

Prospects for Determining the Market Value of Combat Small Arms Based on the Data of Purchase and Sale Agreements in Ukraine

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Development and resolution of an expert task in the course of a forensic commodity examination of military property, equipment, and weapons should be aligned with the requirements for property valuation in Ukraine. The Article's Purpose is to determine the cost of weapons (which is always complicated by the lack of information and legal uncertainty of the market functioning) by analyzing agreements concluded as a result of the procedures for completed public procurement of pistols (general scientific and special methods are employed for this purpose). It has been proven that there is a market for combat small arms in Ukraine. The market participants have been identified and the mixed structure of imperfect competition has been outlined. The similarity of the small arms market in Ukraine to similar arms markets in developed countries has been traced. Having studied the procedure for calculating the residual value of weapons based on the accounting data of institutions and organizations, the author reveals the inconsistency of such valuation procedures with the methodological guidelines established by the legislation. Utilizing research tools for international economic analysis, the article pinpoints the origin of the

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non-market component in the cost of weapons under agreements concluded in the international market, which includes political and protectionist factors and fails to reflect the ratio of supply and demand for the object of valuation in Ukraine. It is recommended that the market value of weapons in Ukraine be determined according to information from completed agreements. To obtain initial price information on completed small arms purchases, it is suggested to use open information from ProZorro.

Keywords: small arms; forensic commodity examination; weapon valuation; residential value; market value; international market.

Research Problem Formulation

Currently, the need to objectively and timely determine the value (valuation) of property is becoming more acute, which is mandatory, specifically for calculating the amount of damage inflicted (subpara. 10, Part 2, Article 7 of the Law of Ukraine *On Appraisal of Property, Property Rights, and Professional Appraisal Activity in Ukraine*).¹, hereinafter referred to as the Law *On Appraisal of Property*). After the beginning of the Russian armed aggression in 2014, Ukraine has faced the need to respond to new military-political and economic threats. Meanwhile, we observe a significant complication of tasks and an increase in requirements for forensic support of law enforcement activities. Since then, one of the priority areas of foren-

sic commodity examination has been the study of military objects.

In response to the above challenges, the Ministry of Justice of Ukraine has classified the forensic examination of military property, equipment, and weapons as a commodity forensic examination since July 31, 2015². Among the objects of study in this area are combat small arms. One of the principal tasks of the new type of forensic examination is to determine the value of objects used as military property³.

Methodological support for valuing all property types by forensic experts must be carried out under the provisions of Part 4, Article 4 of the Law *On Appraisal of Property*⁴, i.e. using the procedures stipulated by regulatory legal acts on property valuation. However, in contrast to valuing

- 1 Про оцінку майна, майнових прав та професійну оціночну діяльність в Україні : Закон України від 12.07.2001 р. № 2658-III (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/2658-14#Text> (date accessed: 16.10.2024).
- 2 Зміни до Інструкції про призначення та проведення судових експертиз та експертних досліджень : затв. наказ. Мін'юсту України від 27.07.2015 р. № 1350/5. URL: <https://zakon.rada.gov.ua/laws/show/z0915-15#n329> (date accessed: 16.10.2024).
- 3 Науково-методичні рекомендації з питань підготовки та призначення судових експертиз та експертних досліджень : затв. наказ. Мін'юсту України від 08.10.1998 р. № 53/5 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/z0705-98#Text> (date accessed: 16.10.2024).
- 4 Про оцінку майна ... URL: <https://zakon.rada.gov.ua/laws/show/2658-14#Text> (date accessed: 16.10.2024).

other property types, the process of determining the value of weapons has a number of significant information issues due to both the characteristics of weapons as objects of forensic examination and the specifics of transferring weapon ownership. Along with the lack of information, a substantial drawback in this area is the legal uncertainty of the procedure for alienating weapons in Ukraine.

Under such conditions, it is impossible to use separate approaches, methods, and valuation procedures to determine the cost of weapons. The search for ways to solve the specified issue has resulted in a compromise manifested as a commodity study based on accounting data (determination of residual value) or using agreements in the international market (determination of market value relying on agreements outside state jurisdiction).

Even with the availability of the required information base, we should state that these decisions also have shortcomings that can call into question forensic examination results. Therefore (in view of the need for an objective and reliable valuation of weapons, the availability of practical experience in this area, and the ability to distinguish information based on agreements in the Ukrainian domestic market), scientific rationale for the expert task of determining the value of weapons

is one of the priority tasks of expert support to justice.

Analysis of Essential Researches and Publications

Since forensic commodity examination of military property, equipment, and weapons was introduced not so long ago, its scientific development is still at the stage of formation. In a previous research paper ⁵ we emphasized that combat small arms differ fundamentally from consumer goods in terms of cost formation factors, while the application of existing methodological approaches is challenging and markedly complex.

What is more, there are developments of specialists from specialized institutions that are essential for valuation procedure application. Thus, various researchers have suggested a procedure for a multidisciplinary comparative valuation of weapons and military equipment samples using the criterion of “technical excellence – cost – resource” to select the optimal equipment option ⁶; approach to justifying the choice of a comparative analysis method for assessing the technical level of complex technical systems for military purposes ⁷; algorithm for measuring weapon characteristics by constructing

5 Дивнич А. В., Стативка Д. И., Дивнич О. Д. Проблемные аспекты экспертной оценки снятого с производства боевого стрелкового оружия. *Армянский журнал судебной экспертизы и криминалистики*. 2020. № 4. С. 81–88. URL: http://journal.nbe.am/wp-content/uploads/2020/12/Amsagir_042_2020_for-web.pdf (date accessed: 16.10.2024).

6 Нор П. І., Борохвостов І. В. Методика комплексної порівняльної оцінки зразків озброєння та військової техніки. *Озброєння та військова техніка*. 2016. № 3 (11). С. 14–18. URL: http://nbuv.gov.ua/UJRN/ovt_2016_3_4 (date accessed: 16.10.2024).

7 Павленко А. Г. Підхід до обґрунтування вибору методу порівняльного аналізу для оцінки технічного рівня складних технічних систем військового призначення. *Збірник наукових праць Державного науково-дослідного інституту випробувань і сертифікації озброєння та військової техніки*. 2019. Т. 1. № 1. С. 135–142. URL: <https://dndivsovt.com/index.php/journal/article/view/202> (date accessed: 16.10.2024).

a fuzzy valuation model⁸; calculation ratios for estimating the cost of an anti-aircraft missile system at different stages of its life cycle using costing⁹ and the calculation of the cost price for importing property and military-purpose equipment and weapons¹⁰; mathematical model of cost by calculating the combat effectiveness of valuation objects;¹¹ estimation of a unit value of maintenance using the example of unmanned aircraft systems¹²; practical application of the hierarchy analysis method when assessing the technical level of military equipment models¹³, and the development of a methodology for disaggregating complex technical systems and their characteristics to assess the quality of weapons and military equipment¹⁴. These research papers can prove useful in determining the utility parameters

of a forensic object, for example, using a comparative approach.

Let's stress that adequate application of principles, methodological approaches, and valuation procedures when valuing a specific forensic examination object is directly related to a forensic commodity examination. The forensic expert is personally responsible for ensuring its reliability (Article 14 of the Law On Forensic Examination¹⁵). At the same time, the developments of specialists from specialized military institutions reveal military-economic analysis of weapons and military equipment samples and are aimed primarily at comparative analysis when making a choice among several acquisition options. Although they use a comparative approach, the market value is one of the set values (output parameters). In addition, the objective of the

- 8 Білокур М. О. Функціональне відображення значень ваг в штучній нейронній мережі визначених властивостей при оцінюванні альтернативних зразків озброєння. *Озброєння та військова техніка*. 2020. № 2. С. 20—31. URL: http://nbuv.gov.ua/UJRN/ovt_2020_2_4 (date accessed: 16.10.2024).
- 9 Ланецький Б. М., Лук'янчук В. В., Ніколаєв І. М., Зубарев О. В. Методичний підхід до оцінювання вартості зенітного ракетного комплексу на різних стадіях життєвого циклу. *Озброєння та військова техніка*. 2021. № 3. С. 12—20. URL: http://nbuv.gov.ua/UJRN/ovt_2021_3_3 (date accessed: 16.10.2024).
- 10 Борохвостов В. К., Рябець О. М., Сушак М. Б. Питання формування ціни на продукцію військового призначення, що закуповується за імпортом. *Озброєння та військова техніка*. 2016. № 3. С. 8—13. URL: http://nbuv.gov.ua/UJRN/ovt_2016_3_3 (date accessed: 16.10.2024).
- 11 Науменко М. Удосконалена математична модель вартості багатоцільових тактичних винищувачів. *Системи озброєння і військова техніка*. 2021. № 1 (65). С. 98—106. DOI: [10.30748/soivt.2021.65.14](https://doi.org/10.30748/soivt.2021.65.14) (date accessed: 16.10.2024).
- 12 Леженін С. І., Стещенко П. М. Методичні особливості оцінювання фінансових витрат у системі вибору альтернативних зразків безпілотних авіаційних комплексів військового призначення. *Збірник наукових праць Державного науково-дослідного інституту авіації*. 2016. Вип. 12. С. 102—108. URL: http://nbuv.gov.ua/UJRN/Znpdndia_2016_12_18 (date accessed: 16.10.2024).
- 13 Романчук Я. П., Сокіл Б. І., Баранов А. В. Використання методу аналізу ієрархій для оцінювання технічного рівня військових автокранів. *Озброєння та військова техніка*. 2021. № 2. С. 35—43. URL: http://nbuv.gov.ua/UJRN/ovt_2021_2_6 (date accessed: 16.10.2024).
- 14 Чуприна В. М., Чередніков О. М., Феденько В. М. Застосування методів декомпозиції при випробуваннях складної військової техніки. *Збірник наукових праць Державного науково-дослідного інституту випробувань і сертифікації озброєння та військової техніки*. 2023. Т. 16. № 2. С. 97—102. DOI: [10.37701/dndivsovt.16.2023.14](https://doi.org/10.37701/dndivsovt.16.2023.14) (date accessed: 16.10.2024).
- 15 Про судову експертизу : Закон України від 25.02.1994 р. № 4038-XII (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/4038-12#Text> (date accessed: 16.10.2024).

analysis is to determine the optimal choice in terms of price / quality criteria. Such market value is either applied as a constant or as a compounding procedure that does not observe the principle of supply and demand as of the valuation date.

Peculiarities of conducting a forensic examination to determine the value of weapons were outlined by V. Bondar ¹⁶ for the first time in domestic industry-specific scientific periodicals (concerning the compliance of the existing information base with the methodological approaches envisaged by national valuation standards). This study justifies the reason for determining the residual value of military property, equipment, and weapons, as well as the possibility of estimating the market value based on international market data.

There is no scientific research on the possibility of determining the market value of small arms based on the data of purchase and sale agreements in Ukraine.

Thus, the scientific development in the field of forensic commodity examination of small arms is still insufficient and requires further development.

Article Purpose

Trace the formulation of an expert task for valuing weapons in Ukraine, study available expert capabilities and prerequisites for current forensic practice.

Providing the example of published agreements for the supply of short-barreled small arms, empirically test possibilities of tackling the information gap in the domestic national market to conduct forensic commodity examinations. Charac-

terize the market participants and summarize its structure.

Critically analyze each of the options for determining the value that are practiced today. Delve into the nature and procedure for estimating the residual value of small arms. Establish the degree to which it corresponds to the real value in monetary terms. Employing research tools of international economic analysis, compare the factors determining the cost of weapons in international markets with the established definition of market value according to the national valuation standard.

Research Methods

General scientific (analysis, synthesis, generalization, description, observation, etc.) and special methods have been applied, specifically international economic analysis tools.

Main Content Presentation

As of today, there are no special legal regulations governing the process of valuing weapons in observance of national standards. Therefore, when solving the issues addressed by the forensic commodity examination of military property, equipment, and weapons regarding determining its value, one should use the general principles for property valuation.

The approximate list of questions addressed by the forensic commodity examination of military property, equipment, and weapons has been supplemented with the following:

16 Бондар В. М. Визначення вартості майна і техніки військового призначення та озброєння. *Криміналістика і судова експертиза*. 2016. Вип. 61. С. 440—450. URL: <https://digest.kndise.gov.ua/wp-content/uploads/2021/06/2016.pdf> (date accessed: 16.10.2024).

- “What is the residual value of an object as of a certain date?”¹⁷;
- “What is the object’s market value of a certain date (considering information provided to the forensic expert regarding purchase and sale agreements for similar objects concluded in the international market)?”¹⁸.

The prerequisite for determining the value as the “equivalent of the valuation object’s cost”, which “is reflected in the probable amount of money”, that is, in “the largest amount of money that the seller can receive and the buyer can agree to pay” (paragraphs 2 and 3 of National Standard No. 1 *General Principles of Valuation of Property and Property Rights*, hereinafter referred to as *National Standard No. 1*)¹⁹, is exchange. Invariance of value estimates can be achieved by adding to the sample agreements that are concluded with the fulfillment of basic conditions:

- absence of exchange restrictions;
- free (“uncoerced”) expression of the will of the parties to an agreement;
- based on the optimality of the agreement according to the criteria for adequate professionalism (“with knowledge of the matter”) of parties’ representatives, expediency (“prudence”) of the agreement, and awareness of the market situation (“after conducting appropriate marketing”).

All other juristic acts in which these conditions are not met usually take into account the influence of third-party (non-market) incentives resulting in a shift in valuations. That is why the market va-

lue of a valuation object, provided that the sample of agreements used in the course of valuation is representative, is the most objective measure of its value.

In view of the above, we examined the agreements concluded as a result of completed public procurement procedures in Ukraine from 27.07.2015 (dates of amendments)²⁰ to 30.06.2024: all published purchases of short-barreled combat small arms (220 tenders with the status of completed procurements, with the indicated current contract amount of UAH 68,368,437.65), belonging to the commodity group ДК 021:2015:35320000-3 *Firearms* (search by lots using the descriptor “pistol”).

It should be pointed out that here we are only studying the existence of facts of concluding and executing arms purchase and sale agreements, data on which are suitable for consideration in the course of forensic examinations. Therefore, we have not separately considered information about the volume of purchases under the agreements.

Procedures with hidden information (with the announcement *Temporarily concealed so that the invaders would not spy*), as well as those that did not contain information about the subject of procurement or did not have an electronic copy of the contract made public, have not been analyzed. The sample includes 79 procurements, including those executed under the following terms:

- public tenders – 24 (including public tenders with peculiarities, pub-

17 Науково-методичні рекомендації URL: <https://zakon.rada.gov.ua/laws/show/z0705-98#Text> (date accessed: 16.10.2024).

18 Там само.

19 Національний стандарт № 1 «Загальні засади оцінки майна і майнових прав»: затв. пост. КМУ від 10.09.2003 р. № 1440 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/1440-2003-п#Text> (date accessed: 16.10.2024).

20 Зміни до Інструкції URL: <https://zakon.rada.gov.ua/laws/show/z0915-15#n329> (date accessed: 16.10.2024).

lic tenders with publication in English);

- sub-threshold procurements – 2;
- procurement without the use of the electronic system (basic) – 24;
- negotiation procedure – 15;
- simplified procedure – 14.

We should note the comparison of the results of public procurement with the usual market conditions. Peculiarities of budget expenditures should be considered. These include, first of all, the general (with some exceptions) prohibition of prepayments (Part 1 of Article 49 of the Budgetary Code of Ukraine ²¹), long payment terms, etc.

The analyzed agreements meet all the conditions of market turnover. The business transaction of purchase and sale envisages that the party (a seller) shall transfer or take an obligation to transfer property (goods) into possession of the other party (a buyer) and the buyer shall accept or take an obligation to accept the property (goods) and to pay a certain amount of money for it (Part 1, Article 655 of the Civil Code of Ukraine ²²). If such an operation is technically possible, economically feasible, and permitted, it observes the principle of “most efficient use”, which should also be borne in mind when determining

the object’s market value (paras. 10 and 13 of National Standard No. 1 ²³). Despite some legal uncertainty and the lack of key principles governing arms trafficking in Ukraine ²⁴, which raises some doubts about the implementation of the *permissibility* criterion ²⁵, representatives of a certain range of subjects (e.g., executors of the state defense procurement contract) are authorized to carry out such business transactions under the Law of Ukraine *On Defense Procurement* ²⁶.

In light of the above-mentioned legal restrictions on the purchase of weapons, we have identified groups of buyers of pistols based on the procedures of completed public procurements: units of the National Police of Ukraine (NP) – 37 agreements; the National Anti-Corruption Bureau of Ukraine (NABU) – 18 agreements; branches of JSC *Ukrzaliznytsia* (UZ) – 9 deals; educational institutions (EIs) – 8 agreements; critical infrastructure enterprises (excluding JSC *Ukrzaliznytsia* and post offices) (CIE) – 2 agreements; national postal operator (Ukrposhta/UP) – 2 agreements; units of the State Administration of Affairs (SAA), the Security Service of Ukraine (SSU) and the Specialized Scientific and Production Association (SSPA) – 1 agreement each (see Fig. 1).

21 Бюджетний кодекс України від 08.07.2010 р. № 2456-VI (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/2456-17#Text> (date accessed: 16.10.2024).

22 Цивільний кодекс України від 16.01.2003 р. № 435-IV (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/435-15#Text> (date accessed: 16.10.2024).

23 Національний стандарт № 1 URL: <https://zakon.rada.gov.ua/laws/show/1440-2003-n#Text> (date accessed: 16.10.2024).

24 Літошко В. В. Правове регулювання обігу вогнепальної зброї в Україні: проблеми та перспективи *Нове українське право. Спецвипуск*. 2022. Т. 2. С. 36–41. DOI: 10.51989/NUL.2022.6.2.5 (date accessed: 16.10.2024).

25 Соколов О. С. Перспективи реформування українського законодавства у сфері обігу зброї з урахуванням положень європейських правових актів. *Вісник Луганського державного університету внутрішніх справ імені Е. О. Дідоренка*. 2019. Вип. 4 (88). С. 147–157. DOI: 10.33766/2524-0323.88.147-157 (date accessed: 16.10.2024).

26 Про оборонні закупівлі : Закон України від 17.07.2020 р. № 808-IX (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/808-20#Text> (date accessed: 16.10.2024).

Each of these buyers, as an independent budget holder, concluded an agreement or had the opportunity to purchase from several sellers during the analyzed period (National Research and Production Association *Fort* of the Ukrainian Ministry of Internal Affairs, *Ibis* LLC, *Tactical Systems* LLC, *Everford* LLC, *Strelchuk O. M. IE*, *Europe Arm Sport* LLC, *Phobos* PE). Such a decentralized structure of arms supply has been formed in developed countries as well. For instance, in the United States, which is a leader in the arms trade, procurement is carried out by the individual military services within the Department of Defense. Each service has its own budget ²⁷.

The diagram of trade relations shown in Fig. 1 indicates that Ukraine also faces a common scenario where there are few buyers and many sellers: oligopsony.

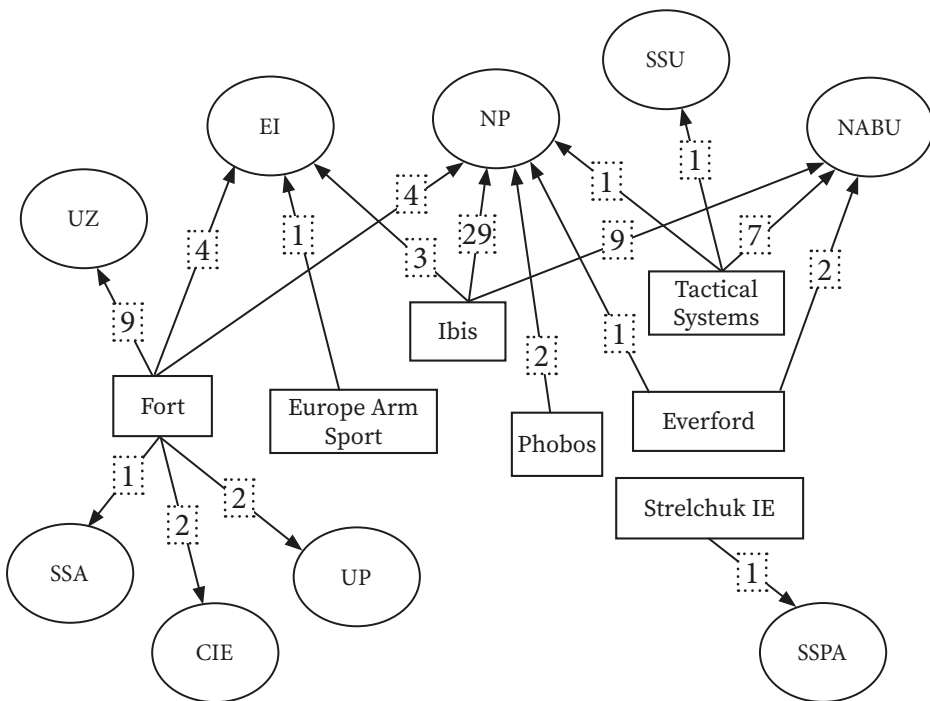


Fig. 1. Relations between buyers and sellers for the supply of combat small arms (using the example of pistols) in Ukraine (31.07.2015 – 30.07.2024) ²⁸

At the same time, a more careful analysis of business transactions demonstrates that the modal value of the number of sellers (in the terminology of the *ProZorro* platform:

²⁷ Ткач І., Синявський В., Яковчук Є., Рудий М., Корчицький В., Сергієнко Р. Аналіз міжнародного досвіду з організації системи державних закупівель озброєння та військової техніки. *Social Development and Security*. 2021. Т. 11. № 2. С. 178–197. DOI: [10.33445/sds.2021.11.2.16](https://doi.org/10.33445/sds.2021.11.2.16) (date accessed: 16.10.2024).

²⁸ Developed by the authors based on the analysis of data from the electronic platform ProZorro: See Модуль аналітики bi.prozorro.org. 12.1. Етап закупівель (всі роки). URL: <https://bi.prozorro.org/sense/app/2595af2b-985f-4771-aa36-2133e1f89df0/overview> (date accessed: 16.10.2024).

“unique lot participants”) was one. That is, oftentimes only one potential participant responds to one purchase offer.

Additionally, the above-mentioned short list of sellers met the needs of almost all buyer groups covered by the study. For instance, the State Research and Production Association *Fort* executed almost 28% of orders, the largest importer *Ibis* LLC – almost 52% (the number of completed purchases in Fig. 1 is indicated by the arrows denoting completed business transactions) corresponding to an oligopolistic market structure.

Let's note that in developed countries, there is also the problem of significant market and political power held by arms manufacturing companies through their interaction with government organizations²⁹.

Therefore, using the example of summarized agreements for the supply of short-barreled weapons (pistols), it can be concluded that there is a hybrid market form characteristic of the arms markets of most developed countries³⁰.

The block diagram of weapons supply, even taking into account only partial disclosure of information in open sources, is sufficient evidence for the existence of a national market for combat small arms characterized by oligopolistic and oligopsonic dynamics.

Conclusions about the characteristics of these market segments can also be drawn from the forensic examination of materials containing information about agreements on other types of weapons.

Despite the available information on the domestic arms market, the prevailing view today is that market transformation in the domestic arms industry is inadequate³¹. Arguments about the inadequacy of modern market infrastructure limit the possibilities of forensic examination of weapons to the post-Soviet practice of determining indicators of the so-called residual value, as well as market value. However, this is done within the framework of agreements on the international market.

Issues of applying the indicator of weapon residual value

The “residual value” term (sometimes also called *book value/carrying value*) is inherited from the administrative-command economy of the former USSR: it means the difference between the initial cost of an object and the amount of its wear. This concept is still leveraged today, for example, in tax accounting. From out perspective, the main problem in defining and further applying the residual value indicator is the following:

- *first*, by failing to take into account the supply/demand ratio for similar new properties in relation to the valuation object at the time of valuation. Usually, the initial cost is considered as a constant value that does not change from the date of registration;
- *secondly*, in determining the amount of wear and tear of the object not in accordance with the actual change in

29 Smith R. P. Defence Acquisition and Procurement: How (Not) to Buy Weapons. Cambridge University Press, 2022. 84 p. DOI: 10.1017/9781009189644 (date accessed: 16.10.2024).

30 Adams W., Adams W. J. The Military-Industrial Complex: A Market Structure Analysis. *The American Economic Review*. 1972. Vol. 62. № 1/2. Pp. 279–287. URL: <http://www.jstor.org/stable/1821553> (date accessed: 16.10.2024).

31 Гулятьєв А. А., Сіренко В. Є., Чернега М. А. Проблеми ціноутворення на продукцію військового призначення та можливі підходи до їхнього розв'язання *Озброєння та військова техніка*. 2017. № 4. С. 11–19. URL: http://nbuv.gov.ua/UJRN/ovt_2017_4_3 (date accessed: 16.10.2024).

its utility, but in conformity with the ratios (percentages of the initial cost) established by legal regulations.

Thus, the Methodology for Determining the Residual Value of the Property of the Armed Forces of Ukraine and Other Military Units (hereinafter referred to as the *Methodology for Determining*)³² outlining the calculation of the cumulative wear-and-tear of weapons according to the storage conditions, level of operation, and actual quality of an object is still in use today. However, only the use of the quality condition coefficient allows, to some extent, for the adjustment of the wear and tear on weapons based on their actual technical condition.

We can clearly point out that the above factors are multicollinear, and their unidirectional influence can either amplify or dampen the response of the dependent cost variable to changes in a particular attribute. What is more, we have already stressed³³ that assuming the same weight (significance) of such factors can lead to almost the same value of the cumulative wear index (CWI):

- 1) an object with “current” storage, 21 years of operation, but with minimal allowable rounds and in excellent technical condition (CWI = 0.72);

- 2) an object after “long-term” storage, 1 year of operation, and with maximum allowable rounds and uninterrupted operation (CWI = 0.7).

That is, the impact of the accumulated error in this method of calculating the residual value significantly distorts valuation results and does not reflect the actual value of the object under study. An example of this practice is court decisions, which demonstrate that the book / residual value of identical small arms samples from the same category varies substantially (see Table).

It should be emphasized that the Methodology for Determining³⁴ considers the possibility of using the purchase price of military property in the past as the cost of its replacement / reproduction. In this case, the residual value calculated under the Methodology for Determining³⁵ contradicts the concept of residual replacement / reproduction value set forth in clause 3 of National Standard No. 1³⁶, according to which the costs of reproduction / replacement should be determined on the date of valuation considering market prices (paragraph 15). Therefore, the results of such a valuation of weapons do not meet the requirements of Article 9 of the Law on Property Valuation³⁷. An analysis of the

32 Методика визначення залишкової вартості майна Збройних Сил України та інших військових формувань : затв. пост. КМУ від 29.05.1998 р. № 759 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/759-98-%D0%BF#Text> (date accessed: 16.10.2024).

33 Дивнич А. В., Статівка Д. І. Узгодження впливу параметрів корисності у моделі вартості стрілецької вогнепальної зброї. *Сучасне матеріалознавство та товарознавство: теорія, практика, освіта* : мат-ли VII Міжнар. наук.-практ. інтернет-конф. (Полтава, 12–13.03.2020). Полтава, 2020. С. 75–78. URL: http://dspace.puet.edu.ua/bitstream/123456789/8517/1/Конф_Сучас_матеріалозн_2020.pdf (date accessed: 16.10.2024).

34 Методика визначення ... URL: <https://zakon.rada.gov.ua/laws/show/759-98-%D0%BF#Text> (date accessed: 16.10.2024).

35 Там само.

36 Національний стандарт № 1 ... URL: <https://zakon.rada.gov.ua/laws/show/1440-2003-п#Text> (date accessed: 16.10.2024).

37 Про оцінку майна ... URL: <https://zakon.rada.gov.ua/laws/show/2658-14#Text> (date accessed: 16.10.2024).

information published in the Unified State Register of Court Decisions ³⁸ has shown that courts, when adopting their decisions, often do not indicate the type of costs on the basis of which the weapons were valued, or the document (expert conclusion, official memorandum, etc.) confirming their cost.

Examples of courts applying the residual and book values of small arms samples

Information source	Price, UAH/unit	Object name, quantity
<i>Examples of residual value application</i>		
Judgment of the Voznesenskyi City District Court of the Mykolaiv Region dated 14.03.2012 in case No. 1407/1 –14/11	87,05	Nagant revolver, 7.62 mm caliber, Category 5 (139 units)
	111,17	TT pistol, 7.62 mm caliber, Category 5 (137 units)
	127,06	TT pistol, 7.62 mm caliber, Category 4 (75 units)
	134,38	PM pistol, 9 mm caliber, Category 4 (98 units)
	179,17	PM pistol, 9 mm caliber, Category 4 (49 units)
	156,77	PM pistol, 9 mm caliber, Category 4 (102 units)
	201,56	PM pistol, 9 mm caliber, Category 4 (1 unit)
	880,70	Walther PP, 7.65 mm caliber, Category 5 (36 units)
	867,37	Walther PP, 9 mm caliber, Category 5 (25 units)
	945,94	Mauser pistol, 7.63 mm caliber, Category 5 (23 units)
	293,57	Mauser pistol, 7.65 mm caliber, Category 5 (9 units)
	708,29	Colt pistol, 11.43 mm caliber, Category 5 (19 units)
	1118,35	Parabellum pistol, 9 mm caliber, Category 5 (22 units)
	1144,71	APS pistol, 9 mm caliber, Category 4 (1 unit)
	671,90	PSM pistol, 5.45 mm caliber, Category 4 (3 units)
	3979,95	SVDN rifle, 7.62 mm caliber, Category 5
	4238,86	SVDN-2 rifle, 7.62 mm caliber, Category 5
	3452,59	SVD rifle, 7.62 mm caliber, Category 4 (3 units)
	297,22	AKMS rifle, 7.62 mm caliber, Category 4 (2 units)
	254,76	AKMS rifle, 7.62 mm caliber, Category 4 (3 units)
	457,25	AKS-74U rifle, 5.45 mm caliber, Category 4 (4 units)
	1540,27	MG-42 machine gun, 7.92 mm caliber, Category 2
Judgment of the Apostolivskyi District Court of Dnipropetrovsk Region dated 05/26/2022 in case No. 171/606/22	6260,84	AKS-74 rifle
<i>Example of book value application</i>		
Ruling by the investigating judge of the Zavodsky District Court of Mykolaiv dated 06/10/2022 in case No. 487/1723/22	216,00	PM pistol with 2 mags

38 Єдиний державний реєстр судових рішень : офіц. сайт. URL: <https://reyestr.court.gov.ua/> (date accessed: 16.10.2024).

The decisions (*see Table*) showing the residual and book value of weapons in cases of theft and loss of military property disregard paragraph 2 of the Procedure for Determining the Amount of Damage Resulting from the Theft, Shortage, Destruction (Damage) of Material Assets, which states that “*the amount of damage <...> shall be determined by conducting an independent valuation*”³⁹, i.e. taking into account the provisions of para. 5 of Article 9 of the Law On Appraisal of Property⁴⁰ and by assessing the market value of property.

Therefore, the current practice of determining the residual value based on accounting data does not meet the requirements of current legislation.

The issue of applying market value considering agreements in the international market

Until recently, the scientific community believed⁴¹ that concealing information about agreements would make it possible to conduct marketing research on defense products in Ukraine. It was argued that such analysis could be conducted only in foreign markets.

Agreements made in the international market should be divided into those concluded with Ukrainian resident entities and those concluded without their participation.

In this respect, it should be promptly highlighted that agreements concluded

without the participation of Ukrainian residents and outside the jurisdiction of Ukraine are not applicable. The main terms and conditions (in particular, the price) stipulated therein are formed under the influence of factors other than the economic and legal factors of Ukraine.

On the other hand, even in international agreements which participants are Ukrainian residents, prices and conditions of the global market are applied (Part 1, Article 14 of the Law of Ukraine *On Prices and Pricing*⁴²). That is, unlike the economic and legal environment of Ukraine, a similar internal discrepancy in prices specified in foreign trade contracts has not yet been resolved.

Moreover, the inconsistency in the content of agreements concluded in the international market is currently accompanied by a complete decline in foreign economic activity in the field of arms exports.

For instance, exports of all types of combat small arms peaked in 2010–2012. With the onset of the Russian-Ukrainian war in 2014, the number of weapons sold on the foreign market decreased drastically. After Russia fully invaded Ukraine, exports ceased, with the exception of 18 units sold in 2022 in the *revolvers and pistols* category (*see Fig. 2*). Therefore, at this time, it is not possible to provide a sample of price values based on international market agreements.

39 Порядок визначення розміру збитків від розкрадання, нестачі, знищення (псування) матеріальних цінностей : затв. пост. КМУ від 22.01.1996 р. № 116 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/116-96-п#Text> (date accessed: 16.10.2024).

40 Про оцінку майна ... URL: <https://zakon.rada.gov.ua/laws/show/2658-14#Text> (date accessed: 16.10.2024).

41 Іванова І. М. Особливості формування вартості продукції оборонного призначення. *Стратегічні пріоритети*. 2016. № 2. С. 82–87. URL: http://nbuv.gov.ua/UJRN/spa_2016_2_11 (date accessed: 16.10.2024).

42 Про ціни і ціноутворення : Закон України від 21.06.2012 р. № 5007-VI (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/5007-17#Text> (date accessed: 16.10.2024).

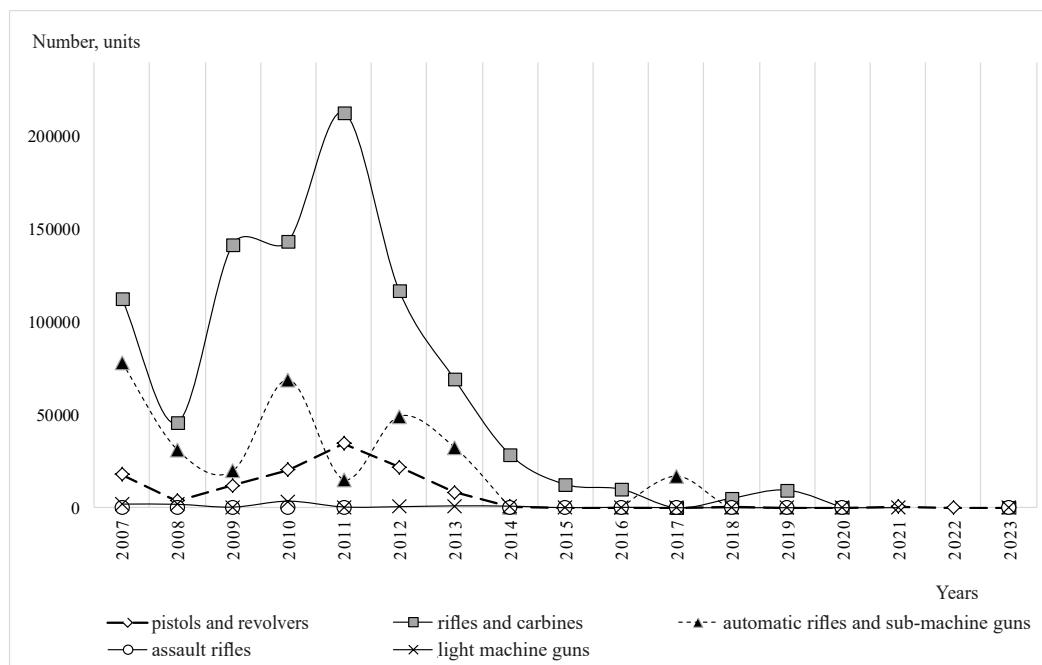


Fig. 2. Export of firearms and small arms by Ukraine (2007 –2023) ⁴³

A separate expert task is resolving the issue of comparing weapons that are the subject of international agreements with the object of valuation submitted for a forensic examination. Recognizing these goods as similar property requires accurate information about materials and production technology.

Along with the degree of utility, recognizing the value parameters of weapon samples relying on the similarity criterion is also complicated. Forensic experts should bare in mind that the price of weapon samples offered in the international market is often shaped by:

- reasoning about political expediency, since “the participants in the

international arms market are actually not individual economic entities, but states or even power blocs” ⁴⁴. This is related to the state of international economic relations between counterparts. Among the constructivist, liberal, and realist theories of international relations, the arguments in favor of constructivism are quantitatively confirmed, based on judgments about shared identity, belief in a clear link between security and economic cooperation, and only in certain cases the hypotheses about agreements that stem from practical (realistic) principles or

⁴³ Prepared by the authors using data from the State Service for Export Control of Ukraine: See *Обсяги міжнародних передач озброєнь 2007—2023 / Держслужба експортного контролю України : офіц. сайт.* URL: <https://www.dsecu.gov.ua/ua/obsiagy-peredach-ozbroyen> (date accessed: 16.10.2024).

⁴⁴ Dunne J. P., Sköns E. The Military Industrial Complex. *Working Papers*. 2009. No. 907. 17 p. URL: <http://carecon.org.uk/DPs/0907.pdf> (date accessed: 16.10.2024).

free market principles (liberalism) are confirmed ⁴⁵;

- subsidizing production ⁴⁶ to improve price competitiveness in the market (sometimes for dumping). Because the beneficiaries of arms transfers are states, not individual economic entities, World Trade Organization rules do not apply to such agreements;
- protectionism of national regulatory authorities, which, by introducing protective customs barriers, import licensing procedures, etc., are trying to provide additional economic incentives to their own manufacturers ⁴⁷;
- exerting pressure on the global arms market through so-called “gray” (without official notification of deliveries) and “black” (illegal) exports, while measures to counter the proliferation of illegal arms are failing ⁴⁸;
- sanctions on international arms transfers to individual states. To date, no algorithm has been developed to detect and subsequently adjust the amount of the markup to market value in case of “atypical”

motivation of the buyer state. For instance, the existence of schemes to violate the international arms embargo on weapons or their components has been repeatedly disclosed (for example, the supply of weapons to Russia ⁴⁹). Since international economic sanctions disrupt trade relations not only between the initiator and the target country, but also between a substantial number of third parties, so-called sanctions opportunism is often observed ⁵⁰. Under such circumstances, with the increase in the risks of revelation, a “special interest of the buyer” arises, which leads to the increase in market value, transforming into the so-called special value. Therefore, taking into account such agreements in the market analysis is methodologically incorrect and leads to a bias in valuation.

More and more arms transfer agreements now stipulate subjects of a complex nature, which makes it difficult for a researcher to separate the cost of the actual weapon from the contract price. According to the global trend, foreign economic arms contracts are concluded in the form

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- 45 Willardson S. L., Johnson R. A. Arms transfers and international relations theory: Situating military aircraft sales in the broader IR context. *Conflict Management and Peace Science*. 2022. Vol. 39. Is. 2. Pp. 191–213. DOI: [10.1177/0738894221992034](https://doi.org/10.1177/0738894221992034) (date accessed: 16.10.2024).
- 46 García Alonso M. C. Price competition in a model of arms trade. *Defence and Peace Economics*. 1999. Vol. 10 (3). Pp. 273–303. DOI: [10.1080/10430719908404927](https://doi.org/10.1080/10430719908404927) (date accessed: 16.10.2024).
- 47 Anicetti J. Paying the buyer: from one off defense offsets to strategic alliances. Florence : EUI, 2022. URL: <https://hdl.handle.net/1814/73767> (date accessed: 16.10.2024).
- 48 Wisotzki S. Efforts to curb the proliferation of small arms and light weapons: from persistent crisis to norm failure? *Z Friedens und Konfliktforsch.* 2021. Vol. 10. Pp. 247–271. DOI: [10.1007/s42597-022-00073-9](https://doi.org/10.1007/s42597-022-00073-9) (date accessed: 16.10.2024).
- 49 Денков Д., Мірошніченко Б. Діряве ембарго. Як Росія обходить санкції на імпорту зброї / Українська правда. 22.04.2022. URL: <https://www.epravda.com.ua/publications/2022/04/22/686100/> (date accessed: 16.10.2024).
- 50 Preble K. A. Economic Sanctions and Opportunism : Abstract of Ph. D. Thesis. Albany, 2021. 24 p. URL: <https://www.proquest.com/openview/c973f76928e66c4a06bfd7d757567898/1?pq-origsite=gscholar&cbl=18750&diss=y> (date accessed: 16.10.2024).

of offset agreements. The subject of the contract is supplemented by the condition of technology transfer⁵¹ and creation of own production facilities in the territory of the importing country⁵². The logic of the choice between purchasing ready-made weapons and concluding an offset agreement lies in the alternative of obtaining benefits in the short and long term, respectively⁵³.

Obviously, such offset agreements do not follow the similarity criterion and cannot be taken into account while a forensic commodity examination. However, in the context of a priori limited access to the content of agreements or possible classification of their part on technology exports, if only the price and volume of delivery of goods are disclosed, it is possible that the valuation of arms samples may be biased and, accordingly, an expert error may occur.

Overall, accounting for information based on agreements in the international market has certain peculiarities, since the price of weapons is not formed under the influence of purely economic factors. The specificity of arms as a commodity group lies primarily in the fact that there is no income from their purchase. In fact, the incentive to spend on arms is the increase in socio-political risks accompanied by a substantial impact of external factors (externalities). That is why the cost of arms in international transfers will always include a non-market component.

Instead, research based on prices formed in the national economic envi-

ronment and within the jurisdiction of Ukraine is possible due to the concentration of information within agreements on the domestic market.

A summary of possible scenarios for determining the cost of small arms is shown in Fig. 3.

Conclusions

Under the current conditions of information deficiency and legal uncertainty of the arms market functioning in Ukraine, the recommended expert task for valuing weapons is to estimate the residual value and market value, considering agreements on the international market.

Meanwhile, the results of a forensic commodity examination of weapons may have biased estimates when addressing these issues. Determination of the residual value based on the accounting data of institutions (organizations) whose balance sheet includes the relevant property is not methodologically sound, since the initial data for the calculation — the value of the initial cost and the amount of wear — do not reflect the actual value of the valuation object.

Market value assessment of small arms based on agreements on the international market may include a non-market component due to political or protectionist measures. Such market data do not reflect the influence of value-forming economic and legal factors in Ukraine and notably narrows the analytical framework and forensic examination capabilities.

51 Anicetti J. Defence offsets and the global arms trade: explaining cross-national variations. *European University Institute*. 2024. DOI: 10.2870/30303 (date accessed: 16.10.2024).

52 Чепков І. Б., Зубарев В. В., Свергунов О. О. Глобальні тенденції розвитку офсетної політики при експорті / імпорті озброєнь. *Озброєння та військова техніка*. 2016. № 3. С. 3–7. URL: http://nbuv.gov.ua/UJRN/ovt_2016_3_2 (date accessed: 16.10.2024).

53 Palavenis D. Offset versus off-the-shelf in arms procurement: the Boxer infantry fighting vehicle in Lithuania as a case study. *Journal of Baltic Studies*. 2021. Vol. 52. Is. 4. Pp. 565–584. DOI: 10.1080/01629778.2021.1969421 (date accessed: 16.10.2024).

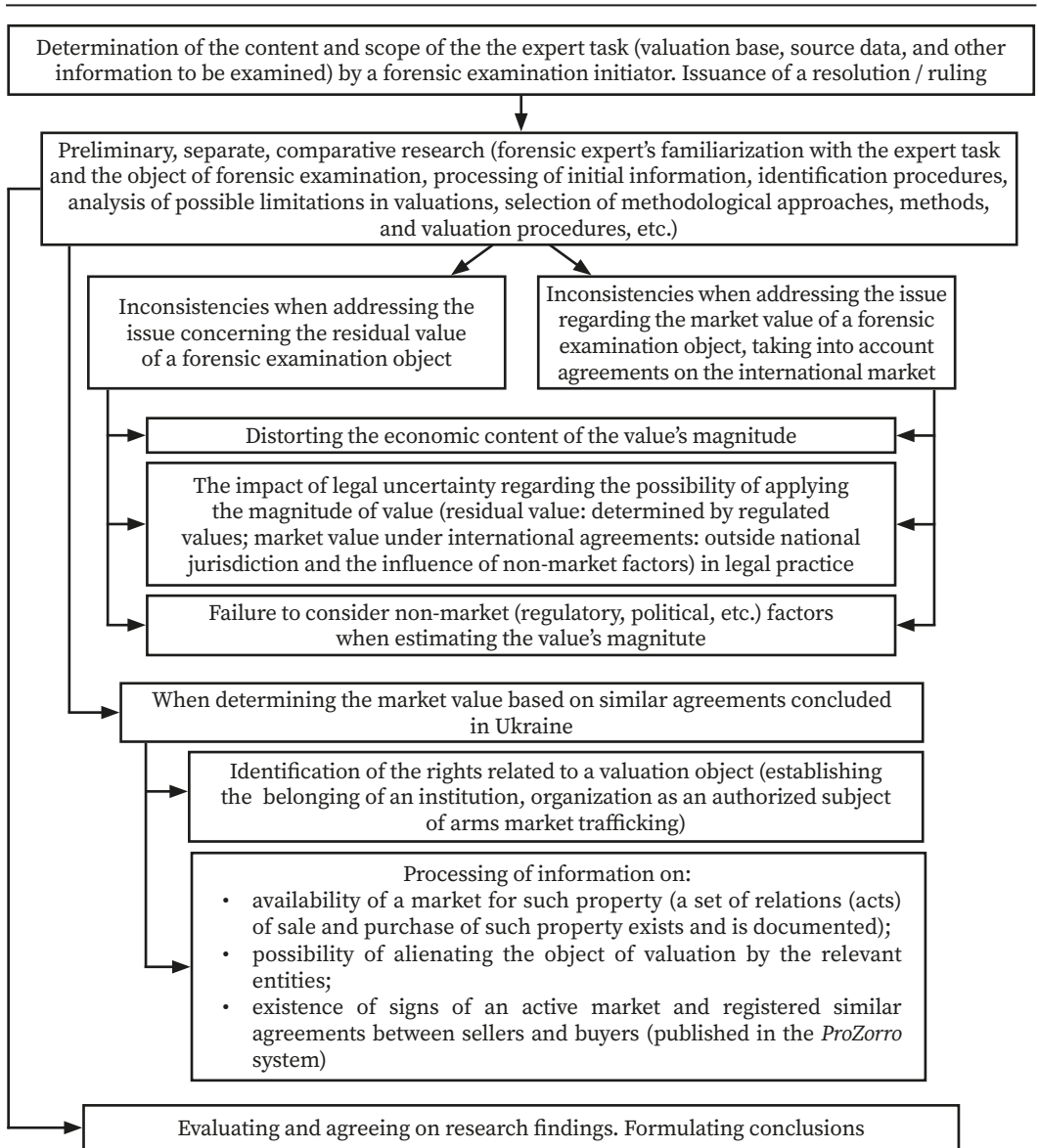


Fig. 3. Algorithm for bridging the gaps in determining the cost of weapons (in conformity with the requirements of clauses 50 and 51 of National Standard No. 1⁵⁵ and Section IV of the Instructions on the Organization of Conducting and Registration of Expert Proceedings in Units of the Expert Service of the Ministry of Internal Affairs of Ukraine ⁵⁶)

55 Національний стандарт № 1 URL: <https://zakon.rada.gov.ua/laws/show/1440-2003-п#Text> (date accessed: 16.10.2024).

56 Інструкція з організації проведення та оформлення експертних проваджень у підрозділах Експертної служби Міністерства внутрішніх справ України : затв. наказ. МВС України від 17.07.2017 р. № 591. URL: <https://zakon.rada.gov.ua/laws/show/z1024-17#Text> (date accessed: 16.10.2024).

The issue of analyzing information on international market agreements disappears if a sample of price values is studied within the existing domestic market of Ukraine. The latter is characterized as an imperfectly competitive market, the structure of which corresponds to the arms markets of developed countries. The corresponding initial price regarding agreements for completed purchases is displayed on the *ProZorro* resource.

To ensure the results of small arms valuation are consistent with mandatory national standards, we recommend asking a forensic expert questions about the market value of the object based on similar agreements concluded in Ukraine.

**Перспективи визначення
ринкової вартості
бойової стрілецької
вогнепальної зброї
за даними угод купівлі-продажу
в Україні**

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Формувати та виконувати експертне завдання під час проведення товарознавчої експертизи військового майна, техніки й озброєння потрібно з урахуванням вимог до оцінки майна в Україні. Метою статті є визначення вартості зброї (що завжди ускладнено нестачею інформації та правовою невизначеністю функціонування ринку) за допомогою аналізування угод, укладених за результатами процедур завершених публічних закупівель пістолетів (для чого застосовано загальнонаукові та спеціальні методи). Доведено існування ринку бойової стрілецької вогнепальної зброї в Україні. Виокремлено суб'єктів ринку та схарактеризовано змішану структуру недосконалої конкуренції. З'ясовано подібність ринку стрілецької зброї в Україні до аналогічних ринків зброї в розвинених країнах. Дослідженням

порядку обчислення залишкової вартості зброї на підставі облікових даних установ і організацій визначено невідповідність таких оцінних процедур законодавчо закріпленим методологічним вимогам. Із застосуванням дослідницького інструментарію міжнародного економічного аналізу визначено походження неринкової компоненти у вартості зброї за укладеними на міжнародному ринку угодами, яка містить політичні та протекціоністські чинники й не відображає співвідношення попиту та пропозиції на об'єкт оцінки в Україні. Рекомендовано визначати ринкову вартість зброї в Україні на підставі інформації про завершені угоди. Для отримання вихідної цінової інформації про завершені закупівлі стрілецької зброї запропоновано послуговуватися відкритими відомостями з інтернет-ресурсу *ProZorro*.

Ключові слова: стрілецька зброя; товарознавча експертиза; оцінка зброї; залишкова вартість; ринкова вартість; міжнародний ринок.

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Declaration of Competing Interest

Authors declare no conflict of interest.

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