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## **TOOLS FOR IDENTIFICATION FINANCIAL TRANSACTIONS INVOLVING LEGALIZATION OF CRIMINAL PROCEEDS**

*The paper studies the problems of theoretical and practical foundations of ensuring the country's economic security, the methodology of detection of economic threats, the substantiation of the state policy in the area of economic security in contemporary conditions.*

*Keywords: economic security, economic systems, national interests, state policy.*

**Introduction.** The National Bank of Ukraine identifies the following categories of risk: credit, liquidity, interest rate, market, operational and technological exchange, reputation, legal, strategic [14]. However, at present there was a problem of estimation of a new risk that is associated with the use of banking services for laundering proceeds and financing of terrorism. The Financial Ways Money Laundering (FATF) proposed a “strategy of risk assessment of money laundering and financing of terrorism” [16]. At the same time identifies three sources of formation of risk: the country; client; service. At an angle of approach FATF August 20, changes were made to the Law of Ukraine “On prevention and counteraction to legalization (laundering) of proceeds of crime or financing of terrorism”. Article 11 of the Act provides for financial monitoring by collecting and processing relevant information.

Financial monitoring is carried out in Ukraine in the primary and secondary levels. In the primary monitoring involved banks, insurance companies and a number of other financial institutions. The secondary monitor is the prerogative of the central bodies of executive power, the National Bank and the Financial Monitoring Committee. Over the past two years, 97 % of reports of suspicious financial transactions of clients came to the higher authorities of the bank [8]. Note that the questionable practices characterize such features as the holding in unnecessarily complicated or unusual conditions, the lack of economic feasibility and, of course, contradictory legislation of Ukraine [6, p. 130].

The system of financial monitoring of Ukrainian banks for the most part consists of four levels:

- All employees of the front office, serving clients;
- Division of Financial Monitoring of branches and offices;

- A division of the financial monitoring of the head office;
- Chairman of the Management Board, responsible for compliance with all legal requirements and the appointment of the head of the Financial Monitoring Unit.

**Summary of issues considered.** For money laundering schemes is characterized by three stages of action [12, p. 18–19]:

- involvement of illegal income in the chain of legitimate financial transactions (“dry”);
- Masking the source of income through the implementation of these operations (“spin”).

It is noted that inherently illegal sources of financial transactions is hidden from direct observation, and therefore the judge it is possible only on the basis of indirect evidence of character. Considered separately, these symptoms often are uninformative, but the analysis of them together can form a fairly complete picture of the potential money laundering schemes [12, p. 41–44]. Signs that cause suspicion of a questionable nature of financial transactions, conventionally divided into two groups:

- The signs are not typical property-monetary transactions (their detection is possible at an early stage);
- Signs of legalization schemes (their detection is possible, as a rule, after a chain of linked transactions).

About dubious financial transactions can be judged by their originality. Last identified on the basis of attributes, which primarily include:

- View of the main activities of the company involved in the transaction;
- The nature of the operation;
- Features of the legal form of the participants;
- The events immediately preceding the transaction;
- The history of cash flow.

To identify unusual technologies (atypical) operations are clustering analysis and regression modeling. Clusters with few objects and their boundaries, and time series values of emissions at interpret it as “eccentricity”. For large amounts of background information is also used neural networks, have the ability to educate themselves on the basis of accumulated knowledge.

The most “popular” ways in which criminals are adopting dirty money into the financial system include [11, p. 13]:

- Artificially inflated trading revenue (price manipulation) for the sale of goods;
- The establishment of control by the criminal organization of financial institutions, or – activities of their staff;

- Smurfing – split payments (deposits), in other words, the structuring of cash transactions, without exceeding the limits established by law in order to avoid the registration of such operations;
- Arrange the purchase of financial instruments for cash;
- The exchange of small denomination banknotes for higher ratings, as well as cash – for another currency;
- Moving money through the banking institutions, particularly abroad, using payment cards;
- The merger of legal and illegal capital when the bank accounts of legally operating companies “mixed into” dirty money;
- Concealment of criminal money under the charitable contributions and donations.

A large list of attributes that can be used to identify financial transactions questionable character is shown in [11, p. 49–50]. For foreign operations reflects their scheme 1.

### Scheme 1 – Signs of dubious foreign operations

№	Objective sense
1	Transferring money abroad in the absence of foreign economic contract and import of goods without their import into the customs territory of the country
2	The transfer of money to a beneficiary located in countries that are potentially on macroeconomic indicators can not carry out such a transaction
3	Back unreasonably large amounts as investments of non-residents
4	Countries of translation and / or beneficiaries are those volumes of export-import operations which do not confirm the size of cash flows
5	Conducting large-scale financial transactions involving securities of low liquidity that are not quoted in an active market
6	Permanent transfer of significant sums in one country on the same 1–2 contractual
7	Translation (or receive) significant amounts without any obvious political expediency in an offshore zone (or out of)
8	Translation of large sums in bank institutions located outside the country of the beneficiary
9	Getting large amounts of foreign currency in favor of individuals with their removal through the bank
10	Repeated renegotiations (or other conditions) that alter the essence of the financial transactions
11	The beneficiary's bank is an institution that has an impeccable reputation in the legalization of dirty money

### **Current issues in banking risk assessment**

The need to develop tools that would be adequate to identify such a specific type of bank risk, as the legalization of criminal proceeds, in fact, initiated preparation [11]. Initially, the authors have adapted to the domain of the research “binary” part of the approach developed in the monograph edited by A. A. Yepifanova [15]. It is based on the realization of a two-tier model – rapid analysis (questionnaire), and complex analysis. In the first of these cases only apply quantitative methods, which involve the calculation of specific indicators and the interpretation of the obtained values. Profile filled as follows: for each of the queue is considered established evaluation criteria with setting 0 or 1. Depending on the amount of balls typed the conclusion about the state of the financial security of the bank’s positions. In the second case, the processing quantity information is performed using an expert assessments on the basis of which are determined by the coefficients characterizing the relative importance of said criteria.

Further analysis of the results of questioning of binary interfaces with elements of the Bayesian methodology [11, p. 82–87]. It is concluded that the prospect of such an approach to the conduct of financial monitoring. We also consider the use of the device of the regression analysis for the localization of various anomalies time series with which conclusions can be made in terms of the subject area of monitoring [11, p. 88–98].

Of course, ideally, we would like to have a quantitative measure of the integral properties characterizing the risk of a financial transaction from the point of view of the legalization of criminal proceeds. In this regard, we shall proceed from the following assumptions, which seem logical enough:

- Especially considering the risks are crucial stages of the research on such fields as the formation of informative features, the choice of appropriate criteria, the recruitment of competent experts, and so on heuristics;
- However, issues of practical implementation of the procedures of the expert estimation of statistical information for the purpose of constructing an integral criterion, and the pairing of Humanities and heuristic components of the study to obtain estimates, they allow the formalization, in other words, is sufficiently versatile;
- The implementation of said interface method essentially involves the study and, accordingly, in this perspective, we can interpret the assessment of the risk to a much more general position, namely, how to support management decisions, which are devoted to materials difficult to comprehend the number of bibliographic sources.

In light of the above considerations are of interest S. N. Waterside, B. A. Dadashova and A. L. Plastun about the method of calculation of the

integral index of the example of evaluating the financial and economic efficiency of the security services Bank (BB) [12, p. 161–171]. Here is a very informative seems excerpt.

“The attempts to perform the necessary evaluations within the parameters [1], or by using a single” integrated “index” [2] are not widely used, because in this case there is a problem comparing 2 or more multi-dimensional objects. However, some results of the first object may be more attractive, for example, the amount of debt recovery for problem loans, while others, such as the cost of providing services of the big blind, etc., may have a significantly worse value.

In general, the set of partial indicators of the different sides of the service WB may be different [Table number indicated]. One of the properties of a set of indicators is their inconsistency, which is based on well-known balance of advantages and disadvantages, ie, for every advantage has to pay something. As a result, becomes a multi-criteria evaluation of when the desired increase in some indicators leads to undesirable change and other difficult to choose a compromise solution. In our opinion, at the moment in the scientific literature effective solution to this problem is absent. “In the context of the subsequent presentation to focus on the marked “multicriteriality”.

At the same time, then the authors of [12] is still moving to the evaluation of the integral index using a taxonomic approach, which is generally very fruitful. At the same time they are trying to achieve the desired results with in-depth features on the differentiation of the respective promoters and disincentives, showing how the past can flow into each other according to changes in the situation. In our opinion, in the context of the selected species taxonomic algorithm, such a path is hardly justified.

### **A synthesis of the taxonomy and analytic hierarchy process**

On the contrary, can be called a very constructive approach to the diagnostic study G. K. Bronshpaka, P. T. Bubenko and S. I. Chernishova [4] based on a synthesis of the two methods: taxonomic, in the interpretation of [7, p. 155–162], and the analytic hierarchy process [13]. So, consider  $m$  financial transactions, each of which is characterized  $n$  quantitative traits. Transactions are valued at their particular traits selected standard by distance  $c_{i_0}$ ,  $i = 1, 2, \dots, m$  in  $n$  – dimensional space. When you select a reference may, in particular, the following options:

1. All signs comply with the standard as a criminal operation. In this case, the smaller  $c_{i_0}$  is, the more uncertain is  $i$ -th operation. However, the choice of standard features can cause misunderstandings.

2. Signs of reference are defined as the arithmetic mean of the signs of  $m$  operation. In this case, on the contrary, the greater  $c_{i_0}$ , the more doubtful operation. However, such a choice is possible only for sufficiently large

values  $m$  (it should take into account the diverse nature of the transactions in question factor).

3. Signs of reference are defined as the arithmetic signs of the same operations for a sufficiently long period of time. In this case also, the more  $c_{i0}$ , the questionable transactions. Of course, this choice is the most preferred and, at the same time, raises the question of separation of objectivity financial transactions types.

These tasks are generated in the form of a matrix  $[z_{ij}]$ , where  $z_{ij}$  – normalized coordinate  $j$ -th feature  $i$ -th operation (in other words, reduced to dimensionless form by dividing by the same amount for all  $j$ ). The weighted Euclidean distance between the reference and operations are as follows:

$$c_{i0} = \left[ \sum_{j=1}^n \rho_j (z_{ij} - z_{0j})^2 \right]^{1/2}, i = 1, 2, \dots, m,$$

where  $z_{0j}$  – normalized coordinate reference;

$\rho_j \in [0,1]$  – weighting factors that characterize the relative importance of attributes. If we consider the  $m$  interrelated transactions, for comparison with the prototype can be useful average distance and standard deviation for the entire set of objects that are defined as follows:

$$c_0 = \frac{1}{m} \sum_{i=1}^m c_{i0}; C_0 = \left[ \frac{1}{m} \sum_{i=1}^m (c_{i0} - c_0)^2 \right]^{1/2}.$$

Note that Characterized scheme without major complications apply to the task to make comparisons with the standard in a dynamic setting. An effective approach to the study of a wide class of problems of taxonomy contained in the monograph V. D. Mazurova [9]. Solving them is very useful as the material of the book, I. A. Birger [3].

It will be appreciated that this estimate by distance using weights  $\rho_j$  is well-known analysts of the banking sector (see, in particular, [3]). However, in the aspect of novelty is very important is the organic conjugation of this evaluation with the analytic hierarchy process (AHP), which has developed a distinguished American mathematician and expert in the field of systems analysis Thomas Saaty [13]. With regard to the calculation of the AHP is extremely effective in the context of the following items:

- Digitization signs humanitarian nature;
- Differentiation of financial transactions by type;
- Determining weighting factors.

In general, the use of AHP allows, in our opinion, to deal with the problem of multicriteria, which the authors [12] described the almost unsolvable (see above). From the preface [13] Professor I. A. Ushakov: “One of the key points in the book is the presentation of the so-called method of analytic hierarchy process. This new mathematical tools developed by T. Saaty solutions for a variety of practical multi-criteria problems, has been successfully used in this book to solve various problems of planning”.

We also note concerns the authors [4] that the AHP is a “man-machine” in the fullest sense of the expression, as optimally complements of each of the parties. If a person is characterized by the ability of analytical and heuristic thinking, the computer operates easily with a variety of formal features. T. Saaty described the AHP as a new methodological approach. He treats the AHP as a systematic procedure for layering of elements that defines the essence of any problem. In this system are divided on the grounds of: appointment, function, flow, and the structure.

*The method consists in decomposing the problem into simpler components and processing sequences of expert judgments by pairwise comparisons. As a result, rates are determined by the interaction of the elements of the hierarchy and judgments are characterized numerically. MAI includes procedures: a synthesis of multiple judgments, obtaining priority criteria, finding alternative solutions. To carry on a subjective basis of pairwise comparisons of the relative importance of scale has been developed that is based on the results of many years of testing conclusively demonstrated its practical value (Scheme 2).*

### Scheme 2 – The scale of the relative importance

The intensity of relative importance	Attribute	Clarification
1	Equal importance	Equal contribution of the two types of activity in the set goal
3	Moderate the superiority of one over the other	Experience and judgment come easy the superiority of one type of activity over another
5	A significant or strong superiority	Experience and judgment gave strong the superiority of one type of activity over another
7	Significant excellence	One activity is given so strong superiority on the other, it becomes practically significant
9	Very strong excellence	Очевидность превосходства одного вида деятельности над другим подтверждается наиболее сильно
2, 4, 6, 8	Intermediate judgments between the two neighboring	Compromise cases
Reciprocals of the above numbers	When compared one species activity obtained with another number $a$ , then the comparison will be in reverse $1/a$	

Suppose you want to get an expert opinion on which of several choices of values  $\rho_j$  is the most appropriate. To do this, the experts have to initially determine the evaluation criteria of these options, which are the most representative. In particular, from the perspective of the data scheme 1. Importantly, the criteria may simultaneously serve as features.

By paired, we emphasize the comparison of these criteria in the context of the scale (see Table 2) is formed by back-symmetric matrix, that is such that  $a_{ij} = 1/a_{ji}$ . Its treatment with complex algorithmic software “Expert Choice” [13], provides a vector priority criteria. Next, also using scheme 2 options for action are compared in pairs by experts in the context of each of the criteria, allowing you to build a matrix of the same type that are also processed by a computer to obtain the corresponding vectors. Their multiplication (computer) in the vector gives priority rating of the proposed choices of coefficients  $\rho_j$ .

Note that the pairing of comparisons can be described as a defining element AHP. In fact, a person is not able to think multi-dimensionally and trying in some way to rank a large number of features of different properties, be sure to make a mistake. By type that  $a > b > \dots p > \dots > z$  and simultaneously  $z > a$ .

During the computer processing of the data consistency located the index of the matrix  $(IM) = (\lambda_{\max} - n)/(n - 1)$ . The matrices used in the AHP type  $\lambda_{\max} \geq n$ .  $IM$  compared with the value that would be obtained by a random selection of quantitative judgments of the scale  $1/9, 1/8, 1/7, \dots; 1, 2, \dots, 9$  similar type of matrix. Average consistency  $(AC)$  for random matrices  $n$  are shown in scheme 3. Ratio consistency  $(RC) = IM/AC$ . Value  $RC$  may be 10 %, in some cases be 20 %, but not more than [13, p. 38–39] (otherwise, the experts need to check their judgments). Thus, we can estimate the error of solving the problem, which is very important.

**Scheme 3 – Average consistency for random matrices**

$n$	1	2	3	4	5	6	7	8	9	10
$CC$	0,00	0,00	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,49

From the preface [13]: “This expert system is flexible and advanced user interface that allows you to receive interim and final information about the decision in a convenient graphical form. All search procedures tradeoffs that arise in *solving multi-objective optimization*, which is implemented in a dialogue with the computer user. It should be noted that the expert system are widely spread in the world, particularly in many organizations and in-



stitutions of the United States, Canada, Japan, China and many European countries. Thousands of copies of it are used in various fields of managers, engineers, researchers (please note that the text is a fragment of 20 years ago and the “Expert’s Choice” is continuously being improved).

In conclusion, we note that the formation of experts requires special training, as in the processing of the results, the majority judgment may obscure the position of the most competent specialists [10, p. 394–409]. However, as has been said T. Saaty, even when consensus is not reached will, expertise will clearly loomed a problem, which is a positive. And, of course, as a group of experts can perform one banking analyst reliability of the estimates is able to significantly improve MAI. Even better, regardless duplicate the work carried out by the same AHP.

**Conclusions.** The problem of identifying laundering operations criminal proceeds objective is very difficult both because of its multicriteriality understood in the sense of the presence of interdependent factors and strategies, and because of their inability to clear formalization. However, it is for such classes of problems is the method of analytic hierarchy process (AHP) T. Saaty, very well-regarded in the fields of practical applications. In terms of the special scale AHP allows the digitization of high-quality signs and restructure the original problem so that at each stage of the algorithm produces only people pairwise comparisons of options (strategies, etc.), using their analytical skills. Overcoming the “multi-dimensional” take on the machine and the computer matrix analysis to rank the ultimate decision-making options for preference.

Review of publications on banking monitoring in Ukraine suggests that the current period, the capacity of AHP are not actively being used. In our opinion, the correction of the situation by the widespread introduction of the “Expert’s Choice” could lead bank monitoring is considered at risk for money laundering, as well as a whole at a much higher level. The advantage is the flexibility of the AHP to adapt it to the domain of various studies and numerical implementation of the unit, which is used for this purpose. Pairing the AHP with the method of taxonomy, in its simplest interpretation is, in our opinion, an effective means of assessing bank risk, characterized by a multiplicity of potential options for decision-making.

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#### *Анотація*

Досліджуються питання теоретичних та практичних основ забезпечення економічної безпеки держави, методології виявлення економічних загроз, обґрунтування напрямів державної політики в сфері забезпечення економічної безпеки держави в сучасних умовах.