УДК 343.9+549.8 DOI: 10.37025/1992-4437/2024-41-1-19

P. Baranov,
Dr. Sc. (Geology), Professor,
Senior Forensic Expert of Commodity, Gemological Research Department, Commodity, Gemological, Economic, Construction, Land Research and Evaluation Activities Laboratory,
Dnipro Scientific Research Forensic Center,
MIA of Ukraine
1 Tupyk Budivelnyi, Dnipro, 49033, Ukraine
ORCID: https://orcid.org/0000-0002-3367-4277
email: pn2dsbaranov@gmail.com
phone: +38(097)291-68-13
O. Slyvna,
Cand. Sc. (Geology),
Forensic Expert of Commodity, Gemological Research Department, Commodity, Gemological, Economic, Construction, Land Research and Evaluation Activities Laboratory,
Dnipro Scientific Research Forensic Center,
MIA of Ukraine
1 Tupyk Budivelnyi, Dnipro, 49033, Ukraine
ORCID: https://orcid.org/0000-0002-7063-1938
V. Korotaiev,
Cand. Sc. (Law), Associate Professor,
Head, Dnipro Scientific Research Forensic Center,
MIA of Ukraine
1 Tupyk Budivelnyi, Dnipro, 49033, Ukraine
ORCID: https://orcid.org/0000-0002-0269-0389

PRICE LISTS FOR AMBER AND THEIR SIGNIFICANCE IN MARKET AND PLANNED REGULATION OF THE ECONOMY

Abstract. This article examines the role of state price lists in both planned and market economies. State price lists regulate amber economic activity at all levels, including extraction, processing, and sale. In market economies, however, state price lists are meaningless, as the owners of deposits themselves form price lists for each specific object. The current price lists for amber in Ukraine do not include information on the main properties that determine its value, such as colour, transparency, inclusions, and quality of polishing. This lack of information makes it impossible to provide an objective and comprehensive expert evaluation of a particular sample of raw amber. Furthermore, the approved price lists are not linked to specific Ukrainian amber deposits and occurrences. The purpose of this article is to develop an algorithm for creating alternative price lists for raw amber based on real market data and to establish a database. The research methodology is based on general scientific methods such as analytical, dialectical, comparative legal, systemic and structural, comparative and evaluative, as well as special methods such as gemological, economic, integrated development environment, SQL, and C# programming languages. When creating price lists for amber products, it is common to consider the costs of raw materials, manufacturing technology, and sales. The authors propose a methodology for determining the cost of raw materials based on solving an inverse problem. Specifically, the price of raw materials required for a product is calculated based on the price of the product, which already includes the costs of manufacturing technology and sales. This approach introduces scientific novelty to the field. The methodology being considered is based on current data from the real amber market. An alternative method for forming price lists is proposed, which is also based on modern amber market data. The process of creating price lists involves several stages: identifying the product type, determining its consumer properties, establishing the cost of production and manufacturing technology, calculating the yield of usable materials, and determining the cost of raw materials. To ensure objectivity and reliability, the "Amber1" software is used. The data bank, which is created and constantly updated, along with the declarative SQL programming language, offers numerous opportunities for obtaining information on the analysis of the contemporary amber market and its pricing. The results obtained have practical significance for expert studies, research, and education in higher education. They are also relevant to

economic, financial, and gemological activities, as well as to the improvement of national legislation in law-making and law enforcement.

Keywords: amber; price list; cost; price; algorithm formation; programming languages; software; pricing properties; expert assessment.

Introduction

The current price lists for amber in Ukraine still serve regulatory functions in the economy, which does not meet modern requirements for objective and comprehensive expert evaluation. This is inconsistent with the basic principles of forensic examination. Additionally, the price lists contain ambiguous terminology, which is unacceptable in an expert assessment, and do not accurately reflect the prices of Ukrainian amber. The prices are based on European prices set by the owners of amber mining and processing enterprises. Meanwhile, the owners of amber deposits in Ukraine lack both the means and the inclination to produce their own price lists, as they are required to follow the documents (price lists) approved by the Ministry of Finance of Ukraine. Consequently, to prevent any unnecessary issues, they have opted to establish auctions.

Considering the above, professional services are compelled to create their own alternative price lists based on real data from the Ukrainian amber market to conduct a comprehensive and dependable gemological examination. To enhance the objectivity and reliability of expert evaluation of amber, the authors of this scientific article have created a computer program. The program's database offers extensive opportunities to obtain information on the analysis of the current amber market and its pricing.

Materials and methods

During the preparation of this article, a comprehensive analysis of scientific works of domestic and foreign authors was conducted, which directly or indirectly studied the issues raised in the article (in particular, Rippa, & Yang, 2017; Bredikhina, & Vasylchuk, 2020; Belichenko et al., 2021; Bilham, 2021; Pustovoitova, 2021; Belichenko et al., 2022; Dunne et al., 2022; Gierlowski, n.d.). Nevertheless, there is a lack of in-depth work on this particular focus.

The purpose of this article is the development of an algorithm for the creation of alternative price lists for raw amber on the basis of the real market of products and the creation of a database for them. The article defines the following tasks to achieve this goal: to analyse the consumer characteristics of different types of amber products (colour, weight, size, inclusions and cracks, transparency, processing quality, price); to create and fill databases based on the results of processing commercial websites on the Internet, trading platforms, domestic and foreign exhibitions; to develop an algorithm for compiling alternative price lists for raw amber based on solving the inverse problem to calculate the price of raw materials required for these products, given the prices of the products.

In order to carry out these tasks, the authors analysed the Internet resources of domestic and foreign mining, processing and trading companies for the sale of goods, promotion of online websites and shops. The main part of the work is based on the practical results of the research carried out in the last five years.

The sequence of the study is determined by the logic of setting these tasks, the current legislation and the analysis of its application.

Results and discussion

In the world practice, mining companies that carry out their economic activities in specific deposits, taking into account market realities and draw up pricelists for raw amber (*Amber Raw Buyers Directory*, n.d.; *Natural Raw Amber Price List*, n.d.; *Raw amber price index*, n.d.). The cost and income of amber extraction are influenced by various factors such as mining and geological conditions, development and extraction methods, techniques and technologies. These factors subsequently translate into specific price parameters (Bilham, 2021). The obtained value indicators are systematised into price lists for each type of raw material, depending on market needs.

In countries where the economy is regulated by the state, authorised state authorities approve price lists. In a planned economy, amber price lists are used to increase the country's mineral resource base. This mechanism is suitable for a planned economy.

Price lists are issued separately for wholesale, retail, and procurement products based on technical specifications such as technical characteristics of raw materials, products, unit of measurement, and price.

Prices for serial or mass-produced products are typically set without specifying their validity period. Retail prices are used when selling goods through state and cooperative retailers. These prices, minus trade discounts and surcharges, are used to make payments between suppliers and trading companies and organizations. Wholesale prices for production goods are used in settlements between suppliers and purchasing companies and organizations. All suppliers and trading organizations must comply with these prices.

Thus, in a planned economy, the state controls the entire process of extracting, producing, and selling

goods. This justifies the existence of permanent price lists.

Currently, the pricing process for amber in Ukraine lacks market orientation. This is because the state is responsible for expert evaluation and preparation of price lists for precious stones, organogenic stones, and semi-precious stones, as mandated by Ukrainian legislation on state regulation of mining. The State Gemological Centre of Ukraine (SGCU) is responsible for the production, use, and storage of precious metals and stones, as well as the regulation of operations involving them (*Verkhovna Rada Ukrainy [VRU]*, 1997, Lystopad 18, Pro derzhavne rehuliuvannia vydobutku, st.15, ch. 4).

This scientific budgetary institution is under the management of the Ministry of Finance of Ukraine. It is not involved in amber extraction, nor does it participate in the processes of its further technological processing and sale.

According to the Regulation on the State Gemological Centre of Ukraine (*Ministerstvo finansiv Ukrainy [MFU]*, 2004, Lypen 19, Polozhennia pro Derzhavnyi hemolohichnyi tsentr Ukrainy (nova redaktsiia), p. 3, pidp. 3.1) the institution operates as a gemological centre. Under section 3.1, one of the activities of the organisation is scientific and technical expertise, which includes the assessment of the estimated value of raw materials and finished products of precious stones.

The SGCU publishes a quarterly information and reference publication called the "Directory of Prices of Precious and Decorative Stones" (*MFU. Derzhavnyi hemolohichnyi tsentr Ukrainy*, 2021, Dovidnyk tsin) which summarises information on the dynamics of price indicators for precious stones in raw materials and products on the markets. The analysis is based on prices commonly found on the European market, which may not accurately reflect the specifics of domestic amber deposit development. Current price lists are often criticized for their lack of objectivity and general expediency.

Currently, the issue is further complicated by the illegal extraction of amber in Ukraine (Bredikhina, & Vasylchuk, 2020; Movchan et al., 2021; Pustovoitova, 2021). Therefore, the establishment of a legal framework for pricing raw amber and the creation of regulatory price lists are not in the interests of the black market.

It is important to note that engaging in illegal activities related to the extraction, sale, purchase, transfer, shipment, or processing of amber in significant quantities is considered a serious crime under Part 2 of Article 240^1 of the Criminal Code of Ukraine (Mostepaniuk, & Pavlovska, 2020). A "significant amount" should be interpreted as amber worth one hundred times or more than the tax-free minimum income of citizens. In this case, determining the value of amber is significant. Amber, in its raw, unprocessed, and processed forms, belongs to the group of precious stones of organic formation (*VRU*, 1997, Lystopad 18, Pro derzhavne rehuliuvannia vydobutku) and to minerals of national importance (*Derzhspozhyvstandart Ukrainy*, 2007, Hruden 17, Natsionalnyi klasifikator Ukrainy).

Conducting such evaluation, which is based on the principles of objectivity and completeness of research (*VRU*, 1994, Liutyi 25, Pro sudovu ekspertyzu, st. 3), is entrusted to the subjects of gemological forensic examination. The independence and validity of a forensic expert's conclusion are ensured, among other things, by criminal liability for providing a deliberately false conclusion (*VRU*, 2001, Kviten 05, Kryminalnyi kodeks Ukrainy, Article 384).

In Ukraine, the expert evaluation activities of the amber market are regulated by two main documents, the legitimacy of which is ambiguous. The first document is the "National Standard of Ukraine for Raw Amber. General technical conditions" (DSTU 8847:2019), which is purely technical in nature and establishes the basic principles of amber classification and the main requirements for storage, transportation, labelling, packaging, control and acceptance of amber, and, secondly, price lists for amber, which, as noted above, are formed by the SGCU in the bulletin "Dovidnyk tsin koshtovnoho ta dekoratyvnoho kaminnia".

At the same time, it should be noted that in connection with the reform of Ukraine's legislation on standardisation (*VRU*, 2019, Veresen 20, Pro vnesennia zmin; *Derzhavne pidpryiemstvo "Ukrainskyi naukovo-doslidnyi i navchalnyi tsentr problem standartyzatsii, sertyfikatsii ta yakosti"*, 2019, Kviten 17, Pro pryiniattia natsionalnykh standartiv), terms such as "world standards", "state standard", "technical conditions" are used to regulate legal relations in the field of state regulation of extraction production, use, storage, in particular, of precious stones and control over operations with them, are either replaced by the terms "indicator", "current legislation" or removed altogether. Therefore, it so happened that the said standard was adopted on 17 April 2019 and entered into force on 1 July 2020, and the law on "de-standardisation" (*VRU*, 2019, Veresen 20, Pro vnesennia zmin), adopted on 20 September 2019, entered into force on 16 October 2020. That is, the current law (*VRU*, 1997, Lystopad 18, Pro derzhavne rehuliuvannia vydobutku) does not provide for any standards in this area.

The main drawback of the price list, which is directly related to the expert assessment of raw amber (*MFU. Derzhavnyi hemolohichnyi tsentr Ukrainy*, 2021, Dovidnyk tsin), is the lack of connection with mining enterprises and the lack of reference to

specific Ukrainian deposits. Additionally, the price list contains terminology with double meanings or specific interpretations, which is unacceptable in an expert assessment.

Based on the current price lists, amber quality is assessed according to weight, texture, shape, surface, fissures, and inclusions. However, the terminology used in the price lists can pose challenges for experts and appraisers. The ambiguity of concepts can affect the objectivity of determining amber quality and, consequently, its value.

Consider the issue of ambiguous terminology in the aforementioned documents.

Texture. The four quality groups of amber are characterised by a massive texture (*Tekhnichnyi komitet standartyzatsii "Iuvelirna promyslovist"* (TK 186), 2019, Burshtyn-syrovyna. Zahalni tekhnichni umovy (DSTU 8847:2019). The term "massive texture" is a geological term used by producing geologists to describe dense and heavy rocks during field descriptions. Therefore, it is incorrect to use this term to describe a light gemstone. Texture, in the classical sense, refers to the pattern of a material and can be homogeneous, mottled or landscape. It should be used as a decorative term and as one of the main classifying properties.

Shape. The term "volumetric form" in geometry refers to objects that have three dimensions: length, width, and height. However, it is not appropriate to apply this term to amber as a criterion. Instead, we should use the concept of aspect ratio. For instance, an aspect ratio of 1:1:1 represents an isometric shape, 1:1:3 represents an elongated shape, and 1:2:0,2 represents a flat shape.

Surface. Raw amber does not have a smooth surface and can only be achieved through technological means. Samples of amber can have various surface textures such as rough, pitted, or cavernous, and may also have an oxidation crust.

Oxidation crust. It has been observed that Ukrainian amber is often covered with a "shirt" that can be classified into two groups: a crust of disintegrated (destroyed) amber and an oxidation film. When examining samples with an oxidation film, it is possible to make a preliminary assessment based on transparency, visible cracks, and inclusions. However, if the sample has a disintegrated crust, it is practically impossible to examine its main decorative properties and internal defects such as cracks and inclusions.

Color and transparency. All four groups of amber are described using the same criteria, including "any colour" and "from transparent to opaque". This can lead to debate over the specification of these characteristics.

Inclusions. Information about the presence of inorganic and organic inclusions in amber is given in percentage terms. At the same time, inclusions such as inclusions are not described at all, although their presence increases the value of amber many times, and sometimes tens or hundreds of times.

Thus, it is not possible to provide an objective assessment of raw amber based on the criteria provided in the price lists. Therefore, determining the real value of amber is impossible.

According to the Law of Ukraine (*VRU*, 1997, Lystopad 18, Pro derzhavne rehuliuvannia vydobutku), amber, as a precious stone of organogenic origin, should be controlled by the state, and its value should be determined by unambiguous clear regulations, similar to precious metals (*MFU*).

According to the Fond derzhavnoho maina Ukrainy (2001, Traven 21, Pro zatverdzhennia Poriadku), owners of mineral deposits (subsoil users) are required to create their own price lists for the raw materials they extract. These price lists should take into account the costs of extraction, primary processing, and sorting. This is a common practice observed worldwide.

However, Ukrainian subsoil users face pressure from government agencies, such as the SGCU, which issue price lists of unclear origin. This complicates economic relations regarding amber.

In the past, SGCU price lists were calculated based on the actual colour, weight, size, and yield of amber used in jewellery production.

According to the International Amber Association (Poland), the most valuable natural amber is that which showcases its unique colour beauty while maintaining the natural shape of the samples (Gierlowski, n.d.).

It is evident that amber pricing is influenced by factors beyond its inherent value, such as the supply and demand ratio, which is ultimately determined by the market strategy of leading amber mining and processing companies.

Therefore, amber valuation, as noted by other scholars (Belichenko et al., 2017; Belichenko et al, 2022), is a significant and pressing issue in valuation and expert activity in Ukraine. At the same time, the inconsistency in approaches to price determination necessitates the development of alternative price lists for raw amber based on data from the modern amber market (Baranov et al., 2022).

The amber market consists of two main segments: the market for products and the market for raw materials.

The product segment is well advertised (Belichenko et al., 2021; Baranov, & Slyvna, July 2023). On the commercial websites of top companies, high-quality illustrations of their product range are displayed, accompanied by information on the aesthetic features such as colour, purity, inclusions, cracks, and quality of processing. Additionally, geometric and economic characteristics such as size, weight, and cost are also provided. However, it is important to note that any claims

of healing properties of amber should be clearly marked as subjective evaluations. At the same time, sellers are guided by the preferences of different categories of buyers, particularly amber enthusiasts. These buyers consider amber products as jewels and take into account not only their cost but also their quality, origin, and naturalness. Other buyers may perceive products based on subjective evaluations such as "good – not good", "cheap – expensive", or "like – dislike", focusing on the sensual and emotional factor. However, it is important to maintain objectivity and avoid subjective evaluations unless clearly marked as such. However, the final and crucial assessment of the product for further market analysis is made by the buyer.

The segment of raw materials is not extensively advertised on the internet (*Międzynarodowe Targi Bursztynu i Biżuterii AMBERIF*, n.d.; Rippa, & Yang, 2017), but it is managed by professionals and amber experts who shape the information, advertising, and pricing policies in the amber market. With a strong understanding of technological and economic market laws, as well as quality and cost considerations for raw materials and products, individuals may be hesitant to share their expertise, prioritising business interests.

The analysis results indicate that there is no correlation between the two market segments. The available price lists do not provide a clear understanding of how the cost of raw materials is formed.

It is known that the cost of raw materials consists of the costs of exploration, production, and government fees (Bilham, 2021). Making such calculations can be challenging, particularly when there have been significant changes in the state's economy, such as a shift from planned to market regulation. Therefore, in the current business environment in Ukraine, it is nearly impossible to create price lists at a private enterprise and have them approved at the state level, as there are already legally established price lists. However, there are doubts about their objectivity and necessity. In light of this, subsoil users are compelled to engage in non-traditional amber trading through auctions, which incurs additional costs and requires time to organize. While price lists for raw materials are readily available on the internet and other trading platforms, as is common practice throughout the civilized world, they do not apply to this situation.

In this research article, the authors attempt to create alternative price lists for amber to clarify the formation of prices for raw materials. They are likely to receive criticism from extractive and processing companies and spark a broad discussion, but this is the most effective way to uncover the truth.

It should be noted that these price lists provide prices for raw materials for each type of product.

The general scheme for creating price lists is as follows: product type – consumer properties – product price – processing method – calculation of product yield – prices for raw materials.

Each type of product has specific requirements for the quality of its raw materials. These requirements include the shape, sample size, weight, and colour of the product, as well as the presence or absence of cracks and inclusions (see Table 1). These criteria are the properties of the finished products. Properties of amber are consumer properties of products (color, presence or absence of cracks, presence of inclusions) and calculations based on size and weight parameters (weight, size) and raw material prices.

Table 1

Consumer properties for specific amber products (real products on the websites of online stores)

(Etsy: amber, n.d.; *Yantar Polissia,* n.d.*)*

Products	The shape, the size, mm	Weight of the product, g	Colour	Cracks	Inclusions	Price, $
Necklace-balls	Isometric, 12	36,8	Landscape	None	None	583
Healing beads	Irregular (20x11x7)	60	Cognac	None	None	21,94
Cameos	Flat (29x18x10)	4,4	Honey	None	None	24,28
Cabochons	Oval, sphere (16x11x5)	0,55	Red	None	Single	70,95
Figurines	Elongated (50x30x31)	25,8	Honey	None	None	151,55

Table 1 shows that the initial shape of the raw amber sample is the defining property. It is ideal to have a fraction of raw materials with the required shape for manufacturing a specific product. For the manufacture of a ball, the isometric shape of raw amber samples is used. It is important to note that the size of the sample determines the number of blanks that can be produced. It is possible to make the same ball from a sample of a different shape, as long as its size allows.

For instance, a flat sample measuring 10x10x3 cm can produce 9 blanks for isometric balls measuring 3x3x3 cm, or 20 blanks for cabochons measuring 5x3x1 cm.

It is important to consider the economic justification for choosing a sample of a particular shape, as a heavier sample will be more expensive.

For instance, let's calculate the cost of raw amber needed to produce 38 beads of 12 mm and above, weighing a total of 36,8 g: 36,8 g · 3,33 = 123 g of usable material, which requires 123 g of raw material (based on a yield of 30 %). To create a single bead, 3,21 g of raw material is required (123 g/38).

If a fraction of 2 to 5 g is used, the cost of raw materials will be $22 (calculated using DSTU price lists) for one bead: 0,18 $/g · 123 g = $22; for 5 to 10 g of raw material, which can produce two beads, the cost will be $43: 0,35 $/g · 123 g = $43. And if you take one sample weighing 123 g (the cost of the 100–200 fraction is 2,94 $/g) and then make 38 blanks from it, the cost of raw materials will be 2,94 $/g · 123 g = $361.

Therefore, it is economically beneficial to select a fraction that closely matches the size and weight of the final product, at the lowest possible cost.

Table 2 shows the revised price list for raw materials based on the indicators mentioned earlier (refer to Table 1).

Table 2

Price list for raw amber for the manufacture of some products according to Table 1 (example)

Grade	Form of raw material, fraction weight, g	Weight of raw materials, g	Amber colour	Price of raw material, $/kg	Price of raw materials in the product, $	Product, size, mm
1	Isometric 3,21	123	Landscape	1460	175	Necklace-balls, 12
4	Irregular (20x11x7)	84	Cognac	180	15	Healing beads (20x11x7)
1	Flat (32x2x12)	8,8	Honey	1380	12	Cameos (29x18x10)
2	Oval, sphere (19x13x52)	1,38	Red	20 560	28	Cabochons (16x11x5)
1	Elongated (54x34x35)	64,5	Honey	940	61	Figurines (50x30x31)

Raw amber (Table 2) possesses consumer properties (Table 1) and is classified into four grades based on the presence of cracks and inclusions:

grade 1 – without cracks and inclusions;

grade 2 – umbrella cracks, single inclusions;

grade 3 refers to cracks that do not compromise the integrity of the sample, and inclusions up to 50 %;

grade 4, on the other hand, refers to cracks and inclusions that exceed 50 % of the sample.

The shape of the fraction determines the type of product, with an isometric shape being suitable for the manufacture of balls, statuettes, and other types of products, provided the size allows it.

The weight of the fraction determines the size of each type of product, taking into account the product yield. For balls, the yield is only 30 %. To calculate the weight of raw materials required to make a ball, multiply the weight of the ball by 3,33.

The current price list includes fractions and prices for weights up (mass group, g) to 2, 2 to 5, 5 to 10, 10 to 20, 20 to 50, 50 to 100, 100 to 200, 200 to 300, 300 to 500, and 500 to 1000. However, this data is not very informative for a designer or technologist, since even in small weight fractions there is a discrepancy of 5 and 10 g, which makes a big difference to the weight of the ball and its cost. For example, a 10 g sample can be used to produce a bullet almost 2 times larger than a 5 g sample. In the first case, the weight of the bullet will be 2,99 g, and in the second – 1,53 g.

The colour of amber is a consumer property inherited from the raw material. According to the results of research (Kirin et al., 2023), there are four main colours that affect the value of amber: honey, landscape, chromatic (lemon, cognac, green) and achromatic (grey-black).

These properties (primarily shape, size, weight, colour, defects) have a significant impact on the price dynamics of both products and raw materials. Colour is the leader in this regard.

The price of raw materials ($/kg) is derived from analysis and calculations based on market prices for products. It can be real, real with marketing tricks, and commission. Therefore, the most reliable information on raw material prices is available on the websites of

branded shopping centres or stores. In any case, the results demonstrate the capabilities of the approach to compiling price lists with extended information.

It should be noted that the use of such price lists requires access to the decorative properties of raw materials, i.e. amber samples should be polished and polished.

Thus, the research and the results obtained allow us to propose an algorithm for creating alternative price lists, which involves two stages.

At the first stage, a database is compiled, which includes the parameters of products and amber properties: size, weight, colour, grade, inclusions, cracks, and purity. The second stage involves calculating the weight of raw materials required for the manufacture of a particular product and the cost of these raw materials.

The "Amber1" software, developed in C#, Visual Studio, and SQL, can help solve this problem quickly (Baranov et al., 2022; Baranov et al., 2023). The basis of this software product is the principle of inheriting amber properties from the product to the raw material, which already includes the calculation of the cost of manufacturing products, the cost of its sale and the yield of usable amber. Based on the entered parameters of similar products, using the formulas written into the code syntax, a table (price list) is generated with specific amber properties and prices for specific raw materials intended for the manufacture of a particular type of product.

The sequence of compiling price lists for raw amber, which has been tested on products presented on well-known online trading platforms (Amazon, Prom, etc.), involves the following steps: obtaining information about products from an electronic resource; entering the results into the database; processing the results by the program and generating price lists for a certain type of product and raw materials for their manufacture.

The software calculates the cost and weight of raw materials, and the results are presented in the form of a ready-made table (see, for example, Table 3).

Table 3

Price list for balls according to the calculated data of the SGCU price list (example)

Settlement data (websites of online stores in Poland)					SGCU price list	
Amber grade	**Colour**	**Weight of raw materials, g**	**Price of raw material, $/kg**	**Diam, mm**	**Fraction weight, g**	**Price UA, $/kg**
1	Lemon	19	844	20	10 до 20	875
1	Lemon	25	858	23	20 до 50	1806
1	Lemon	60	1772	32	50 до 100	2366
1	Lemon	134	2361	42	100 до 200	2940
1	Honey	9,39	3623	17,14	10 до 20	875
1	Honey	15,92	4124	20,37	10 до 20	875
1	Honey	17,65	4128	21,15	10 до 20	875
1	Honey	17,75	4702	21,7	10 до 20	875
2	Lemon	22,64	371	23	20 до 50	1806
2	Black	31,3	441	25	20 до 50	1806
3	Green	11,32	510	18	10 до 20	875

With the help of certain SQL queries, you can solve a variety of market analysis tasks, i.e. the previous table can be expanded by adding the diameter of the ball, the weight of the product, the weight of the fraction from the price lists, etc.

Conclusions

The article discusses the use of state price lists in planned and market economies. In planned economies, state price lists regulate economic activity related to amber, including extraction, processing, and sale. In market economies, deposit owners create price lists for each specific object and agree on prices for both raw materials and products, making state price lists unnecessary. The current price lists for amber in Ukraine lack data on key price-determining characteristics such as colour, transparency, inclusions, and polishing quality. This omission makes it impossible to provide an objective and comprehensive expert evaluation of a particular raw amber sample. Furthermore, the approved price lists are not linked to specific Ukrainian amber deposits and occurrences, which further reduces the likelihood of a reasonable assessment.

The article presents a methodology for calculating the cost of raw materials by solving the inverse problem. This involves calculating the price of raw materials required for a product based on the product's price, which includes the costs of manufacturing technology and sales. Additionally, the author proposes an algorithm for creating alternative price lists based on data from the modern amber market. The process for creating the proposed price lists involves determining the type of product, its consumer properties, cost, and manufacturing technology, as well as calculating the yield of usable materials and the cost of raw materials. The objectivity and reliability of the results is due to the "Amber1" software, which provides a wide range of information on the analysis of the modern amber market and its pricing.

Acknowledgements

None.

Conflict of interest

None.

References

[1] Amber Raw Buyers Directory: List of Amber Raw Importers. (n.d.). *TradeWheel.com.* https://www.tradewheel.com/buyers/amber-raw/

[2] Baranov, P. M., Kirin, R. S., Korotaiev, V. M., & Slyvna, O. V. (2022). Kompiuterna prohrama "Amber1: Vyznachnyk vartosti burshtynu-syrtsiu" (avtorske pravo No 113069 vid 25.05.2022). *Biuleten "Avtorske pravo i sumizhni prava", 71*, 111 [in Ukrainian]. https://ukrpatent.org/uk/articles/bulletin-copyright

[3] Baranov, P., Korotaiev, V., & Slyvna, O. (2023). Features of pricing of amber products in modern conditions. *Forensic Herald, 2*(*40*), 68–76, 77–87. DOI: https://doi.org/10.37025/1992-4437/2023-40-2-68

[4] Baranov, P. M., & Slyvna, O. V. (2023, July 18–21). Rynok suvenirnykh zrazkiv burshtynu. In *Science and development of methods for solving modern problems*: The 28th International scientific and practical conference. Melbourne, 32–35 [in Ukrainian]. DOI: 10.46299/ISG.2023.1.28

[5] Belichenko, O. P., Ladzhun, V. I., & Tatarintseva, K. V. (2017). *Atestatsiia ta ekspertna otsinka dorohotsinnoho kaminnia orhanohennoho pokhodzhennia (burshtyn)*: navch. posib. Kyiv: DHTsU, 20 s. [in Ukrainian].

[6] Belichenko, O. P., Ladzhun, Yu. I., Tatarintsev, K. V., Haievskyi, Yu. D., Maksiuta, O. V., & Kravchenko, M. O. (2021). Suchasnyi stan ta dynamika rozvytku rynku burshtynu. *Koshtovne ta dekoratyvne kaminnia, 1*, 20–26 [in Ukrainian]. http://nbuv.gov.ua/UJRN/Ktdk_2021_1_6

[7] Belichenko, O. P., Tatarintseva, K. V., Ladzhun, Yu. I., Haievskyi, Yu. D., Maksiuta, O. V., & Kravchenko, M. O. (2022). Naukove obgruntuvannia rozroblennia ta onovlennia tekhnichnykh umov i metodychnykh dokumentiv DHTsU z atestatsii ta ekspertnoi otsinky dorohotsinnoho kaminnia, dorohotsinnoho kaminnia orhanohennoho utvorennia. *Koshtovne ta dekoratyvne kaminnia, 4*, 15–18 [in Ukrainian].

[8] Bilham, N. T. (2021). Responsible mining and responsible sourcing of minerals: opportunities and challenges for cooperation across value chains. *Geological Society, London, Special Publications, 508*, 161–186. DOI: https://doi.org/10.1144/sp508-2020-130

[9] Bredikhina, V. L., & Vasylchuk, Ya. S. (2020). Suchasni problemy pravovoho rehuliuvannia vydobuvannia burshtynu [Modern problems of legal regulation of amber mining]. *Yurydychnyi naukovyi elektronnyi zhurnal, 7*, 213–217 [in Ukrainian]. DOI: https://doi.org/10.32782/2524-0374/2020-7/54

[10] Derzhavne pidpryiemstvo "Ukrainskyi naukovo-doslidnyi i navchalnyi tsentr problem standartyzatsii, sertyfikatsii ta yakosti". (2019, Kviten 17). *Pro pryiniattia natsionalnykh standartiv, pryiniattia zminy do natsionalnoho standartu, skasuvannia mizhderzhavnoho standartu:* nakaz (No 95) [in Ukrainian]. https://zakon.rada.gov.ua/rada/show/v0095774-19#Text

[11] Derzhspozhyvstandart Ukrainy. (2007, Hruden 17). *Natsionalnyi klasyfikator Ukrainy. Klasyfikator korysnykh kopalyn (KKK) DK 008:2007* (na zaminu DK 008-96): pryiniato ta nadano chynnosti nakazom (No 357) [in Ukrainian]. https://zakon.rada.gov.ua/rada/show/va357609-07#Text

[12] Dunne, E. M., Raja, N. B., Stewens, P. P., Zin-Maung-Maung-Thein, & Zaw, K. (2022). Ethics, law, and politics in palaeontological research: The case of Myanmar amber. *Communications biology, 5*(1), 1023. DOI: https://doi.org/10.1038/s42003-022-03847-2

[13] Etsy: amber. (n.d.). *etsy.com*. https://www.etsy.com/search?q=amber&ref=auto-1&as_prefix=amber

[14] Gierlowski, W. (n.d.). The evaluation of amber gemstones. *Amberica West*. https://www.ambericawest.com/gierlowski2/

[15] Kirin, R. S., Baranov, P. M., Korotaiev, V. M., & Shevchenko, S. V. (2023). Algorithm for the formation of price lists for raw amber taking into account individual consumer characteristics. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu, 1*, 20–25.

DOI: https://doi.org/10.33271/nvngu/2023-1/020
[16] Międzynarodowe Targi Bursztynu i Biżuterii AMBERIF, 2023. (n.d.). *Amberif.* https://amberif.pl/
[17] Ministerstvo finansiv Ukrainy. Fond derzhavnoho maina Ukrainy. (2001, Traven 21). *Pro zatverdzhennia Poriadku otsinky dorohotsinnykh metaliv, dorohotsinnoho kaminnia, dorohotsinnoho kaminnia orhanohennoho utvorennia, napivdorohotsinnoho ta dekoratyvnoho kaminnia pid chas pryvatyzatsii (korporatyzatsii):* nakaz (No 242/855) [in Ukrainian]. https://zakon.rada.gov.ua/laws/show/z0494-01#Text
[18] Ministerstvo finansiv Ukrainy. (2004, Lypen 19). *Polozhennia pro Derzhavnyi hemolohichnyi tsentr Ukrainy (nova redaktsiia)*: zatv. nakazom (No 465) (u redaktsii nakazu vid 16 lypnia 2012 r. No 837) [in Ukrainian]. http://www.gems.org.ua/ua/s.php
[19] Ministerstvo finansiv Ukrainy. Derzhavnyi hemolohichnyi tsentr Ukrainy. (2021). *Dovidnyk tsin koshtovnoho ta dekoratyvnoho kaminnia, 1*(48) [in Ukrainian].
[20] Mostepaniuk, L. O., & Pavlovska, A. A. (2020). Analiz skladu zlochynu, peredbachenoho statteiu 240-1 Kryminalnoho kodeksu Ukrainy [Analysis of corpus delict, foreseen by the Article 240-1 of the Criminal Code of Ukraine]. *Visnyk Penitentsiarnoi asotsiatsii Ukrainy, 2*(12), 126–133 [in Ukrainian]. DOI: https://doi.org/10.34015/2523-4552.2020.2.12
[21] Movchan, R. O., Vozniuk, A. A., Kamensky, D. V., Dudorov, O. O., & Andrushko, A. V. (2021). Problems of criminal liability for illegal amber mining in Ukraine. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu, 6*, 113–117. DOI: https://doi.org/10.33271/nvngu/2021-6/113
[22] Natural Raw Amber Price List. (n.d.). *world-amber.com.* http://world-amber.com/natural-raw-amber-price-list/
[23] Pustovoitova, Ya. V. (2021). Problemy suchasnoho stanu protydii nezakonnomu vydobutku dorohotsinnoho kaminnia orhanohennoho utvorennia [Problems of thecurrent state of control of illegal extraction of precious stones of organogenic formation]. *Visnyk Natsionalnoho tekhnichnoho universytetu Ukrainy "Kyivskyi politekhnichnyi instytut". Politolohiia. Sotsiolohiia. Pravo, 4*(52), 68–73 [in Ukrainian]. DOI: https://doi.org/10.20535/2308-5053.2021.4(52).248143
[24] Raw amber price index. (n.d.). *Le'amber Consortium.* http://www.leamber.com/raw-amber-price-index
[25] Rippa, A., & Yang, Y. (2017). The Amber Road: Cross-Border Trade and the Regulation of the Burmite Market in Tengchong, Yunnan. *TRaNS: Trans-Regional and -National Studies of Southeast Asia, 5*(2), 243–267. DOI: 10.1017/trn.2017.7
[26] Tekhnichnyi komitet standartyzatsii "Iuvelirna promyslovist" (TK 186). (2019). *Burshtyn-syrovyna. Zahalni tekhnichni umovy [Amber in Raw Material. General technical specifications] (DSTU 8847:2019)* [in Ukrainian]. http://online.budstandart.com/ua/catalog/doc-page.html?id_doc=82574
[27] Verkhovna Rada Ukrainy. (1994, Liutyi 25). *Pro sudovu ekspertyzu [On Judicial Examination]*: Zakon Ukrainy (No 4038-XII) [in Ukrainian]. https://zakon.rada.gov.ua/laws/show/4038-12#Text
[28] Verkhovna Rada Ukrainy. (1997, Lystopad 18). *Pro derzhavne rehuliuvannia vydobutku, vyrobnytstva i vykorystannia dorohotsinnykh metaliv i dorohotsinnoho kaminnia ta kontrol za operatsiiamy* z *nymy [On State Regulation of Mining, Production and Use of Precious Metals and Precious Stones and Control over Transactions with Them]*: Zakon Ukrainy (No 637/97-VR) [in Ukrainian]. https://zakon.rada.gov.ua/laws/show/637/97-вр#Text
[29] Verkhovna Rada Ukrainy. (2001, Kviten 05). *Kryminalnyi kodeks Ukrainy [The Criminal Code of Ukraine]*: Zakon Ukrainy (No 2341-III) [in Ukrainian]. https://zakon.rada.gov.ua/laws/show/2341-14#top
[30] Verkhovna Rada Ukrainy. (2019, Veresen 20). *Pro vnesennia zmin do deiakykh zakonodavchykh aktiv Ukrainy u zviazku z pryiniattiam Zakonu Ukrainy "Pro standartyzatsiiu"*: Zakon Ukrainy (No 124-IX) [in Ukrainian]. https://zakon.rada.gov.ua/laws/show/124-20#n195
[31] Yantar Polissia. (n.d.). *Internet-mahazyn "Yantar Polissia".* https://yantar.ua/ua

List of used sources

[1] Amber Raw Buyers Directory: List of Amber Raw Importers. *TradeWheel.com.* [n.d.]. URL: https://www.tradewheel.com/buyers/amber-raw/
[2] Баранов П. М., Кірін Р. С., Коротаєв В. М., Сливна О. В. Комп'ютерна програма «Amber1: Визначник вартості бурштину-сирцю» (авторське право № 113069 від 25.05.2022). *Бюлетень «Авторське право і суміжні права»*. 2022. № 71. С. 111. URL: https://ukrpatent.org/uk/articles/bulletin-copyright
[3] Baranov P., Korotaiev V., Slyvna O. Features of pricing of amber products in modern conditions. *Forensic Herald*. 2023. No 2(40). P. 68–76, 77–87.

DOI: https://doi.org/10.37025/1992-4437/2023-40-2-68
[4] Баранов П. М., Сливна О. В. Ринок сувенірних зразків бурштину. Science and development of methods for solving modern problems : *The 28th International scientific and practical conference* (Melbourne, 18–21 July 2023). Melbourne : International Science Group, 2023. P. 32–35.
DOI: 10.46299/ISG.2023.1.28
[5] Беліченко О. П., Ладжун В. І., Татарінцева К. В. Атестація та експертна оцінка дорогоцінного каміння органогенного походження (бурштин) : навч. посіб. Київ : ДГЦУ, 2017. 20 с.
[6] Беліченко О. П., Ладжун Ю. І., Татарінцев К. В., Гаєвський Ю. Д., Максюта О. В., Кравченко М. О. Сучасний стан та динаміка розвитку ринку бурштину. *Коштовне та декоративне каміння.* 2021. № 1. С. 20–26.
URL: http://nbuv.gov.ua/UJRN/Ktdk_2021_1_6
[7] Беліченко О. П., Татарінцева К. В., Ладжун Ю. І., Гаєвський Ю. Д., Максюта О. В., Кравченко М. О. Наукове обґрунтування розроблення та оновлення технічних умов і методичних документів ДГЦУ з атестації та експертної оцінки дорогоцінного каміння, дорогоцінного каміння органогенного утворення. *Коштовне та декоративне каміння.* 2022. № 4. С. 15–18.
[8] Bilham N. T. Responsible mining and responsible sourcing of minerals: opportunities and challenges for cooperation across value chains. *Geological Society, London, Special Publications.* 2021. No 508. P. 161–186.
DOI: https://doi.org/10.1144/sp508-2020-130
[9] Бредіхіна В. Л., Васильчук Я. С. Сучасні проблеми правового регулювання видобування бурштину. *Юридичний науковий електронний журнал*. 2020. № 7. С. 213–217.
DOI: https://doi.org/10.32782/2524-0374/2020-7/54
[10] Про прийняття національних стандартів, прийняття зміни до національного стандарту, скасування міждержавного стандарту : наказ Державного підприємства «Український науково-дослідний і навчальний центр проблем стандартизації, сертифікації та якості» від 17.04.2019 № 95.
URL: https://zakon.rada.gov.ua/rada/show/v0095774-19#Text
[11] Національний класифікатор України. Класифікатор корисних копалин (ККК) ДК 008:2007 (на заміну ДК 008-96) : прийнято та надано чинності наказом Держспоживстандарту України від 17.12.2007 № 357.
URL: https://zakon.rada.gov.ua/rada/show/va357609-07#Text
[12] Dunne E. M., Raja N. B., Stewens P. P., Zin-Maung-Maung-Thein Zaw K. Ethics, law, and politics in palaeontological research: The case of Myanmar amber. *Communications biology*. 2022. No 5(1). P. 1023.
DOI: https://doi.org/10.1038/s42003-022-03847-2
[13] Etsy: amber. *etsy.com*. [n.d.].
URL: https://www.etsy.com/search?q=amber&ref=auto-1&as_prefix=amber
[14] Gierlowski W. The evaluation of amber gemstones. *Amberica West*. [n.d.].
URL: https://www.ambericawest.com/gierlowski2/
[15] Kirin R. S., Baranov P. M., Korotaiev V. M., Shevchenko S. V. Algorithm for the formation of price lists for raw amber taking into account individual consumer characteristics. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu.* 2023. No 1. P. 20–25.
DOI: https://doi.org/10.33271/nvngu/2023-1/020
[16] Międzynarodowe Targi Bursztynu i Biżuterii AMBERIF, 2023. *Amberif.* [n.d.].
URL: https://amberif.pl/
[17] Про затвердження Порядку оцінки дорогоцінних металів, дорогоцінного каміння, дорогоцінного каміння органогенного утворення, напівдорогоцінного та декоративного каміння під час приватизації (корпоратизації) : наказ Міністерства фінансів України, Фонду державного майна України від 21.05.2001 від № 242/855.
URL: https://zakon.rada.gov.ua/laws/show/z0494-01#Text
[18] Положення про Державний гемологічний центр України (нова редакція) : затв. наказом Міністерства фінансів України від 19.07.2004 № 465 (у редакції наказу від 16 липня 2012 р. № 837).
URL: http://www.gems.org.ua/ua/s.php
[19] Довідник цін коштовного та декоративного каміння / ред. А. М. Ткаленко. Київ : ДГЦУ, 2021. № 1(48).
[20] Мостепанюк Л. О., Павловська А. А. Аналіз складу злочину, передбаченого статтею 240-1 Кримінального кодексу України. *Вісник Пенітенціарної асоціації України.* 2020. № 2(12). С. 126–133.
DOI: https://doi.org/10.34015/2523-4552.2020.2.12
[21] Movchan R. O., Vozniuk A. A., Kamensky D. V., Dudorov O. O., Andrushko A. V. Problems of criminal liability for illegal amber mining in Ukraine. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu.* 2021. No 6. P. 113–117.
DOI: https://doi.org/10.33271/nvngu/2021-6/113
[22] Natural Raw Amber Price List. *world-amber.com.* [n.d.].
URL: http://world-amber.com/natural-raw-amber-price-list/
[23] Пустовойтова Я. В. Проблеми сучасного стану протидії незаконному видобутку дорогоцінного каміння органогенного утворення. *Вісник Національного технічного університету України «Київський політехнічний інститут». Політологія. Соціологія. Право.* 2021. № 4(52). С. 68–73.
DOI: https://doi.org/10.20535/2308-5053.2021.4(52).248143

[24] Raw amber price index. *Le'amber Consortium.* [n.d.].
URL: http://www.leamber.com/raw-amber-price-index
[25] Rippa A., Yang Y. The Amber Road: Cross-Border Trade and the Regulation of the Burmite Market in Tengchong, Yunnan. *TRaNS: Trans-Regional and -National Studies of Southeast Asia.* 2017. No 5(2). P. 243–267.
DOI: 10.1017/trn.2017.7
[26] ДСТУ 8847:2019. Бурштин-сировина. Загальні технічні умови. Чинний від 17.04.2019. Технічний комітет стандартизації «Ювелірна промисловість» (ТК 186), 2019.
URL: http://online.budstandart.com/ua/catalog/doc-page.html?id_doc=82574
[27] Про судову експертизу : Закон України від 25.02.1994 № 4038-XII.
URL: https://zakon.rada.gov.ua/laws/show/4038-12#Text
[28] Про державне регулювання видобутку, виробництва і використання дорогоцінних металів і дорогоцінного каміння та контроль за операціями з ними : Закон України від 18.11.1997 № 637/97-ВР.
URL: https://zakon.rada.gov.ua/laws/show/637/97-вр#Text
[29] Кримінальний кодекс України : Закон України від 05.04.2001 № 2341-III.
URL: https://zakon.rada.gov.ua/laws/show/2341-14#top
[30] Про внесення змін до деяких законодавчих актів України у зв'язку з прийняттям Закону України «Про стандартизацію» : Закон України від 20.09.2019 № 124-IX.
URL: https://zakon.rada.gov.ua/laws/show/124-20#n195
[31] Янтар Полісся. Інтернет-магазин «*Янтар Полісся*». [n.d.].
URL: https://yantar.ua/ua

The article was received by the editors 25.10.2023

П. М. Баранов,
доктор геологічних наук, професор,
старший судовий експерт відділу товарознавчих
та гемологічних досліджень
лабораторії товарознавчих, гемологічних,
економічних, будівельних, земельних досліджень
та оціночної діяльності,
Дніпропетровський науково-дослідний експертно-
криміналістичний центр МВС України
тупик Будівельний, 1, м. Дніпро, 49033, Україна
ORCID: https://orcid.org/0000-0002-3367-4277
email: pn2dsbaranov@gmail.com
тел.: +38(097)291-68-13
О. В. Сливна,
кандидат геологічних наук,
судовий експерт відділу товарознавчих
та гемологічних досліджень
лабораторії товарознавчих, гемологічних,
економічних, будівельних, земельних досліджень
та оціночної діяльності,
Дніпропетровський науково-дослідний експертно-
криміналістичний центр МВС України
тупик Будівельний, 1, м. Дніпро, 49033, Україна
ORCID: https://orcid.org/0000-0002-7063-1938
В. М. Коротаєв,
кандидат юридичних наук, доцент,
директор, Дніпропетровський науково-дослідний
експертно-криміналістичний центр МВС України
тупик Будівельний, 1, м. Дніпро, 49033, Україна
ORCID: https://orcid.org/0000-0002-0269-0389

ПРЕЙСКУРАНТИ НА БУРШТИН, ЇХ ЗНАЧЕННЯ В РИНКОВОМУ ТА ПЛАНОВОМУ РЕГУЛЮВАННІ ЕКОНОМІКИ

Анотація. У науковій статті розглянуто роль державних прейскурантів у планових (регулюють господарську діяльність бурштину на всіх рівнях – видобуток, перероблення та реалізація) і ринкових (державні прейскуранти не мають сенсу, немає потреби в їх створенні, оскільки власники родовищ самі формують прайс-листи для кожного конкретного об'єкта) економіках. В Україні чинні прейскуранти на бурштин не містять даних про основні цінотвірні властивості (колір, прозорість, наявність включень та інклюз, якість полірування), що не дає змоги дати об'єктивну та повну експертну оцінку конкретному зразку бурштину-сирцю. Крім того, затверджені прейскуранти не прив'язані до конкретних українських родовищ і проявів бурштину. Тому метою статті є розроблення алгоритму складання альтернативних прейскурантів на бурштин-сирець на основі реального ринку виробів, формування банку даних. В основу методологічних досліджень покладено загальнонаукові (аналітичний, діалектичний, порівняльно-правовий, системно-структурний, порівняльно-оцінний) і спеціальні (гемологічний, економічний, комплексне інтегроване середовище розроблення, мови програмування SQL, C#) методи. З огляду на те, що, створюючи прейскуранти на вироби з бурштину, зазвичай зважають на витрати на сировину, технологію виготовлення та реалізацію, наукова новизна полягає в тому, що автори запропонували методику визначення вартості сировини на основі розв'язання оберненої задачі, тобто ґрунтуючись на ціні виробу, у якій вже передбачено витрати на технологію його виготовлення та реалізацію, розраховується ціна сировини, необхідної для цього виробу. В основу розглянутої методики покладено сучасні дані реального ринку бурштину. Запропоновано альтернативний варіант формування прейскурантів, в основу яких також покладено дані сучасного ринку бурштину. Алгоритм створення прейскурантів складається з таких етапів: визначення виду виробу, визначення його споживчих властивостей, встановлення вартості виробу і технології його виготовлення, розрахунок виходу придатного та визначення вартості сировини. Об'єктивність та надійність результатів зумовлено програмним забезпеченням "Amber1". Створений та постійно поповнюваний банк даних, а також декларативна мова програмування SQL передбачають широкі можливості для отримання інформації в галузі аналізу сучасного ринку бурштину та його ціноутворення. Практична значущість здобутих результатів полягає в можливості їх використання під час експертних досліджень, а також у науково-дослідній і навчальній діяльності науковцями та здобувачами вищої освіти, у господарській і фінансово-економічній діяльності суб'єктів гемологічних

відносин, у правотворчій і правозастосовній діяльності органів державної влади у процесі вдосконалення національного законодавства.

Ключові слова: бурштин; прейскурант; вартість; ціна; алгоритм формування; мови програмування; програмне забезпечення; цінотвірні властивості; експертна оцінка.