International Journal of Research in Social Sciences
Vol. 9 Issue 7, July 2019,
ISSN: 2249-2496 Impact Factor: 7.081
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

METHODS FOR COMPLEX RETRO-FORECAST ANALYSIS AND COMPLEX FORECASTING OF THE ACCOUNTING BALANCE IN TERMS OF THE INTERESTS OF INVESTORS OF INSURANCE COMPANIES

Shokhmansur Shokhazamiy[*]

Bakhodir Alimov[**]

Abstract. A new method of complex retro-forecasting analysis and the method of complex forecasting of the balance sheet of insurance companies from in terms of the interests of investors with their theoretical and methodological basis, which are based on the Lagrange interpolation formula, expressed as functions have been proposed. The possibility of practical application of these methods is justified with the help of tests conducted on the basis of the data of the balance sheets of specific insurance companies.

Keywords: insurance company, its investor and balance sheet, Lagrange interpolation formula in the form of functions, method of complex retro-forecast analysis, method of complex forecast.

Introduction. Issues of complex retro-forecast analysis and complex forecasting methods applied for analyzing balances of the Insurance Companies (IC) always attract a particular attention of researchers and experts because management of any economic entity, in particular, an insurance company, cannot implement efficient management, as well as cannot make decisions on the innovative and investment development of the companies.

Hypothesis. In terms of satisfying the benefits of investments IC management, with the aim of obtaining an accurate mathematical solution of the financial analysis and forecasting, we put forward the hypothesis that it is recommended to use the methods for complex retro-forecast analysis and complex forecasting

[*] Republican High School of Business and Management named after Abu Raykhon Beruniy, Head of "Finance, accounting and Assessment affairs" department, Doctor of Economics, Professor

[**] senior teacher of "Audit and economic analysis" department, Tashkent Financial Institute

methods based on Lagrange interpolation formula in the accounting balance.

Theoretical basis. To achieve the aim set forth in this article it is required to determine the concepts related to the complex retro-forecast analysis and complex forecasting methods, as well as satisfaction benefit of the of the IC investors.

"The concept "complex" can be regarded as a synonym for the concept of "system" which means that the content of at least two interconnected elements. The notion "complex" in terms of the essence of the complex analysis and forecasting of the accounting balance of the IC consists of five assets and liabilities sections: *a, b, c, x, d* sections (where: *a* – long-term assets of the first section; *b* – current assets of the second section; *x* – sources for equity of the liabilities of the second section; *c* – insurance reserves of the liabilities of the second section; *d* – liabilities of the third section of liabilities) which should be analyzed in their mutual interconnection.

The term "retro" (originated from Latin "retro" – "referred to the past", "retrospective") is applied to the cultural and/or tangible value and means "old thing", "historical event, incident", "historical fact" and can be used in fact-based historical analysis[1].

The concept of "analysis" is used to analyze the status of an object over a certain (past) period of time based on its peculiarities.

The forecast is the hypothetical forecast (prediction) of the future event.

If we take into consideration the definition of the term "forecast"[2] and discounting method (Richard, and etc. 2011) in terms of indicators available in the forecast (facts occurred) it is possible to make a conclusion that the term "complex forecast" can be interpreted on the basis of its essence, i.e.: "complex forecast" represents a generalized term consisting of terms "complex" and "forecast" and implies the complex forecast. In compliance with this method, the complex forecast for the incomplete or future period is based on official historical facts of past periods of at least three years.

It should be noted that if the calculation process is applied for discounting occurred during the past period of time, in a complex retro-forecast analysis, the forecasting process consists of sequences of events for the last historical period, based on historical facts of past periods of at least three years. The basic difference of this method from the regular forecast is that[3] the analysit is concerned about the amount of difference between the predicted outcome for the last period and the outcome for the current period.

The difference between the complex forecasting method and complex retro-forecast analysis can be summarized as follows.

If we take into consideration the definition of the term "forecast"[4] and discounting method (Richard, and etc. 2011) in terms of indicators available in the forecast (facts occurred) it is possible to make a conclusion that the term "complex

[1] http://evdemosfera.narod.ru/ist/retro/_retro.html
[2] https://gufo.me (Big Encyclopedic Dictionary)
[3] In the above-mentioned statements and on the encyclopedia, according to the definition of the word "forecast" can be made for future periods based on the indicators available (facts).
[4] https://gufo.me (Big Encyclopedic Dictionary)

forecast" can be interpreted on the basis of its essence, i.e.: "complex forecast" represents a generalized term consisting of terms "complex" and "forecast" and implies the complex forecast. In compliance with this method, the complex forecast for the incomplete or future period is based on official historical facts of past periods of at least three years.

It should be noted that considering benefits of investor of the IC we should take into account structural units of the balance sheet such as assets and liabilities, in particular, long-term assets (*a*), current (short-term) assets (*b*), insurance reserves (*c*) and liabilities (*d*) equity sources on the basis of the interrelated complex management, that is raising equity (*x*) it will be possible to get higher dividends or receive higher additional nominal value. Therefore, *a, b, c, x, d* incorporated in the sections of assets and liabilities of the accounting balance of IC can be arranged as the mathematic equation of interconections $a + b = x + c + d$ and mathematical equation $a + b - (x + d) = c$ constitutes the model aimed at satisfying the benefits of the IC investors.

The benefit of an investor of the insurance company (IC) is referred to the sections of assets and liabilities which comprise the balance sheet of the IC. We can carry out analysis on the basis of the interconnection of structural units of *a, b, x, d*. Implementation of this analysis will enable to find out that growth of the market value of the IC is related to the insurance reserves *c* and administrative costs incorporated in the periodic expenses (for example: preference domestic consumer loans, benefits and bonuses). Therefore, *a, b, c, x, d* incorporated in the sections of assets and liabilities of the accounting balance of IC can be arranged as the mathematic equation of interconections $a + b = x + c + d$ and mathematical equation $a + b - (c + d) = x$ constitutes the model aimed at satisfying the benefits of the IC investors.

Methodology. On the basis of interpretation of two models specified above, in terms of the benefit of the IC investors represented by the mathematical equation $a + b - (c + d) = x$ it is required to separately specify methods for complex retro-forecast analysis and complex forecasting methods based on Lagrange interpolation formula (Rakhimov, 2006). To achieve this aim, first of all, it is advisable to provide a brief description of the essence and opportunities of applying Lagrange interpolation formula.

Let's imagine, that while studying a case it is necessary to detect functional interconnection between the values of x and y, as well as compliance of a variable x of interval $[a, b]$ with the relevant values of $x_0, x_1, \frac{3}{4}, x_n$ and a variable$y$ with the relevant values $y_0, y_1, \frac{3}{4}, y_n$. Herein, analytical reflection of this connection is unknown. For example, this unknown function $y = ts(x)$ in the interval $[a, b]$ in the certain or polynominal function can be represented as

$$y_0 = ts(x_0), y_1 = ts(x_1), , ..., y_n = ts(x_n)$$

where values in the interval $[a, b]$ are determined in the function $y = ts(x)$ which can be seen in the polynominal function $\leq n$ where $\backsim(x)$.

The values $x_0, x_1, \frac{3}{4}, x_n$ can be represented as parameter y of polynominal function $y_0, y_1, \frac{3}{4}, y_n$. Such issue is called interpolation function. Interpolation polynominal function can be represented as follows:

$$P(x) = C_0(x-x_1)(x-x_2)\dots(x-x_n) + C_1(x-x_0)(x-x_2)\dots(x-x_n) + C_2(x-x_0)(x-x_1)(x-x_3)\dots(x-x_n) + \cdots + C_n(x-x_0)(x-x_1)(x-x_2)\dots(x-x_{n-1}) \quad (1)$$

where $C_0, C_1, \dots, C_n$ coefficients

$$P(x_0) = y_0, P(x_1) = y_1, \frac{3}{4}, P(x_n) = y_n \quad (2)$$

should be selected to satisfy the requirements of

$$y_0 = C_0(x_0-x_1)(x_0-x_2)\dots(x_0-x_n),$$

where

$$C_0 = \frac{y_0}{(x_0-x_1)(x_0-x_2)\dots(x_0-x_n)}$$

If we assume (1) that $x = x_1$, then

$$y_1 = C_1(x_1-x_0)(x_1-x_2)\dots(x_1-x_n),$$

where

$$C_1 = \frac{y_1}{(x_1-x_0)(x_1-x_2)\dots(x_1-x_n)}$$

and etc. So if we assume that (1) $x = x_n$

$$y_n = C_n(x_n-x_0)(x_n-x_1)\dots(x_n-x_{n-1}),$$

in this case we get the equation

$$C_n = \frac{y_n}{(x_n-x_0)(x_n-x_1)\dots(x_n-x_{n-1})}.$$

Based on the above-stated formulas it is possible to illustrate polynominal function in the form of the following formula:

$$P(x) = \frac{(x-x_1)(x-x_2)\dots(x-x_n)}{(x_0-x_1)(x_0-x_2)\dots(x_0-x_n)}y_0 + \frac{(x-x_0)(x-x_2)\dots(x-x_n)}{(x_1-x_0)(x_1-x_2)\dots(x_1-x_n)}y_1 + \cdots + \frac{(x-x_0)(x-x_1)\dots(x-x_{n-1})}{(x_n-x_0)(x_n-x_1)\dots(x_n-x_{n-1})}y_n \quad (3)$$

In this formula (3) functions are called as Lagrange interpolation formula (Rakhimov, 2006). If to provide formula (3) in short, its fractions $p_1, p_2, \dots, p_n$ can be determined as follows:

$$p_1 = \frac{(x-x_1)(x-x_2)\dots(x-x_n)}{(x_0-x_1)(x_0-x_2)\dots(x_0-x_n)};$$
$$p_2 = \frac{(x-x_0)(x-x_2)\dots(x-x_n)}{(x_1-x_0)(x_1-x_2)\dots(x_1-x_n)};$$
$$\dots\dots$$
$$p_n = \frac{(x-x_0)(x-x_2)\dots(x-x_{n-1})}{(x_n-x_0)(x_n-x_2)\dots(x_n-x_{n-1})}. \quad (4)$$

((4) if we put $p_1, p_2, \dots, p_n$ in formula (3), it is possible to get the following equation.

$$y_{forecast} = P(x) = p_1 y_0 + p_2 y_1 + \dots + p_n y_n \quad (5)$$

Here: $y_{forecast}$ – n is a forecast indicator which is calculated with the help of indicators x and y known earlier.

Now we refer formula (3) to the essence of two issues stated above. For this purpose we divide sections of assets and liabilities of the accounting balance sheet of the IC into 5 (five) *a, b, x, c, d* parts according to Figure 1.

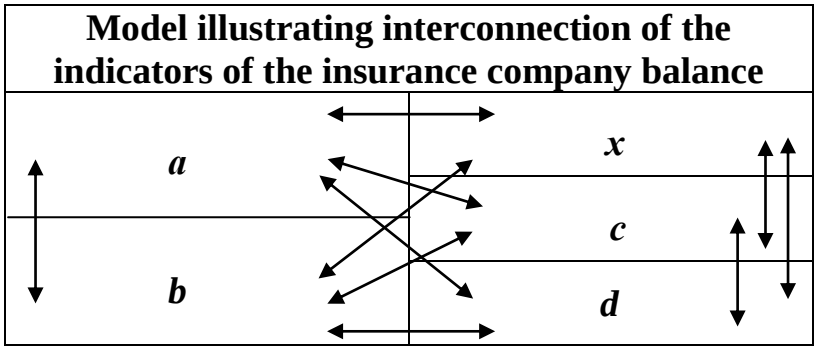

Figure 1. Sections (groups of indicators) of the insurance company balance and schematic model representing their interrelation

On the basis of the schematic model illustrated in Figure 1, to provide economic essence to formula (1), the indicators *a, b, c, x, d* of the balance of the IC will be connected with the schematic model of Figure 1. Thus, for the model $a + b - (c + d) = x$ on the basis of formulas (3)-(5) we consider the essence of complex retro-forecast analysis in details.

First method, i.e. if mathematical equation $a + b - (c + d) = x$ illustrates the model used to satisfy the benefits of the IC investors, it is complex retro-forecast analysis method.

Taking into account schematic model illustrated in Figure 1, we provide complex retro-forecast analysis method based on formulas(1)-(3) for the model $a + b - (c + d) = x$. For this purpose, first of all, we are revealing mathematic-algorithm essence of is complex retro-forecast analysis based on Lagrange interpolation formula for interconnection of *a, b, c, d* of the accounting balance.

Herewith, first of all, we observe the connection of x indicator with a indicator within the period (in terms of quarters or years).

Table 1

Dynamics of indicators (c) and (b) of the accounting balance by the second model of the complex retro-forecast analysis for selected period of time

Indicators	Period 1	Period 2	Period 3	Period 4	...	$Period\ n$
Sources for equity	x_1	x_2	x_3	x_4	…	x_n
Current assets	a_1	a_2	a_3	a_4	…	a_n

Herein (in Table 1) it is possible to determine indicators of insurance reserves (x_1, x_2, x_3, x_4) of periods 1,2,3,4 and indicators of current assets (a_1, a_2, a_3) of periods 1,2,3 using Lagrange interpolation formula which will help to identify current assets $a_{4э}$ for period 4 as retro-forecast indicators. With this aim in formulas (3)-(5) given above we consider indicatots of Table 1 in their sequence.

$$P(x) = \frac{(x-x_2)(x-x_3)}{(x_1-x_2)(x_1-x_3)}a_1 + \frac{(x-x_1)(x-x_3)}{(x_2-x_1)(x_2-x_3)}a_2 + \frac{(x-x_1)(x-x_2)}{(x_3-x_1)(x_3-x_2)}a_3 \quad (6)$$

Herewith we will determine fraction with the help of formula (6) as follows.

$$p_1 = \frac{(x-x_2)(x-x_3)}{(x_1-x_2)(x_1-x_3)};\ p_2 = \frac{(x-x_1)(x-x_3)}{(x_2-x_1)(x_2-x_3)};\ p_3 = \frac{(x-x_1)(x-x_2)}{(x_3-x_1)(x_3-x_2)}. \quad (7)$$

Putting values of p_1, p_2, p_3 from formula (7) into formula (6) and accepting $a_{4э}$ as a sample we can develop the formula for calculating retro-forecast indicators:

$$a_{4э} = P(x) = p_1a_1 + p_2a_2 + p_3a_3 \quad (8)$$

Indicator $a_{4э}$ calculated with the help of formula (8) for period 4 is based on the real value of a_4 indicating current assets from the accounting balance and therein application of the following quality criterion is advisable:

$$a_{4э} - a_4 = \Delta a_4 \quad (9)$$

The algorithmic process based on the formulas (5)-(9) can be illustrated in the following way:

1) if $\Delta a > 0$, real opportunities of the IC are used at a lower level than retro-forecast indicators accepted as a sample;

2) if $\Delta a < 0$, real opportunities of the IC are used at a higher level than retro-forecast indicators accepted as a sample;

3) if $\Delta a = 0$, real opportunities of the IC are used at the same level as retro-forecast indicators accepted as a sample.

The results obtained with the application of formula (9), that is, the difference between retro-forecast indicator of Table 1 for period 4 and the indicator

of the real balance can provide a quantitative evaluation of the balance sheet of the IC.

Considering the issue from the point of view of an investor's benefit, algorithmic process for the first interrelation of model $(a + b - (c + d) = x$ we will replace indicator (a) with indicators *(b), (c), (d)* one by one, further applying the second, third and fourth interrelations given by formulas (5)-(9) in the formulas (10)-(14) we can get final values of the balance sheet for at least three-year period of time (that implies the period of at least three quarters or a year). Table 2 given below illustrates algorithmic process of the complex retro-forecast analysis.

On the basis of the algorithmic process shown in Table 2, correspondingly, using indicators of periods 1,2,3 for period 4, indicators of periods 2,3,4 for period 5, indicators of period 3,4,5 for period 6,.... of periods ($n - 3$), ($n - 2$), ($n - 1$)- for period n and applying formulas (8)-(9), complex retro-forecast indicators accepted as sample and real balance indicators which comply with complex retro-forecast indicators it is possible to determine the algorithmic process for complex retro-forecast analysis.

Table 2

Algorithmic process of complex retro-forecast analysis based on the interrelation of balance's indicator by the first model for selected periods

Balance indicators	**Period 1**	**Period 2**	**Period 3**	**Period 4**		
				Real indicators	**Forecast sample analysis**	**Difference (+;-)**
Long-term assets (a)	a_1	a_2	a_3	a_4	$a_{4э}$	Δa_4
Current assets (b)	b_1	b_2	b_3	b_4	$b_{4э}$	Δb_4
Total balance assets ($a + b$)	$\boldsymbol{a_1 + b_1}$	$\boldsymbol{a_2 + b_2}$	$\boldsymbol{a_3 + b_3}$	$\boldsymbol{a_4 + b_4}$	$\boldsymbol{a_{4э} + b_{4э}}$	$\Delta a_4 + \Delta b_4$
Equity sources (x)	x_1	x_2	x_3	x_4	x_4	$\Delta x_4 = 0$
Insurance reserves (c)	c_1	c_2	c_3	c_4	$c_{4э}$	Δc_4
Liabilities (d)	d_1	d_2	d_3	d_4	$d_{4э}$	Δd_4
Total balance assets ($x + c + d$)	$\boldsymbol{x_1 + c_1 + d_1}$	$\boldsymbol{x_2 + c_2 + d_2}$	$\boldsymbol{x_3 + c_3 + d_3}$	$\boldsymbol{x_4 + c_4 + d_4}$	$\boldsymbol{x_4 + c_{4э} + d_{4э}}$	$\Delta x_4 + \Delta c_4 + \Delta d_4$

Thus, taking into consideration that algorithmic process for complex retro-forecast analysis by model Шундай қилиб, $(a + b - (c + d) = x$ is reflected in Table 2, putting indicators of periods 1,2,3 provided in the Table into formula (8) we can determine the results of $a_{4э}$, $b_{4э}$, $c_{4э}$, $d_{4э}$ complex retro-forecast indicators accepted as samples:

$$\left.\begin{matrix} a_{4э} = P(x) = p_1 a_1 + p_2 a_2 + p_3 a_3 \\ b_{4э} = P(x) = p_1 b_1 + p_2 b_2 + p_3 b_3 \\ c_{4э} = P(x) = p_1 c_1 + p_2 c_2 + p_3 c_3 \\ d_{4э} = P(x) = p_1 d_1 + p_2 d_2 + p_3 d_3 \end{matrix}\right\} \text{- Process 1} \qquad (10)$$

In this way, that is in the way similar to process 1, we can determine algorithmic processes for periods 5, 6 and so on up to period *n* (period 2, period 3) in the form of the following formulas (11)-(13):

$$\left.\begin{matrix} a_{5э} = P(x) = p_2 a_2 + p_3 a_3 + p_4 a_4 \\ b_{5э} = P(x) = p_2 b_2 + p_3 b_3 + p_4 b_4 \\ c_{5э} = P(x) = p_2 c_2 + p_3 c_3 + p_4 c_4 \\ d_{5э} = P(x) = p_2 d_2 + p_3 d_3 + p_4 d_4 \end{matrix}\right\} \text{- Process 2} \qquad (11)$$

$$\left.\begin{matrix} a_{6э} = P(x) = p_3 a_3 + p_4 a_4 + p_5 a_5 \\ b_{6э} = P(x) = p_3 b_3 + p_4 b_4 + p_5 b_5 \\ c_{6э} = P(x) = p_3 c_3 + p_4 c_4 + p_5 c_5 \\ d_{6э} = P(x) = p_3 d_3 + p_4 d_4 + p_5 d_5 \end{matrix}\right\} \text{- Process 3} \qquad (12)$$

.....

.....

$$\left.\begin{matrix} a_{nэ} = P(x) = p_{n-3} a_{n-3} + p_{n-2} a_{n-2} + p_{n-1} a_{n-1} \\ b_{nэ} = P(x) = p_{n-3} b_{n-3} + p_{n-2} b_{n-2} + p_{n-1} b_{n-1} \\ c_{nэ} = P(x) = p_{n-3} c_{n-3} + p_{n-2} c_{n-2} + p_{n-1} c_{n-1} \\ d_{nэ} = P(x) = p_{n-3} d_{n-3} + p_{n-2} d_{n-2} + p_{n-1} d_{n-1} \end{matrix}\right\} \text{- Process } k \qquad (13)$$

Deduction of indicators (a_3, b_3, c_3, d_3) obtained with the help of application of formula (11), deduction of indicators (a_4, b_4, c_4, d_4) obtained with the help of formula (12), deduction of indicators (a_n, b_n, c_n, d_n) obtained with the help of formula (13) we arrange in compliance with criterion 9:

$$\begin{matrix} a_{4э} - a_4 = \Delta a_4 & a_{5э} - a_5 = \Delta a_5 & .... & a_{nэ} - a_n = \Delta a_n \\ b_{4э} - b_4 = \Delta b_4 & b_{5э} - b_5 = \Delta b_5 & .... & b_{nэ} - b_n = \Delta b_n \\ c_{4э} - c_4 = \Delta c_4 & c_{5э} - c_5 = \Delta c_5 & .... & c_{nэ} - c_n = \Delta c_n \\ d_{4э} - d_4 = \Delta d_4 , & d_{5э} - d_5 = \Delta d_5 , & .... & d_{nэ} - d_n = \Delta d_n \end{matrix} \qquad (14)$$

Various scenarios determined with the help of formulas (5)-(9) specified above can be presented in the following way:

1) if $\Delta a \ (or \ \Delta b, \Delta c, \Delta d) > 0$, real opportunities of the IC are used at a lower level than retro-forecast indicators accepted as a sample;

2) if $\Delta a \ (or \ \Delta b, \Delta c, \Delta d) < 0$, real opportunities of the IC are used at a higher level than retro-forecast indicators accepted as a sample;

3) if Δa (ёки $\Delta b, \Delta c, \Delta d) = 0$ real opportunities of the IC are used at the same level as retro-forecast indicators accepted as a sample.

Placement of results received with the application of formula (14) in Table 3 enables to assess the quality of indicators of the IC balance.

Table 3

Assessment of the quality of interrelation of accounting balance indicators by the second model for selected periods

Balance indicators	**Period 4**	**Period 5p**	**…**	**Period (n-1)**	**Period n**
Long-term assets (a)	Δa_4	Δa_5	**…**	Δa_{n-1}	Δa_n
Current assets (b)	Δb_4	Δb_5	**…**	Δb_{n-1}	Δb_n
Total balance assets ($a + b$)	$\Delta a_4 + \Delta b_4$	$\Delta a_5 + \Delta b_5$	**…**	$\Delta a_{n-1} + \Delta b_{n-1}$	$\Delta a_n + \Delta b_n$
Equity sources (x)	$\Delta x_4 = 0$	$\Delta x_5 = 0$	**…**	$\Delta x_{n-1} = 0$	$\Delta x_n = 0$
Insurance reserves (c)	Δc_4	Δc_5	**…**	Δc_{n-1}	Δc_n
Liabilities (d)	Δd_4	Δd_5	**…**	Δd_{n-1}	Δd_n
Total balance assets ($x + c + d$)	$\Delta x_4 + \Delta c_4 + \Delta d_4$	$\Delta x_5 + \Delta c_5 + \Delta d_5$	**…**	$\Delta x_{n-1} + \Delta c_{n-1} + \Delta d_{n-1}$	$\Delta x_n + \Delta c_n + \Delta d_n$

On the basis of the results of accounting balance indicators calculated within the framework of process 1, process 2 and so on up to process k by the second model shown in Table 3 it is possible to carry out complex retro-forecast analysis aimed at satisfaction of the benefit of the IC investors.

Second method, i.e. the complex forecast method aimed at satisfying the benefits of the IC investors who contributed to the Charter capital is illustrated with the mathematical equation $a + b - (c + d) = x$

Taking into account schematic model provided in Figure 1 above, we consider the essence of the complex retro-forecast method based on formulas (1)-(3) for model $(a + b - (c + d) = x$. For this purpose, first of all, using Lagrange interpolation formula we reveal the mathematical-algorithmic model of the complex forecast process of interrelation of section (c) with the rest sections *a*, *b*, *c*, *d*. Herein, first of all, the relation of the first indicator *x* with indicator *a* is illustrated in Table 4 by periods of time (by quarters or years).

Table 4

Dynamics of indicators of (x) and (a) of accounting balance by the first model with the aim of complex forecast for selected periods

Indicators	**Period 1**	**Period 2**	**Period 3**	**Period 4**
Insurance reserves	x_1	x_2	x_3	$x_{4r} = x_3 * ?\,\%$
Long-term and current (or short-term) liabilities	a_1	a_2	a_3	$a_{4forecast}$

Herewith (according to Table 4) it is possible to determine indicators (x_1, x_2, x_3) for equity sources for periods 1,2,3 and indicators (a_1, a_2, a_3) for long-

term assets with the help of Lagrange interpolation formula. Therein, it is possible to determine forecast indicators of $x_{4r} = x_3 * ?\%$ (where the sign "?" indicates the amount of interest required) for equity sources and long-term assets $a_{4forecast}$ for period 4 according. Pursuing this aim we put indicators presented in Table 4 instead of variables in formulas (3)-(5).

$$P(x) = \frac{(x-x_2)(x-x_3)}{(x_1-x_2)(x_1-x_3)}a_1 + \frac{(x-x_1)(x-x_3)}{(x_2-x_1)(x_2-x_3)}a_2 + \frac{(x-x_1)(x-x_2)}{(x_3-x_1)(x_3-x_2)}a_3 \quad (15)$$

With the help of formula (15) we determine the following fractions.

$$p_1 = \frac{(x-x_2)(x-x_3)}{(x_1-x_2)(x_1-x_3)}; p_2 = \frac{(x-x_1)(x-x_3)}{(x_2-x_1)(x_2-x_3)}; p_3 = \frac{(x-x_1)(x-x_2)}{(x_3-x_1)(x_3-x_2)}. \quad (16)$$

By putting values p_1, p_2, p_3 of formula (16) into formula (15) we can receive the formula of finding forecast indicators of $a_{4forecast}$:

$$a_{4forecast} = Px = p_1a_1 + p_2a_2 + p_3a_3 \quad (17)$$

The results obtained with the help of formula (17) are considered to be the complex forecast indicators for period 4 shown in Table 4.

By putting indicators (b), (c), (d) correspondingly instead of indicator (a) in formula (17) according to the model $(a + b - (c + d) = x$ specified above, we can develop the following formula:

$$b_{4forecast} = P(x) = p_1b_1 + p_2b_2 + p_3b_3 \quad (18)$$

$$c_{4forecast} = P(x) = p_1c_1 + p_2c_2 + p_3c_3 \quad (19)$$

$$d_{4forecast} = P(x) = p_1d_1 + p_2d_2 + p_3d_3 \quad (20)$$

Complex forecast indicators calculated with the help of formulas (17)-(20) in Table 5

Table 5

Algorithmic process of complex retro-forecast analysis based on the interrelation of balance's indicator by the second and the third models for selected periods

Balance indicators	Period 1	Period 2	Period 3	Period 4 (Forecast period)
Long-term assets (a)	a_1	a_2	a_3	$a_{4forecast}$
Current assets (b)	b_1	b_2	b_3	$b_{4forecast}$

Total balance assets ($a+b$)	$\boldsymbol{a_1+b_1}$	$\boldsymbol{a_2+b_2}$	$\boldsymbol{a_3+b_3}$	$\boldsymbol{a_{4forecast}+b_{4forecast}}$
Equity sources (x)	x_1	x_2	x_3	$x_{4forecast}$
Insurance reserves (c)	c_1	c_2	c_3	$c_{4fct}=c_3*?\%$
Liabilities (d)	d_1	d_2	d_3	$d_{4forecast}$
Total balance assets ($x+c+d$)	$\boldsymbol{x_1+c_1+d_1}$	$\boldsymbol{x_2+c_2+d_2}$	$\boldsymbol{x_3+c_3+d_3}$	$\boldsymbol{x_{4fct}+c_{4fct}+d_{4fct}}$

Indicators for periods 1,2,3 calculated with the help of formulas (17)-(20) within the framework of $a+b-(c+d)=x$ model can be used for calculated for complex forecast indicators of predicted period 4. In the similar process of determining complex forecast indicators for period *n* will look as it follows:

$$\begin{Bmatrix} d_{(n)forecast} = P(x) = p_1a_1 + p_2a_2 + \ldots + p_{n-1}a_{n-1} \\ a_{(n)forecast} = P(x) = p_1b_1 + p_2b_2 + \ldots + p_{n-1}b_{n-1} \\ c_{(n)forecast} = P(x) = p_1c_1 + p_2c_2 + \ldots + p_{n-1}c_{n-1} \\ b_{(n)forecast} = P(x) = p_1d_1 + p_2d_2 + \ldots + p_{n-1}d_{n-1} \end{Bmatrix} \quad (21)$$

Complex forecast indicators obtained from formulas (17)-(20) and formula (21) are presented in Table 6 given below.

Table 6.

Algorithmic process of complex retro-forecast analysis based on the interrelation of balance's indicator by the first model for selected periods

Balance indicators	**Period 1**	**Period 2**	**...**	**Period *n*-**	**Period ($n+1$) (Forecasted period)**
Long-term assets (a)	a_1	a_2	...	a_{n-1}	$a_{(n)forecast}$
Current assets (b)	b_1	b_2	...	b_{n-1}	$b_{(n)forecast}$
Total balance assets ($a+b$)	$\boldsymbol{a_1+b_1}$	$\boldsymbol{a_2+b_2}$	...	$\boldsymbol{a_{n-1}+b_{n-1}}$	$\boldsymbol{a_{(n)forecast}+b_{(n)forecast}}$
Equity sources (x)	x_1	x_2	...	x_{n-1}	$x_{(n)forecast}=x_{n-1}*?\%$
Insurance reserves (c)	c_1	c_2	...	c_{n-1}	$c_{(n)forecast}$
Liabilities (d)	d_1	d_2	...	d_{n-1}	$d_{(n)forecast}$
Total balance assets ($x+c+d$)	$\boldsymbol{x_1+c_1+d_1}$	$\boldsymbol{x_2+c_2+d_2}$	...	$\boldsymbol{x_{n-1}+c_{n-1}+d_{n-1}}$	$\boldsymbol{x_{(n)fct}+c_{(n)fct}+d_{(n)fct}}$

Tables 5 and 6 illustrate the forecast of equity sources *(x)* by the model $(a+b-(c+d)=x$ on the basis of accounting balance indicators. Using this technique it has become possible for the IC management to forecast how increase of part (c) and reduction of part (x) can bring revenue and additional bonuses and

in what amount which exceeds the sum specified in the labour contract.

LITERATURE REVIEW

Based on foreign literature analysis among foreign scholars who have contributed to the analysis and forecasting of accounting balances of insurance companies the following economists can be mentioned: D.Hampton, R.Higgins, Benninga Simon, Mayes Timothy R. and Todd M. Shank, Jiambalvo James, Palepu Krishna G. and Paul M. Healy, Elaine Henry, Steve W. J. Lin and Ya-wen Yong, Sharmila S., Senthil Kumaran, Allan Timmermann.

The following Russian scientist have contributed to the research of the financial condition of insurance companies, their solvency and financial sustainability by means of analyzing indicators of accounting balance: Rinchino T.Yu, Mozolkina O.A., Repina K.V., Lapteva N.A. and Laptev G.G., Vinnikova I.S., Kulokov S.V., Jilyakov D.I. and Zaretskaya V.G., Shvetsova I.N. and Pashkevich M.A., Petrova V.I., Uvarova A.Ya., Astafurova I.S. and other scientists who have studied various aspects of this issue in their scientific papers.

In Uzbekistan the following scholars and experts devoted their studies to the financial analysis of insurance companies in Uzbekistan: Khodjayeva M.Kh., Shirinov S.E., Ochilov I.K., Shokhazamiy Sh.Sh. and Sunnatov Yu.U. These scholars used traditional methods while carrying out financial analysis.

However, it should be noted that the scholars mentioned above haven't researched the issues of complex financial analysis and forecast in their scientific papers. The analysis technique applied in Uzbekistan for assessing financial condition of insurance companies based on accounting standards established on the basis of national accounting standards, primarily relied on determining economic indicators (coefficients) and applying previously-used classical analysis methods. In addition, it should be noted that both domestic scholars and foreign economists haven't considered the possibility of using Lagrange interpolation formula in the complex analysis and forecast methods to analyze indicators of accounting balances of insurance companies[5].

However, the methods of applying Lagrange interpolation formula in the complex analysis and forecast methods to analyze indicators of accounting balances of economic entities, in particular, insurance companies haven't been worked out yet.

Generally speaking, as literature review of scientific papers of prominent foreign and domestic economists and scholars shows, submitting reliable financial statements by insurance companies as well as providing transperancy, as well as searching complex analysis and forecast of accounting balance indicators and their practical application will enable to formulate theoretical and practical conclusions. These conclusions will contribute to the development of appropriate theoretical proposals and practical recommendations aimed at application of mathematic and econometric methods to develop perfect methodology for complex analysis and

[5] In addition to Lagrange interpolation formula in the compact form applied by the Uzbek scientist Shokhazamiy Sh.Sh. and his trainee Sunnatov Yu.U.

forecast of indicators of accounting balances of domestic insurance companies in term of the approved Action Strategy.

Having generalized researches given above which are devoted to the common issues of financial analysis and methodology, the issues of complex analysis and forecast of indicators of accounting balances of insurance companies haven't been properly studied. Thus fact justifies the urgency of carrying out relevant researches in this area.

EXPERIMENTAL ANALYTICAL TEST OF THE METHOD

First method, **i.e. the model represented as $a + b - (c + d) = x$ and designed to satisfy the benefits of the IC investor is subject to the empirical test implemented on the basis of accounting balance data of Insurance Company "Alskom" JSC with the application of complex retro-forecast analysis.**

To achieve this aim, on the basis of mathematical-algorithmical process specified above, we perform complex retro-forecast analysis of interrelations of the rest sections *a* – long-term assets, *b*- current (short-term) assets, *c* – insurance reserves, *d* – long-term or current (short-term) liabilities of the section (*x)* of the accounting balance shown in Figure 1. For this purpose, we implement analysis gradually, starting from one element of this interrelation, indicator *x* with indicator a in terms of complex forecast illustrated in Table 7 by periods (quarters or years).

Table 7.

Issue of complex forecast of required 10% growth of indicator *(x)* and *(a)* on the basis of indicator *a* on the basis of the interrelation of these indicators of the accounting balance of IC "Alskom" JSC in terms of the Investor model

Indicators	Period 1 (2016)		Period 2 (2017)		Period 3 (2018)		Period 4 (2019)	
	balance value	Indicator	balance value	Indicator	balance value	Indicator	balance value	Реал баланс киймат
Equity sources	x_1	8074157,0	x_2	12151963,2	x_3	15825695,4	x_4	17380099,9
Long-term assets	a_1	12530806,9	a_2	16402793,8	a_3	19969628,0	a_4	22568551,9

Herein (in Table 7) it is possible to determine retro-forecast indicators (x_1, x, x_3, x_4) for equity sources for periods 1,2,3,4 and indicators (a_1, a_2, a_3) for long-term assets for periods 1,2,3 with the help of Lagrange interpolation formula. In this regard we can calculate sample $a_{4э}$ accepted for period 4. For this purpose we can calculate the value of $a_{4э}$uing formulas (3)-(5) in Table 7.

$$a_{4э} = P(x) = \frac{(x_4-x_2)(x_4-x_3)}{(x_1-x_2)(x_1-x_3)}a_1 + \frac{(x_4-x_1)(x_4-x_3)}{(x_2-x_1)(x_2-x_3)}a_2 + \frac{(x_4-x_1)(x_4-x_2)}{(x_3-x_1)(x_3-x_2)}a_3 =$$
$$\frac{(17380099,9-12151963,2)(17380099,9-15825695,4)}{(8074157,0-12151963,2)(8074157,0-15825695,4)} * 12530806,9 +$$
$$\frac{(17380099,9-8074157,0)(17380099,9-15825695,4)}{(12151963,2-8074157,0)(12151963,2-15825695,4)} * 16402793,8 +$$
$$\frac{(17380099,9-8074157,0)(17380099,9-12151963,2)}{(15825695,4-8074157,0)(15825695,4-12151963,2)} * 19969628,0 \qquad (22)$$

Therewith, using formula (23) it is possible to determine the following values as fractions:

$$p_1 = \frac{(x-x_2)(x-x_3)}{(x_1-x_2)(x_1-x_3)} = \frac{(17380099,9-12151963,2)(17380099,9-15825695,4)}{(8074157,0-12151963,2)(8074157,0-15825695,4)} = 0,257097;$$
$$p_2 = \frac{(x-x_1)(x-x_3)}{(x_2-x_1)(x_2-x_3)} = \frac{(17380099,9-8074157,0)(17380099,9-15825695,4)}{(12151963,2-8074157,0)(12151963,2-15825695,4)} = -0,965585;$$
$$p_3 = \frac{(x-x_1)(x-x_2)}{(x_3-x_1)(x_3-x_2)} = \frac{(17380099,9-8074157,0)(17380099,9-12151963,2)}{(15825695,4-8074157,0)(15825695,4-12151963,2)} = 1,708488. \qquad (23)$$

By putting valuesp_1, p_2, p_3 of formula (23) into formula (22) we can determine the value of retro-forecast indicator accepted as sample $a_{4э}$:

$$a_{4э} = P(x) = p_1a_1 + p_2a_2 + p_3a_3 = 0,257097 * 12530806,9 +$$
$$(-0,965585) * 16402793,8 + 1,708488 * 19969628,0 = 21501212,02 \qquad (24)$$

Based on $a_{4э}$ indicator calculated with the help of formula (24) and real value a_4 of current assets of the accounting balance for period 4 we can calculate the value of quality criterion:

$$a_{4э} - a_4 = 21501212,02 - 22568551,90 = -1067339,88 = \Delta a_4 \qquad (25)$$

As a result of the algorithmic process calculated with the help of formulas (22)-(25), it is obvious that $\Delta a_4 < 0$, and according to this fact that IC entirely uses its opportunities and potential in relation to its retro-forecast indicators.

Considering from the point of view of the benefits of the IC investors $a + b - (c + d) = x$ and putting consequently indicators *(b), (c), (d)* instead of *(a)* indicator, and further by putting the second, third and fourth interrelations of formulas (26)-(29) into similar formulas (6)-(9), we can receive the results indicated in Table 8 in terms of at least 3 quarter or a year period of time within the algorithmic process of the complex retro-forecast analysis.

Table 8.

Results of complex retroprognois analysis of the interrelation of indicators of the accounting balance of IC "Alskom" JSC (for 2012-2015)

Balance indicators	Period 1	Period 2	Period 3	Period 4		
				Real indicator	Retro-forecast sample indicator	Difference (+;-)
1	2	3	4	5	6	7=6-5
Long-term assets (a)	12530806,90	16402793,80	19969628,00	22568551,90	21501212,02	-1067339,88
Current assets (b)	6136757,10	10014430,70	15714929,50	20458570,30	18756727,15	-1701843,15
Total balance assets ($a+b$)	**18667564,00**	**26417224,50**	**35684557,50**	**43027122,20**	**40257939,16**	**-2769183,04**
Equity sources (x)	8074157,00	12151963,20	15825695,40	17380099,90	17380099,90	0,00
Insurance reserves (c)	10180908,00	13324594,70	18547519,40	24064836,10	21439667,16	-2625168,94
Liabilities (d)	412499,00	940666,60	1311342,70	1582186,20	1438172,11	-144014,09
Total balance assets ($x+c+d$)	**18667564,00**	**26417224,50**	**35684557,50**	**43027122,20**	**40257939,16**	**-2769183,04**

On the basis of the algorithm process shown in Table 8, correspondingly, the indicators of historical periods 1,2,3 can be used for period 4, the indicators of historical periods 2,3,4 can be used for period 5, the indicators for historical periods 3,4,5 can be used for period 6, and the indicators of historical periods 4,5,6 can be used for period 7. By applying formulas (22)-(25) it has become possible to determine the algorithmic process of the complex retro-forecast analysis for identifying relevant balance indicators accepted as a sample.

In this regard, the algorithmic process of the complex retro-forecast analysis by the model $a+b-(c+d)=x$ is illustrated in Table 8. By putting indicators of periods 1,2,3 into formula (24), we can calculate the values of complex retro-forecast indicators $a_{4э}$, $b_{4э}$, $c_{4э}$, $d_{4э}$ accepted as a sample:

$$\left\{\begin{array}{c} a_{4э}=P(x)=p_1a_1+p_2a_2+p_3a_3=0{,}257097*12530806{,}9+(-0{,}965585) \\ *16402793{,}8+1{,}708488*19969628{,}0=21501212{,}02 \\ b_{4э}=P(x)=p_1b_1+p_2b_2+p_3b_3=0{,}257097*6136757{,}1+(-0{,}965585) \\ *10014430{,}7+1{,}708488*15714929{,}5=18756727{,}15 \\ c_{4э}=P(x)=p_1c_1+p_2c_2+p_3c_3=0{,}257097*10180908{,}0+(-0{,}965585) \\ *13324594{,}7+1{,}708488*18547519{,}4=21439667{,}16 \\ d_{4э}=P(x)=p_1d_1+p_2d_2+p_3d_3=0{,}257097*412499{,}0+(-0{,}965585) \\ *940666{,}6+1{,}708488*1311342{,}7=1438172{,}11 \end{array}\right\} \text{- Process 1} \quad (26)$$

In the similar way (as illustrated by Process 1) using algorithmic processes of the complex retro-forecast analysis for periods 5,6,7 by the first model (for

processes 2,3,4) and applying formulas (27)-(29) it is possible to find out the following sample values:

$$\left.\begin{array}{l} a_{5э} = P(x) = p_2a_2 + p_3a_3 + p_4a_4 = 0{,}675105 * 16402793{,}8 + (-4{,}140604) \\ * 19969628{,}0 + 4{,}465499 * 22568551{,}9 = 29167132{,}59 \\ b_{5э} = P(x) = p_2b_2 + p_3b_3 + p_4b_4 = 0{,}675105 * 10014430{,}7 + (-4{,}140604) \\ * 15714929{,}5 + 4{,}465499 * 20458570{,}3 = 33049217{,}85 \\ c_{5э} = P(x) = p_2c_2 + p_3c_3 + p_4c_4 = 0{,}675105 * 13324594{,}7 + (-4{,}140604) \\ * 18547519{,}4 + 4{,}465499 * 24064836{,}1 = 39659069{,}64 \\ d_{5э} = P(x) = p_2d_2 + p_3d_3 + p_4d_4 = 0{,}675105 * 940666{,}6 + (-4{,}140604) \\ * 1311342{,}7 + 4{,}465499 * 1582186{,}2 = 2270548{,}80 \end{array}\right\} - \text{Process } 2 \quad (27)$$

$$\left.\begin{array}{l} a_{6э} = P(x) = p_3a_3 + p_4a_4 + p_5a_5 = 2{,}096511 * 19969628{,}0 + (-4{,}121513) \\ * 22568551{,}9 + 3{,}025002 * 25979175{,}7 = 27437022{,}63 \\ b_{6э} = P(x) = p_3b_3 + p_4b_4 + p_5b_5 = 2{,}096511 * 15714929{,}5 + (-4{,}121513) \\ * 20458570{,}3 + 3{,}025002 * 28719372{,}2 = 35502416{,}32 \\ c_{6э} = P(x) = p_3c_3 + p_4c_4 + p_5c_5 = 2{,}096511 * 18547519{,}4 + (-4{,}121513) \\ * 24064836{,}1 + 3{,}025002 * 32687214{,}2 = 38580430{,}70 \\ d_{6э} = P(x) = p_3d_3 + p_4d_4 + p_5d_5 = 2{,}096511 * 1311342{,}7 + (-4{,}121513) \\ * 1582186{,}2 + 3{,}025002 * 1724601{,}7 = 1445166{,}95 \end{array}\right\} - \text{Process } 3 \quad (28)$$

$$\left.\begin{array}{l} a_{7э} = P(x) = p_4a_4 + p_5a_5 + p_6a_6 = 5{,}727092 * 22568551{,}9 + (-15{,}25097) \\ * 25979175{,}7 + 10{,}523875 * 27090991{,}8 = 18146833{,}7 \\ b_{7э} = P(x) = p_4b_4 + p_5b_5 + p_6b_6 = 5{,}727092 * 20458570{,}3 + (-15{,}25097) \\ * 28719372{,}2 + 10{,}523875 * 37318602{,}3 = 71906222{,}61 \\ c_{7э} = P(x) = p_4c_4 + p_5c_5 + p_6c_6 = 5{,}727092 * 24064836{,}1 + (-15{,}25097) \\ * 32687214{,}2 + 10{,}523875 * 39842774{,}5 = 58610284{,}34 \\ d_{7э} = P(x) = p_4d_4 + p_5d_5 + p_6d_6 = 5{,}727092 * 1582186{,}2 + (-15{,}25097) \\ * 1724601{,}7 + 10{,}523875 * 1652978{,}3 = 155219{,}37 \end{array}\right\} - \text{Process } 4 \quad (29)$$

In the next step we determine the deduction of indicators (a_4, b_4, c_4, d_4) obtained with the help of formula (26), the deduction of indicators (a_5, b_5, c_5, d_5) obtained with the help of formula (28), the deduction of indicators (a_6, b_6, c_6, d_6) obtained with the help of formula (28), the deduction of indicators (a_7, b_7, c_7, d_7) obtained with the help of formula (29) and in this way we determine the following criteria (similar to criterion (25)):

$$\begin{array}{l} a_{4э} - a_4 = 21501212{,}02 - 22568551{,}9 = -1067339{,}88 = \Delta a_4 \\ b_{4э} - b_4 = 18756727{,}15 - 20458570{,}3 = -1701843{,}15 = \Delta b_4 \\ c_{4э} - c_4 = 21439667{,}16 - 24064836{,}1 = -2625168{,}94 = \Delta c_4 \\ d_{4э} - d_4 = 1438172{,}11 - 1582186{,}2 = -144014{,}09 = \Delta d_4 \end{array} \quad (30)$$

$$\begin{array}{l} a_{5э} - a_5 = 29167132{,}59 - 25979175{,}7 = 3187956{,}89 = \Delta a_5 \\ b_{5э} - b_5 = 33049217{,}85 - 28719372{,}2 = 4329845{,}65 = \Delta b_5 \\ c_{5э} - c_5 = 39659069{,}64 - 32687214{,}2 = 6971855{,}44 = \Delta c_5 \\ d_{5э} - d_5 = 2270548{,}8 - 1724601{,}7 = 545947{,}1 = \Delta d_5 \end{array} \quad (31)$$

$$a_{6э} - a_6 = 27437022{,}63 - 27090991{,}8 = 346030{,}83 = \Delta a_6$$
$$b_{6э} - b_6 = 35502416{,}32 - 37318602{,}3 = -1816185{,}98 = \Delta b_6$$
$$c_{6э} - c_6 = 38580430{,}7 - 39842774{,}5 = -1262343{,}8 = \Delta c_6$$
$$d_{6э} - d_6 = 1445166{,}95 - 1652978{,}3 = -207811{,}35 = \Delta d_6 \qquad (32)$$

$$a_{7э} - a_7 = 18146833{,}7 - 33835748{,}3 = -15688914{,}6 = \Delta a_7$$
$$b_{7э} - b_7 = 71906222{,}61 - 52849754{,}1 = 19056468{,}51 = \Delta b_7$$
$$c_{7э} - c_7 = 58610284{,}34 - 53911789{,}0 = 4698495{,}34 = \Delta c_7$$
$$d_{7э} - d_7 = 155219{,}37 - 1486160{,}8 = -1330941{,}43 = \Delta d_7 \qquad (33)$$

On the basis of the result of algorithmic processes calculated in reliance on formulas (30)-(33), for example, it is possible to witness the cases when $\Delta a_4 < 0$, $\Delta a_5 > 0$, $\Delta a_6 > 0$, $\Delta a_7 < 0$, and according to this fact, we can draw the conclusion that the IC does not fully use available opportunities of retro-forecast indicators accepted as a sample by the criteria Δa_5, Δa_6.

However, criteria Δa_4, Δa_7 justify that the IC utilized available opportunities to the full extent. In the same way relevant conclusions can be made on the cases arisen by other criteria values.

Using the data provided in Table 9 obtained with the help of formulas (30)-(33) it is possible to evaluate the indicators of the accounting balance of the IC.

Table 9

Values of quality criteria determined by IC "Alskom" JSC (based on the accounting balance indicators for 2012-2018)

Balance indicators	**Difference between sample forecast indicators and real balance indicators (+;-)**			
	Period 4 (2015)	**Period 5 (2016)**	**Period 6 (2017)**	**Period 7 (2018)**
Long-term assets (a)	-1067339,88	3187956,89	346030,83	-15688914,60
Current assets (b)	-1701843,15	4329845,65	-1816185,98	19056468,51
Total balance assets ($a + b$)	-2769183,04	7517802,54	-1470155,15	3367553,91
Equity sources (x)	0,00	0,00	0,00	0,00
Insurance reserves (c)	-2625168,94	6971855,44	-1262343,80	4698495,34
Liabilities (d)	-144014,09	545947,10	-207811,35	-1330941,43
Total balance assets ($x + c + d$)	-2769183,04	7517802,54	-1470155,15	3367553,91

Basing on the results of the accounting balance indicators calculated within

the framework of processes 1-4 by the first model provided in Table 9, it is possible to make the following conclusion.

It should be noted that values of the determined quality criteria illustrate, that IC "Alskom" JSC over this period of time has used the potential of its opportunities at various levels. In particular, as the retro-forecast indicator accepted as a sample illustrates, in 2015 the IC fully utilized available opportunities. However, in 2016, the IC didn't use real opportunities in relation to retro-forecast indicators accepted as a sample. In 2017 it didn't use its opportunities in relation only to long-term assets. In 2018 the IC fully utilized available opportunities by both long-term assets and liabilities.

***Second method,* i.e. the model represented as $a + b - (c + d) = x$ and designed to satisfy the benefits of the IC investors is subject to the empirical test implemented on the basis of accounting balance data of Insurance Company "Alskom" JSC with the application of complex forecast method.**

To achieve this aim, on the basis of mathematical-algorithmical process specified above, we apply complex forecast method for the interrelation of the rest sections – long-term assets *(a)*, current (short-term) assets *(b)*, insurance reserves *(c)*, and long-term and current (short-term) liabilities of the section *(d)* of the accounting balance *(x)* shown in Figure 1. For this purpose, we implement complex forecast gradually, starting from one element of this interrelation, indicator x with indicator a in terms of complex forecast illustrated in Table 10 by periods (quarters or years).

Table 10

Issue of complex forecast of required 10% growth of indicator *x* on the basis of indicator *x* on the basis of the interrelation of indicators (x) and (a) of the accounting balance of IC "Alskom" JSC in terms of the Investor model

Indicators	Period 1 (2016)		Period 2 (2017)		Period 3 (2018)		Period 4 (2019)	
	Indicator	Its real balance value	Indicator	Its real balance value	Indicator	Its real balance value	Indicator	balance value
Equity sources	x_1	20286732,00	x_2	22913841,30	x_3	31287552,60	$x_{4r} = x_3 * ?\%$	
Long-term assets	a_1	25979175,70	a_2	27090991,80	a_3	33835748,30	$a_{4forecast}$	?

Herein (in Table 10) indicators of equity sources (x, x_2, x_3) for periods 1,2,3 and indicators of long-term assets (a_1, a_2, a_3) for periods 1,2,3 using Lagrange interpolation formula the amount of required indicator for insurance reserves is determined as $x_{req} = x_3 * ?\%$ (where: ? indicates the amount of interest required. We calculate 10% of this value, i.e. multiplying it by 1,1 coefficient which

constitutes 31287552,60*1,1= 34416307,86) which enables to determine forecast indicator $a_{4forecast}$ for period 4 by long-term assets. With this aim as it has been shown above, we use the following formula. Herein we put indicators provided in Table 10 instead of variables of formulas (3)-(5)

Бунда (10-жадвалда) ўз маблағлари манбаларининг 1,2,3-давр кўрсаткичлари

$$P(x) = \frac{(x-x_2)(x-x_3)}{(x_1-x_2)(x_1-x_3)}a_1 + \frac{(x-x_1)(x-x_3)}{(x_2-x_1)(x_2-x_3)}a_2 + \frac{(x-x_1)(x-x_2)}{(x_3-x_1)(x_3-x_2)}a_3 =$$
$$\frac{(34416307,86-22913841,30)(34416307,86-31287552,60)}{(20286732,00-22913841,30)(20286732,00-31287552,60)}25979175,70 +$$
$$\frac{(34416307,86-20286732,00)(34416307,86-31287552,60)}{(22913841,30-20286732,00)(22913841,30-31287552,60)}27090991,80 +$$
$$\frac{(34416307,86-20286732,00)(34416307,86-22913841,30)}{(31287552,60-20286732,00)(31287552,60-22913841,30)}33835748,30 \quad (34)$$

Using the formula specified above we determine the following fraction with the help of formula (35):

$$p_1 = \frac{(34416307,86-22913841,30)(34416307,86-31287552,60)}{(20286732,00-22913841,30)(20286732,00-31287552,60)} = 1,245258;$$
$$p_2 = \frac{(34416307,86-20286732,00)(34416307,86-31287552,60)}{(22913841,30-20286732,00)(22913841,30-31287552,60)} = -2,009577;$$
$$p_3 = \frac{(34416307,86-20286732,00)(34416307,86-22913841,30)}{(31287552,60-20286732,00)(31287552,60-22913841,30)} = 1,764319. \quad (35)$$

By putting values $p_1, p_2, p_3$of formula (35) into formula (34) we obtain the formula $a_{4forecast}$ used for finding out forecast indicators and in this way we determine forecast indicator $a_{4forecast}$:

$a_{4forecast} = P(x) = p_1a_1 + p_2a_2 + p_3a_3 = 1,245258 * 25979175,7 + (-2,009577) *$
$27090991,8 + 1,764319 * 33835748,3 = 37606393,95$ (36)

By putting indicators (b), (c), (d) instead of indicator (a) in sequence into formula (36), on the basis of the formula provided below we find out the value of forecast indicators $b_{4forecast}$, $c_{4forecast}$, $d_{4forecast}$:

$b_{4forecast} = P(x) = p_1b_1 + p_2b_2 + p_3b_3 = 1,245258 * 28719372,2 + (-2,009577) *$
$37318602,3 + 1,764319 * 52849754,1 = 54012243,69$

(37) $c_{4forecast} = P(x) = p_1c_1 + p_2c_2 + p_3c_3 = 1,245258 * 32687214,2 + (-2,009577) *$
$39842774,5 + 1,764319 * 53911789,0 = 55754481,1$

(38) $d_{4forecast} = P(x) = p_1d_1 + p_2d_2 + p_3d_3 = 1,245258 * 1724601,7 + (-2,009577) *$
$1652978,3 + 1,764319 * 1486160,8 = 1447848,68$ (39)

Table 11 given below provides the complex forecast indicators calculated using formulas (36)-(39).

Table 11.

Complex forecast of (*b*), (c), (*d*) accounting balance indicators of IC "Alskom" JCS on the basis of their real value
(for 2019 on the basis of the data of 2016-2018)

Balance indicators	**Period 1 (2016)**	**Period 2 (2017)**	**Period 3 (2018)**	**Period 4 (2019: forecasted period)**
Long-term assets (a)	25979175,70	27090991,80	33835748,30	37606393,95
Current assets (b)	28719372,20	37318602,30	52849754,10	54012243,69
Total balance assets $(a+b)$	**54698547,90**	**64409594,10**	**86685502,40**	**91618637,64**
Equity sources (x)	20286732,00	22913841,30	31287552,60	34416307,86
Insurance reserves (c)	32687214,20	39842774,50	53911789,00	55754481,10
Liabilities (d)	1724601,70	1652978,30	1486160,80	1447848,68
Total balance assets $(x+c+d)$	**54698547,90**	**64409594,10**	**86685502,40**	**91618637,64**

Relying on the data provided in Table 11, in terms of the position $a+b-(c+d)=x$ complex forecast method had passed through empirical experimental test on the basis of the balance indicators of IC "Alskom" JSC. In addition, forecast indicators for 2019 have been identified on the basis of the balance sheet data of IC "Alskom" JSC over the period of 2016-2018. In accordance with this indicator, it has been determined that equity sources (x) will increase by 10%, from 31287552,6 thousand UZS up to 34416308 thousand UZS by 3128755,26 thousand UZS which arises from the rest four indicators: increase of long-term assets (a) from 33835748,3 thousand UZS to 37606394 thousand UZS, i.e. by 3770645,65 thousand UZS; increase of current assets (b) from 52849754,1 thousand UZS to 54012244 thousand UZS, i.e. by 1162489,59 thousand UZS; increase of insurance reserves (c) from 53911789 thousand UZS to 55754481 thousand UZS, i.e. by 1842692,1 thousand UZS; decrease of liabilities (d) from 1486160,8 thousand UZS to 1447848,7 thousand UZS, i.e. 38312,12 thousand UZS. These values have been determined with the use of the complex forecast analysis on the basis of Lagrange interpolation formula. Meanwhile, equity of shareholders of IC "Alskom" JSC is expected to increase in future.

Taking into consideration above-mentioned statements and using the method specified above while making relevant additions and alterations to the developed business-plan, or developing forecst for the business-plan for 2020, IC "Alskom" JSC can use its accounting balance indicators on the basis of the algorithm-mathematic process.

CONCLUSION AND PROPOSALS

Taking into consideration corporate governance rules, complex forecast of the benefits of the IC investors is considered to be the urgent issue.

Possibility to determine and forecast of the quality of managers participating in the IC investors and performance of the accounting department with the help of (*a, b, c, x, d*) balance sections enable to carry out analytical assessment of the quality of the IC balance and interrelation of the elements specified above.

Summing up our research, to obtain mathematical solution of the issue of complex retro-forecast analysis and complex forecast of the IC balances, it is advisable to apply Lagrange interpolation formula in the form of functions. In addition, there should be noted the relevance of application of new advanced methods of complex retro-forecast analysis and complex forecast of the IC balances.

Carrying out complex retro-forecast analysis and complex forecast in terms of the model designed to satisfy the benefits of the IC investors is crucially important for investors.

Performing analytical experimental testing of complex retro-forecast analysis and complex forecast method for the balance in terms of the benefit of the IC investors should be based on their mathematic-algorithmic process.

REFERENCES

1. Richard A. Brealey, Stewart C. Myers, Franklin Allen (2011) Principles of corporate finance / Richard A. Brealey, Stewart C. Myers, Franklin Allen. - 10th ed. p. cm. - (The McGraw-Hill/Irwin series in finance, insurance, and real estate), 2011.- 969 p. (p.156-184).

2. Rakhimov D.G (2006). Higher mathematics. – Textbook. – T.: “IQTISOD-MOLIYA”.

3. Shokhazamiy Sh.Sh. Sunnatov Yu.U (2017)., New approach of analyzing financial economic activities on the accounting balance of companies. Scientific electronic journal “International finance and accounting”. №5, October, -20p. (http://interfinance.uz/en/arxiv/233-ikki5-2).

4. https://gufo.me (Big Encyclopedic Dictionary)

5. http://evdemosfera.narod.ru/ist/retro/_retro.html