Retrieved from https://www.sec.gov/Archives/edgar/data/21344/00 0002134418000008/a2017 123110-k.htm p. 50.*

17. *Annual report pursuant to section 13 or 15(d) of the securities exchange act of 1934 for the fiscal year ended December 31, 2015. Retrieved from https://www.sec.gov/Archives/edgar/data/21344/00 0002134416000050/a2015 123110-k.htm p. 53.*

18. *Annual report pursuant to section 13 or 15(d) of the securities exchange act of 1934 for the fiscal year ended December 31, 2013. Retrieved from https://www.coca-colacompany.com/annual-review/2013/img/2013-annual-report-on-form-10-k.pdf p. 54.*

19. *Homenko, V. (2018). 8 samyh dorogih pishchevyh brendov v mire. [8 most expensive food brands in the world]. Agroinsajder. Retrieved from https://ru.agroinsider.com.ua /2018/06/11/19027/ [in Russian].*

20. *Markus, Ja. I., Pozdnjakov, Ju. V., Maksymov, S. J., Shalajev, V. M., Bulgakova, S. A., Zajceva, V. G., Nef'odov, O. V., Markus, V. V., Chashchyn, Ju. G., Malysheva, K. O. (2018). Control of property evaluation works quality (criticizing, examination). Praktyka ocinky majna [Practice of property evaluation], 3, 104 pp. [in Ukrainian].*

21. *Pozdnjakov, Ju. V., Sadovenko, Ju. P. (2019). Doslidzhennja funkcij gustyny rozpodilu imovirnostej vidnosnyh pohybok al'ternatyvnyh ocinok vartosti brendiv [Research of brands alternative value estimations relative errors probability distribution density functions]. Regional'na ekonomika ta upravlinnja [Regional economics and management]. No. 1 (23), pp. 161–169. [in Ukrainian].*

22. *Pozdnjakov, Ju. V., Sadovenko, Ju. P. (2018). Analiz rozbizhnostej al'ternatyvnyh ocinok vartosti nematerial'nyh aktyviv [Divergences of intangible assets evaluation alternative results analysis]. Visnyk Odes'kogo nacional'nogo universytetu. Ekonomika. [Announcer of the Odesa national university. Economy]. Vol. 23. Issue 7 (72), pp. 192–197. [in Ukrainian].*