



# THE INDICATIVE ESTIMATION'S METHODS OF POSSIBLE WHEELER-DEALER FINANCE

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- ▣ *Generalization and classification of exposure and forecasting methods of possible wheeler-dealer finance are carried out. Possibilities and application scope of these methods are considered in detail and the system of indicative estimation of the wheeler-dealer finance is suggested.*
- ▣ *Wheeler-dealer finance, Benford law, statistical methods, psychological methods.*

## МЕТОДИ ВИЯВЛЕННЯ ТА ПРОГНОЗУВАННЯ ФІНАНСОВОГО ШАХРАЙСТВА

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- ▣ *У статті здійснено узагальнення та класифікацію методів виявлення і прогнозування можливих фінансових махінацій, детально розглянуті можливості та сфера застосування цих методів і запропонована система індикативного оцінювання фінансового шахрайства.*
- ▣ *Фінансове шахрайство, закон Бенфорда, економіко-статистичні методи, психофізіологічні методи.*

## МЕТОДЫ ВЫЯВЛЕНИЯ И ПРОГНОЗИРОВАНИЯ ФИНАНСОВОГО МОШЕННИЧЕСТВА

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- ▣ *В статье на основе обобщения способов и приемов выявления финансового мошенничества осуществлена классификация методов выявления и прогнозирования возможных финансовых махинаций, детально рассмотрены возможности и область применения этих методов и предложена система индикативного оценивания финансового мошенничества.*
- ▣ *Финансовое мошенничество, закон Бенфорда, экономико-статистические методы, психофизиологические методы.*

### Introduction

The phrase «Everything secret sooner or later becomes clear» [1] belongs to the ancient Greek philosopher Socrates, who lived 469 BC. His doctrine, which marked a twist in philosophy – from consideration of nature and world he turned to consider a person, reflected in the Gospels of Mark (Chapter 4, p. 22) and Luke (Ch. 8, p. 17) in the words: «there is nothing concealed that will not be disclosed, or hidden that will not be made known» [2, 3]. Idea of ancient philosopher could be a guiding principle in developing the concept of fighting fraud in financial sector. Unfortunately, in national scientific publications there are no serious publications on evaluation of possible wheeler-dealer finance. Some financial fraud issues can be found in mass publications, where it goes mainly about methods of fighting rather than detection, and the consequences of financial fraud. Due to financial fraud companies have significant losses, causing great harm to both society and the state. It is believed that 10 to 20% of all claims for the insurance payment are made up fraudulently. As a result, according to the New York Central Mutual, only in the U.S. insurance

industry loses about \$20 billion annually. According to the expert of Cassidy, losses caused by credit card fraud are estimated at \$1 billion a year, according to experts of Steele, money laundering annually costs governments approximately \$500 billion.

To deal with phenomena of such manner and scale is a difficult task but real. Of course, one can hire auditors to search for possible wheeler-dealer finance. But that will require a great amount of financial, material and human resources as well as time. And time is money. To provide such information efficiently is the key to effective fraud monitoring and forecasting.

In this case, more than ever, we need a comprehensive approach to search and select effective methods to identify possible fraud under consistency principle. The basis should be a systematic approach representing trinity of tasks: mathematical, economic and psychological. It therefore reveals certain requirements for specialist's qualifications, knowledge, skills, whose work is to find possible financial fraud. Our attention in this article is drawn to such issues.

In the middle of the last century inspectors checking documents were using following method: counting

number of threes and eights, then ones and fours in documents. If eights or fours turned to be more, they could assume that some of them started their lives as threes or ones, respectively, and then controller was armed with magnifying glass and adding machine. Frankly speaking, effectiveness of this method is very low, but there were almost no alternatives [4].

Invention of computers started transition to a new era of information and analysis. Software has made it possible to analyze large massifs of data.

### Purpose

Considering generalization the methods and techniques of financial fraud to classify detection and prediction methods of possible wheeler-dealer finance, identify opportunities and scope of their usage, and to suggest a system of the possible wheeler-dealer finance indicative estimation.

### Discussion

Given the complexity of issue and using the task-trinity principle, all existing methods for detecting possible fraud should be divided into three groups:

1. Pure mathematical.
2. Analytical or economic-statistical.
3. Psychological.

Let's start with mathematical methods. Back in 1881, astronomer Simon Newcomb, while working with the book of logarithms tables, found that pages at the beginning of the book are slobbered stronger than other pages. This pattern was observed not only in one particular instance, but in majority of others. Reflecting on this topic, Newcomb concluded that it could not be a simple coincidence. This led to the law of numbers distribution discovery. According to the law, if one would accidentally select any number from table containing physical or statistic values, the probability that it will begin with ones is approximately 0.301. Only half a century later, American physicist Frank Benford decided to go ahead. He reviewed the background information on 335 rivers surface area, the results of baseball games, and chemical parameters of thousands of chemical compounds, house numbers from address book. The result was the conclusion about same pattern: numbers that start with ones are much more than numbers that start with any other number. This pattern can be expressed mathematically as following [4]:

$$p = \lg(n+1) - \lg(n)$$

Benford called it the law of anomalous numbers, and the pattern discovered by Benford, was called Benford's law. However, it never had practical application, remaining in the list of mathematical curiosities. Only a

quarter century later, in 1961, Robert Pynkham noticed that Benford's law works for any unit. That is, if prices are denominated in local currency according to Benford's distribution, situation will not change even if they are recounted in dollars, rubles or euro. In 1986, physicist Don Lemons noticed a very simple thing: puddles are more than ponds and ponds are more than oceans. Economically speaking Benford law can be described as following: small transactions by smaller amounts are more than large ones. The law does not explain, why all is happening this way, because it is empirical, but it is so. This drew attention of the American mathematician Mark Nigrini. He stated that not only areas of rivers, but numbers of tax declarations and accounting data should follow Benford's law. In 1997 Nigrini and Mittermayer developed six math tests based on Benford's Law. These tests were first put into practice by the international accounting firm «Ernst and Young» for the analysis and detection of irregularities in audit. [4]

Thus, if the data set is result of the natural course of events, and are present naturally «by themselves», they respond to Benford's law. This includes the following sequences:

- numbers of payment orders from various customers (all set);
- amounts of payments from customers;
- amounts in advance reports;
- inventories;
- house numbers in customers addresses.

Unnatural, artificial systems are violating Benford's law:

- postcodes;
- telephone numbers (first digit is the number of ATS);
- winning numbers in lotto and roulette (numbers here are only characters, which can be easily replaced, for example, with letters);
- any amount of data, the size of which is insufficient for the statistical methods application;
- total payments from buyers and the volume of orders, if several positions of same nomenclature are sold.

Tests could be performed both for compliance and non-compliance with Benford's law. There are several types of tests [4]:

- 1) analysis of the «first digit» and «second digit»;
- 2) analysis of the «first and second digits»;
- 3) analysis of «first through third digit»;
- 4) analysis of «rounding numbers»;
- 5) analysis of «duplicates»;

The idea for all tests is the same: if in result of study and construction of the empirical data sequence of digits, significant differences with reference values are revealed, it is a signal for a special examination to detect the cause of such differences.

Tests for compliance with Benford's law could be applied with:

- internal investigations;
- tax audits;
- external audit;
- controlling;
- assessment.

This will reveal:

- fraud;
- inadvertent errors that often occur;
- operational inefficiencies (eg, too many transactions with small amounts);
  - systematic distortion of operational data, such as:
    - amounts of accounting entries;
    - amounts of insurance benefits;
    - cost of warranty repairs;
    - amount of bills;
    - volumes of supplies;
    - amounts in tax declarations.

However, we should note that the tests usage requires a considerable amount of information, so could be applied only to companies with intensive operational activities, resulting in the large amounts of data appearance.

The second group of methods are analytical methods. Considering the fact that wheeler-dealer finance is very common throughout the world, experts say that most financial fraud could be detected using only automated analytical methods of processing information.

Analytical methods can be divided into two groups: traditional and computerized methods. Traditional methods are based on conducting individual investigations with possible computer technology application, as well as training and support for customers.

Automated methods for detection and fraud prevention are based on computer technology application which substantially facilitates reporting on the so-called exceptional situations. Here all events that correspond one or another predetermined criteria receive a special mark. For example, data mining technology (means of obtaining data). They allow you to automate and use more efficiently the additional data from detailed reports to identify and predict fraud through the use of complex and statistically significant analysis [5].

Traditional economic analysis methods are based on characteristics of the different economic indicators interconnection and interdependence that under normal economic activity are linked all together. Indicators interconnection is usually set and driven by the economic processes interaction. After committing economic crimes the indicators interrelationship and interdependence is broken. Economic analysis can reveal the causes of deviations from normal economic activity.

There are some methods to find the economic indicators inconsistencies, which are used to identify economic crimes:

- the related comparisons method;
- the method of special calculation indicators;
- the stereotypes method;
- the adjusted parameters method.

A prerequisite for the related comparisons method usage is hypothesis of the inevitable violation the relationships between connected parameters in interaction of crime with the material processes that occur in a complex economic system of enterprise.

Contradictions could be found in the change of such indicator pairs: electricity consumption for technological needs and output, profit margins and volume of production, consumption of raw materials and production and so on.

Several specific techniques are developed on the basis of related comparisons idea, which have proved their effectiveness in identifying hidden profits from taxation and money laundering [6].

The method of special calculation indicators is to determine analytical indicators according to accounting data or other information sources in order to reduce or eliminate the influence of factors associated with fraud. This method is based on the following assumptions.

First of all, there is possibility to allocate such indicator that is sure to change under the fraud influence.

Second, it is possible to calculate the value of this indicator for normally operating enterprise. This figure was named the special calculation indicator. Presence of gap between actual and reference values of special calculation indicator can be connected with crime possibility.

Stereotypes method is based on detecting illogical connections that were reflected in economic indicators. Illogical relationship in economic indicators, that to certain extent reflects characteristics of one or another fraud type, is named «stereotype».

This method originates from a holistic approach to crime as a real aggregate of somehow organized actions and processes, and is designed to search for unusual relationships between economic indicators that reflect internal structure and external relations of crime and are quite rare under normal economic activity.

The adjusted parameters method is to compare economic performance with environmental factors for particular enterprise. This method could be used when comparing prices, tariffs of sold goods with the average ones for market.

Automated data acquisition methods involve data mining usage and are fundamentally different from traditional ones as are far beyond simple reporting about exceptional situation. These tools detect suspicious cases according to the situation modeling which makes plausible assumptions about the fraud. These cases include:

- Unusual quantities of data in any way different from the norm;
- Unusual relationship between the quantities of data or records;
- Changes in the counterparties' behavior.

Situations' modeling is based on the statistical data analysis methods, such as:

1. Analysis of emissions.
2. Revealing unusual values.
3. Revealing unusual correlations.

Matching mean and standard deviation as well as presentation of data in a variety of charts and graphs could be applied while analyzing emissions to detect them in line of variables that change continuously.

Unusual records revealing is done by comparing them with the specially collected reference group data. There one should be very careful in selecting reference group to avoid incomparability of data due to unrepresentative reference group.

Two or more entries having same values of some variables may indicate the presence of unusual correlations. For example, records for transactions involving companies with different names but the same address, or records for agreements with different lands, but same buyers, sellers and agents.

Search for almost overlapping records, i.e. records with variables which – if possible minor differences – contain mostly identical information.

If the records' tracked chain has some logic, such as staged accidents, then fraud detection methods require clear correlation identification between records. In the simplest version this correlation can be expressed in a particular record, as in the case when accident victims address to the same doctor.

The numerous intermediate records detection. Typical example is a group of people consistently selling houses to each other with the higher price. This may be a preparatory stage for fictitious mortgage or real estate insurance.

Implementation of these methods is possible only under automation process. For example, SAS products – the devices that detect and prevent fraud. SAS Institute is an international company, one of the main analytic software developers and Business Intelligence class solutions. SAS Company was founded in 1976. First name SAS – an acronym of Statistical Analysis System, which eventually was used as the proper name of both the company and those products, which have gone far beyond mere tools of statistical analysis. With these products, one can also perform a probabilistic assessment of the fraud possibility, using intricate and sophisticated statistical and mathematical methods. In order to do this, an «informative portrait» for each type of fraud is set

using characteristics, obtained after identifying specific cases of fraud. All these are used afterwards to identify and prevent potential fraud.

Predictive methods are designed to assess specific data that allow suspect fraud. Forecasts are numerical or text depending on the type of analysis.

As predictive «models» of fraud are accumulated, the information already accumulated in databases is evaluated to identify undetected fraudulent transactions. In addition, the forecast can be used in real time to detect fraudulent transactions before or at the time of its implementation.

Efficiency and reliability of fraud detection increases simultaneously with increasing amounts of data, and should therefore stay ahead of fraud technologies development. Thomas Buckle said: «True knowledge is not familiarity with the facts that make person only a pedant, but to use the facts that make him a philosopher».

Physiological methods for detecting deception are equally effective additional, and sometimes decisive, tools. According to Paul de Courcelle, «Blush is a livery for modesty, shyness and ... lie». Psychology of deception is very powerful tool where the math does not work or there are limitations in the analytical methods application.

All psycho-physiological methods are divided into two groups:

- 1) non-verbal methods;
- 2) verbal methods.

Nonverbal level includes analyzing facial expressions, gestures, micro movements and external manifestations of the internal organs' functioning.

Verbal level includes logical analysis of obtained information as well as ratio of spoken words with non-verbal level signals.

People have tried to draw conclusions about human thoughts while studying facial expressions since ancient times. They believed that eyes observation can give fairly complete and accurate information about human intentions. For example, here is how young Hrinov describes Omelyan Pugachev in A.S. Pushkin story «Captain's Daughter»: «... lively large eyes were running around. His face had very pleasant expression, but froward». Thus, «running eyes» were considered as a sign of insincerity and inclination to deceive.

We should remember that despite all its diversity, mimicry is still poorer than range of human thoughts and feelings, which means that same facial expression may correspond to different mental states and have different interpretations. For example, the phrase «screw up one's eyes» has several interpretations:

- expression of tricks;
- contempt, resentment or irritation;
- mistrust.



These examples from the book of A.A. Akyshyn «Gestures and facial expressions in Russian language» argue that correct interpretation of human emotional experiences is only possible upon analysis of the aggregate of facial expressions, gestures, tone of voice, rhythm of breathing and other nonverbal signals [8].

Spoken lie may be accompanied by characteristic gestures. Gesture to «cover your mouth with hand» most clearly seen among small children, but it happens adults, although in a different form: as touching corners of lips or nose. Allan Pease writes: «If this gesture used by person while speaking, this indicates that he is telling the truth. However, if he covers his mouth with hand at the moment you speak, and he listens, it means that he feels like you are lying» [9].

Another psychologist Desmond Morris, noticed that lying causes itching in delicate muscle tissues. Perhaps this is why some people are putting off shirt collar when they lie and suspect that their deception is exposed.

Allan Pease raises the question: can one fake body language? The answer is – no, because in this case the person demonstrates the lack of congruence (full compliance) between gestures, body micro-signals and spoken words.

Studies using delayed filming showed that these micro-gestures are exposed only a second and they can be seen by communication specialists or people with well-developed intuition. However, most of us can notice the discrepancy between verbal and non-verbal information on subconscious level, and the problem is only in the perception and interpretation of this fact.

This case, described by Sergei Kuliok in his book «When the spirits retreat», happened on the island of Madagascar. In one tribe there was murder. Suspects were about three dozens. A famous in the district magician was invited to find the murderer. He lined suspects in front of fire, twisted neck of red rooster, took off the feathers, burnt it and covered the carcasses with white ash, announcing that the guilty one would fall ill and die touching the rooster. Then he walked along all suspects, each of whom put his hand on rooster.

Then magician ordered to kill a white hen and smeared his face with its blood. Again he bypassed the

rank, telling to pull all hands with palms up. Then he returned to the fire, sat on the ground with his back to the audience and casted stones and bones over an hour. Then told, that guilty are the two, and named them. First one confessed and second tried to escape, confirming this guilt. Actually all magic manipulations he did to impress. The secret lies in rooster, which was smeared with ashes. Those who were not guilty, touched the rooster, and their fingers should become white, and murderers, scared by magician, only pretended to touch, and their hands were clean. Indeed, Confucius was right when he said: «If you want to subdue people, you should martyr them with rituals».

### Conclusion

There is a whole range of methods and techniques that can detect financial fraud. Methods for detection of possible wheeler-dealer in financial sector can be divided into three groups: mathematical, analytical and physiological. However, only full usage of all under systematic approach ensures proper effect and makes it possible not only to detect but also to predict fraud in the financial sector.

Benford's law allows not only finding anomalies in the static data, but also organizes regular monitoring operations in cost values and real values. Benford's law is formal, and therefore all checks can be fully automated. This allows you to verify the accuracy of absolutely all operating data without additional human recourses. Analytical methods for fraud detection and prevention are based on the computer technology usage that allows to automate search process, and effectively use additional data to detect and predict fraud with methods based on statistical analysis. Finally, psycho-physiological methods is an additional effective fraud detection tool with the use of verbal and nonverbal technologies that are based on the principle that, naturally, a person who is trying to hide something, is discovered not that much by astute investigators or fancy equipment, but with his own fear that opens deception. Kuzma Prutkov was truly right when asserted that «the evil enemy of man is he himself».

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