Methodology of Assessing Risks to Sustainable supply Chain of an Insurance Company

Lyudmila Tsvetkova[1*], Tatiana Yurieva[2], Darya Karpova[3], Leonid Khuzhamov[4]

[1] MGIMO University, Moscow, Russia
[2]Russian Presidential Academy of National Economy and Public Administration (RANEPA), Moscow, Russia
[3]RUDN University, Moscow, Russia
[4]MGIMO University, Moscow, Russia
[*]Corresponding author: lyudmila_tsvetkova@yahoo.com

Abstract- **Tough competition for one of the unique resources the companies strive for is a set of stable communications with their suppliers who act as stakeholders for the business in the supply chain management strategy. Thus, there is a link between the resource concept of competitiveness and the concept of stakeholder management. Such an approach makes it necessary to develop a distribution model between stakeholders of limited funds to pay for them, ensuring their satisfaction and stable participation in the exchange process. This requires clear definitions of financial flows in logistics and supply chain management. The paper presents a model for determining the significance of relations with the insurance company's shareholders. The first hypothesis concerns the possibility to describe the relative importance of the resource supplied by each stakeholder, and its place in the ranked series. At the same time, the authors propose such a series both for a developing regional company and for a developed federal insurer. Such a series should correspond to the ranked series of growth rates of payment for each resource acquired from the corresponding stakeholder. The second hypothesis is that these series of relative position of indicators growth rates corresponding the significance series of a particular resource can serve as a standard for monitoring the insurer's stable relations with stakeholders. The degree of discrepancy between the actual indicators included in the series and the standard ones can be used as a measurement of the risk to insurance reserves sufficiency of an insurance company due to unreliable communications with stakeholders and problems in accessing required resources. Regular monitoring the accordance with the standard balance of the main indicators of insurance activities ensures guaranteed compliance with regulatory requirements, the fulfillment of insurance commitments to policyholders, profitability of investors' capital, and meeting their commitments to intermediaries, staff and management.**

1. Introduction

In any field of business activity, the desire to possess the essential resources in the required or ever-growing volume leads to competition for limited resources. For companies, especially those providing financial mediation services, such as the insurance company, it is very important to allocate resources and deliver them from the manufacturer to consumers with minimal costs. Current supply chain management allows reliable control and coordination of material, information and financial flows from suppliers, producers and sellers to consumers within a specified period. Information systems are essential to supply chain management, as they are involved in advanced planning. Aside from steps to rational coordination of financial flows, stable production cycles, and growth, companies seek supply chain management strategies [1]. Buying firms must pay increased attention to supply chain sustainability issues, as stakeholders might hold them responsible for non-sustainable supply chain activities [2].

According to the stakeholder management theory the winner in this competition for the necessary volume of resources is the company that ensures the satisfaction of suppliers with payment for them [3]. The existing constrains of funds for this payment generate another challenge - how to distribute the funds among stakeholder so as to ensure their satisfaction with the communications with insurers at the level of opportunity exchange.

As far as the interests of stakeholders - resource providers - are not fundamentally coordinated, and often simply contradictory, the sustainability of possessing the necessary combination of resources is the main task of the management [4]. This issue is particularly acute for companies operating in the field of financial intermediation, because suppliers of basic resources, expressed in money terms, are also consumers of financial services. These financial intermediaries may rightly include insurance companies. For the insurance industry, the stable access to the resources of all its stakeholders guarantees the insurer the financial sustainability.

The willingness of suppliers of all resources used in the insurance company activities to exchange implies their satisfaction with the equivalence of the ongoing exchange. Consequently, the greater dissatisfaction generates a risk of resources inadequacy required for insurance coverage. This means that the control over the equivalence of resource exchange between the stakeholders and the insurer makes it possible, at early stages, to assess the downward trend in the funds sufficiency for the fulfillment of the insurer's obligations. To ensure such a control, it is necessary to have a standard optimal terms of resource exchange with all stakeholders, which would allow assessing the risk of worsening communication with unsatisfied stakeholders by evaluating the correlation of the actual exchange status with the standard one.

Thus, the question arose, if such a standard is developed, whether it is the same for all insurers. The answer to this question can be obtained by analyzing relations of insurers with stakeholders who are at different stages of their development, financial strength, as well as developing target niches of consumer demand. In other words, at various stages of the company's life cycle.

From the point of view of prudential supervision, the standard being elaborated can become a tool for monitoring technical risks. If, on the basis of stress testing, a certain numerical margin is provided for in the standard ratios of resource exchange, then these ratios will make it possible to control the sufficiency of the capital being formed to compensate for insolvency due to non-technical (entrepreneurial) risks as well. Such risk control allows insurers to prevent their realization by timely managing risk factors for the financial sustainability of an insurance organization.

In order to address the feasibility of elaborating standard of payment ratios for each resource, it is necessary to rely on the following requirements:

• the standard currently being elaborated is to describe such a model of resource exchange, which can most effectively ensure the stability of the companies' development in accordance with its life cycle stage and financial strength;

• the standard should provide control over the dynamics, that is, the pace of benchmarks development;

• the standard should monitor the risks of stakeholders' nonequivalent resource exchange, as a source of instability in the insurer activities as a financial intermediary.

The roles of stakeholders as resource providers in developed and developing medium-sized insurance companies are different due to the different stages of their life cycle. This implies the specificity of equivalent resource exchange standards for these two classes of companies. To test the hypothesis put forward, we analyzed the compatibility of correlations of actual and standard ranked series included in the indicators model with level of technical reserves of a number of insurance companies.

In order to solve the problem posed, we built an ordered series of the significance for the insurance company's stakeholders on the basis of the difference in their roles [5], resulting from the different significance of their resources. Since each of the acquired resources is paid by the company, the indicators in which this payment is expressed must grow in the same order in which the importance of the stakeholders supplying them is located.

According to the proposed hypothesis the pace of these indicators growth in line with the standard order guarantees the funds sufficient for fulfilling insurer's commitments due to the reliable access to resource base. In so doing this order is different for companies at different stages of their life cycle.

We can consider the presented ordered series of the dynamics of indicators changes included in financial metrics as a standard of equivalent resource exchange. While assessing the correlation of this series with a similar series of actual dynamics, it is advisable to conclude on probable assessment of the risk of losing access to the resources provided by those stakeholders whose payment is reduced due to

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and by encouraging others in contrast to the equivalent resource exchange standard. At the same time, Kendall and Spearman's rank correlation coefficients were used as indicators for assessing such a risk.

To test the relevance of the proposed indicators to the level of financial sustainability of the insurer, the authors analyzed whether their change dynamics depends on the financial soundness of the insurance companies. The results of the comparative analysis of these coefficients and indicators of the insurance reserves sufficiency basically showed the proportionality of their changes and made it possible to draw a conclusion about the applicability of the proposed methodology in the process of prudential supervision of the sustainable development of the insurance company.

2. Literature review

tio of the elements involved in the calculation of these indicators should ensure the development of the company while guaranteeing the obligations fulfillment, that is, for the stability of its development (Tab. 1).

Table1. Analysis of indicators reflecting trends in the development of the insurance company

Indicator name	Calculation formula	Purpose of ap	Directions of indicators development along with the increase in the implementation of insurance obligations	The elements balance in calculating the indicator along with an increase in the implementation of insurance obligations
		Purpose of ap Suggested by [3] the idea concerning depicting a firm and its external and internal environment as a set of stakeholders whose interests and demands the management has to take into consideration and satisfy acting as official representatives of the firm received extensive support [6, 7]. According to the stakeholder theory, as a result of the formed stable relations with all groups of stakeholders, the organization obtains sustainable competitive advantages ensuring its long-term competitiveness and above-average profitability. This enables the enterprise to operate continuously and unrestrictedly [8]. Within the framework of stakeholder's theory, organizations operate to satisfy the interests (needs) of all their stakeholders, and this is their main, fundamental objective [9]. The relationship between the organization and its stakeholders is built on the basis of a resource exchange, as each stakeholder seeks to create their own resource base that would be entirely consistent with the objectives [6]. [7], [10] were engaged in solving the problem of formalizing the process of assessing the significance of each stakeholder. These researchers set themselves the goal to develop a method for ranking the stakeholder according to the degree of their influence on corporate sustainability. [11] also were engaged in developing methods for identifying the role of various stakeholders. The article by [12] provides a conceptual model for managing stakeholders and extends the relationship between corporate and global sustainability. For an analysis of stakeholders' roles [13] proposed a method		

of interviewing and questioning.

Often to identify the significance of stakeholders, the model proposed by [10], with which it is possible to obtain quantitative estimates of the comparative importance of stakeholders. Such author as [14] investigate the issues of stakeholders classifying and positioning ("Stakeholder mapping") at large industrial enterprises. The models proposed by the author allow them to objectively determine the satisfaction proportions of competing stakeholders' interests. The paper by [15] introduced the term "Stakeholder mapping", which is quite rare for domestic literature, and translated as "map of stakeholders". [16] in her work addresses the problem of identifying project stakeholders and the impact of the project on them. [17]considers an instrument of public-private partnership (PPP) from the point of view of ensuring the interests of both participants in a PPP project, and analyzes the role of the state as a projects stakeholder the implementing results of which is under the responsibility of the government. The relations with stakeholders is in detail analyzed by [5, 18], based on the stakeholder approach to examining the activities of insurance companies. [19] investigates the challenges inherent in retail trade. The results obtained, according to the authors, can be used for the development of corporate and regional development strategies.

As ideas about the spectrum of resources required by a company or enterprise develop, interest to new groups of stakeholders as providers of these resources develops accordingly. The researchers' attention is attracted by the stakeholders - suppliers of human and social resources as a means of creating the organizational capital of an enterprise in order to ensure its sustainable development [20]. The recognition of the human resources role in addressing the tasks of strategic management has increased attention to personnel management as one of the main stakeholders of the enterprise, as well as to managing its satisfaction through incentives due to its performance results, which form material capital, as well as professional and organizational resources [21]. When solving the problem of stakeholders ranking, researchers are increasingly referred to as key suppliers of intellectual resources as the

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main for the company development. At the same time, the authors consider suppliers of intellectual resources as the key stakeholders of the company, ensuring its rapid innovative development and competitiveness growth. [22].

Recent years have increased attention to those groups of stakeholders, in regard to whose interests the concept of "sustainable development" is being implemented for generations to come. For example, [23] focuses on the relationship of enterprises with stakeholders in the process of shaping socially responsible behavior. In particular, she proposes the classification of stakeholders, allowing the company to improve the interaction with them. [24] approaches the problem of stakeholder interaction from the same point of view. Environmental security and social responsibility, which are critical to the competitiveness of the enterprise, are included in the sphere of ensuring the interests of the company's stakeholders [25]. In solving the problem of equivalent resource exchange with stakeholder's practical approaches to establishing an acceptability zone of resource exchange for stakeholders depending on the importance of communications with them for the company and in order to retain the company on the all necessary resources market were developed by [26,27]. This idea was supported by the [25], which analyzes the influence of stakeholders' contradictions on the neglect of the company's social responsibility and its negative impact on the external environment. If we consider consumers of environmental cleanliness as a company's group of stakeholders, this confirms the hypothesis that under the conditions of limited resources of the company one of the stakeholders group's interests are infringed while interests of other groups are unreasonably satisfied, which ultimately leads to the company's stagnation. However, it remains unclear how buying firms can implement sustainability standards and practices in light of the growing complexity of modern, globalized supply chains. As sustainability risks usually originate from minor, less visible suppliers [28] that are "sheltered" from the scrutiny of the general public [29], there is an increasing need to monitor sub-suppliers and incorporate the assessment of

risks stemming from non-adherence to quality or sustainability standards into the supplier evaluation process [30]. Such risks of supply chain glitches that have particularly low "visibility" for buying firms, such as environmental pollution due to manufacturing or the use of child labor, can nevertheless cause huge chain liability effects and result in a negative reputation. The instruments for the practical analysis of the conditions for the company's sustainable development based on the stakeholder approach were proposed by [31] as a toolkit for assessing the effectiveness of the company's interaction with stakeholders). Based on the scheme of financial and non-financial resources interconnection while ensuring the growth of the company's value, such as human, intellectual, innovative and managerial resources, she proposed a model for assessing the degree of all listed stakeholders' interest in the growth of the company's value as key to its sustainability. Author's model of efficiency evaluation of an organization was proposed by [32]. The content of the model is based on the integration of the stakeholder theory ideas and the balanced indicators system by [33]. The authors suggested a formula for calculating the coefficient of the company overall performance by taking into consideration the satisfaction degrees of the organization's most significant stakeholders.

The approach of Asher et al., who formulated the task of strategic managing stakeholders' satisfaction based on the neural approach, is extremely interesting. The authors' main hypothesis is that the state of being satisfied and willingness to cooperate are provided at the level of the personal characteristics of the positive impressions of the process about this cooperation.

All these authors agree that, within the framework of the stakeholder theory, organizations operate to satisfy the needs (interests) of all their stakeholders, and this is their main, fundamental objective. When solving the problem of developing a corporate-wide strategy as an integrated system consisting of all its stakeholders, it is impossible to do without new tools of strategic analysis and planning that allow a company to systematically consider an

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enterprise and its business processes and exclude substitution of the company's objectives with the goals of certain groups of stakeholders.

The solution to the problem of searching for instruments ensuring the balance of stakeholders in resource exchange is in the focus of those scholars who are also interested in higher education institutions development [34]. The main consumers of the stakeholder theory are not all companies, but only those that are interested in maintaining relationships with a wide range of stakeholders and in managing them. Stakeholder theory can offer these companies non-standard approaches to solving their specific tasks [35]. An example of such an organization is an insurance company, whose behavior can be described as maneuvering between the interests of numerous stakeholders. At the same time, the optimization of financial results is directly related to stakeholders' needs   satisfaction in the context of a given non-evident result of the activity, which expands the risk of the financial result to all its participants, including the consumers themselves. Thus, the development of the proposed practical tool for analyzing relations with the insurance company's stakeholders is relevant due to the absence of such attempts in scientific research.

materials and methods

To assess the risk level, the source of which is unsustainable access to resources due to the inequality of its exchange, it has been proposed to use as a standard of equivalent exchange a ranked sequence of financial indicators, evaluating the equivalence of resources costs depending on the role that each stakeholder's resource plays in ensuring sustainable development of the business. The idea of this standard is that the more precisely it is followed the greater financial sustainability is, i.e., un profitableness stability corresponding the insuring price. Measures to maintain it are much cheaper and more accurate than the required additional equity capital, designed to compensate for the risk of deviations from a given level of insurance reserves sufficiency.

The task of the standard being developed is to describe such a model of resource exchange that most effectively ensures the stability of the companies development in

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accordance with its stage of life cycle and financial strength; provide control over the dynamics, that is, the pace of benchmarks development and serve as a basis for monitoring the risks of inequality of the resource exchange of stakeholders, as a source of instability in the insurer's activities The insurer has several groups of resource providers: shareholders and insurants supply financial resources [5], personnel supply human resources, entrepreneurial resources, and also provide a resource for communication with consumers, management supplies organizational and information resources. The significance of each such resource is to be designated by its position in the chain of significance: A> B> C ... Here A, B, C, etc. means the name of the resources supplied by these groups. The most significant resources should be available to the company at a higher rate than the less significant ones, since their lack is more critical for the company, and high rates mean an increase in the company's market share. The correspondence of the growth rate of each resource included in the resource chain to its position in the significance chain implies the optimal resourcing without its excessive supply or shortage.

The description of the resource exchange standard required the selection of appropriate indicators characterizing their growth rates. The chain of selected resource sufficiency indicators can be seen as a standard ranked series. At the same time, it is possible to build an actual ranked series of the growth rates ratio for the indicators included in it. Comparing the actual and standard ranked series based on the ranked correlation coefficients allows assessing the risk of negative dynamics in their mismatch and ensures the possibility of prudential supervision over the risk of insufficient resources for the stability of the insurance company.

For growing companies that form their relationship and client capital, the resources they acquire in accordance with their importance and necessity for the company are ranked as follows:

Policyholder resources> shareholder resources> human resources, managerial, entrepreneurial and organizational resources, etc. > resources of intermediaries

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		[5]. The resources of the policyholders are paid by the insurance compensation (IC). Shareholder resources are paid by increasing net profit (NP). Human resources of personnel and management, created in the course of their activities, as well as organizational and information resources are paid as part of the expenses of the conducting business (ECB). Intermediary resources are paid as acquisition costs or commissions (C). In order to maintain a standard balance in the resource exchange system, the growth rate (t) of the aforementioned indicators must correspond to their rank in the model. That is: $tIP > tNP > tECB > tC$. *(1)* However, the standard model should include indicators that ensure the ability of the insurer to fulfill its commitments in a stable risk environment, as well as other indicators of the company's activities that ensure its performance control for shareholders. Let us introduce the following elements for their calculation: GIP - got insurance premium; EIP - earned insurance premium; IR - insurance reserves; TA - total assets; OC - ownership capital. Let us summarize the estimated indicators calculated on the basis of the above mentioned ones in the table, indicating what the ra**plication**		
Coverage ratio of insurance reserves (obligations) from its own resources - safety coefficient		Control of unconditional implementation of obligations	Increase	$tOC > tIR$
Insurance reserves adequacy ratios (on the basis of insurance compensations)		Control of insurance reserves relevance to actual obligations	Increase	$tIR > tIC$
Leverage ration		Control of the share of insurance reserves in assets	Decrease	$tIR > tTA$

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Equity-assets ratio		Control of the ownership capital share in total assets	Increase	tOC>tTA
Coefficient of solvency ensuring		Control of unconditional implementation of obligations	Increase	tOKIC
Return on capital employed		Control of the equity capital investments profitability	Increase	t<u>GIP</u>>tOC
Insurance reserves turnover coefficient		Control of sufficiency of insurance premiums received to form assets that provide current payments	Increase	tGIP>tIR
Unprofitably ratio of insurance operations		Control of sufficiency of insurance premiums for insurance payments	Decrease	tIC>tEIP
Development ratio of insurance operations		Control of ensuring the insurants' interests	Increase	tIR>tEIP
ECB ratio		Control over the expenses of conducting business	Decrease	tEIP>tECB

Source: own

Applying the transitivity principle to the resulting series of paired inequations, we compose the following chain (2) from them:

$$tGIP> tOC>tTA>tIR>tEIP$$

$$(2)$$

Combining this chain with a chain of figures indicating the equivalence of resource exchange for a developing insurance company, we obtain the following standard ratios for the stable development of a regional insurer (3):

$$tGIP> tOC>tTA>tIR>tEIP>tIC>tNP>tECB>tC$$

$$(3)$$

As mentioned earlier, for a developed company that has stabilized its presence in the market, the standard sequence will be different. The relocation of shareholders to the status of "key stakeholders" will cause the need to include return-on-sales in the system of strategic indicators . The need for growth of this indicator introduces in the model the ratio: tNP>tGIP. In addition, the coefficient of insurance operations development in the case of a stabilized company should acquire the inverse ratio: tEIP> tIR. With these adjustments, the standard of resource exchange for a stabilized insurance company is as follows:

$$tNP>tGIP>tOC>tTA>tEIP>tIR>tIC>tECB>tC$$

$$(4)$$

Thus, we obtained two standards of resource exchange equivalence for companies at different stages of the life cycle.

The method of analyzing the compliance of the actual state of the resource exchange dynamics with the optimal standard is as follows.

In accordance with the indicator position in the standard chain, it is assigned a standard rank. Then, the change rates of the analyzed indicators are calculated for each year, and these values are ranged from the highest to the lowest one. The normative and actual ranks series are compared for their consistency by calculating the Kendall and Spearman rank correlation coefficients. The calculation of these coefficients is modified to assess inconsistencies, allowing us to assess the risk of financial balance loss. For clarity of calculations, it is proposed to use a matrix that fixes the ratio of the compared series values. 1 is placed in each element of this matrix, if the indicator corresponding to the column is greater than the indicator for the row, otherwise -1 is placed. The equality of the various elements is referred to as 0. With this approach, full agreement with the standard chain of relationships is described in the standard of effective resource exchange in the form of a matrix (Tab. 2).

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Table2. Matrix of the standard dynamics of resource exchange indicators

	tGIP	tOK	tTA	tIR	tEIR	tIC	tNP	tEIC	tC
tGIP		-1	-1	-1	-1	-1	-1	-1	-1
tOK	1		-1	-1	-1	-1	-1	-1	-1
tTA	1	1		-1	-1	-1	-1	-1	-1
tIR	1	1	1		-1	-1	-1	-1	-1
tEIR	1	1	1	1		-1	-1	-1	-1
tIC	1	1	1	1	1		-1	-1	-1
tNP	1	1	1	1	1	1		-1	-1
tEIC	1	1	1	1	1	1	1		-1
tC	1	1	1	1	1	1	1	1	

Source: own calculations

The actual ratios of the indicators included in the standard are also described in the form of a matrix. In this case, the deviation of any matrix value from the standard is the inversion.

Depending on the number of inversions, the position of the indicator in the chain of the standard financial balance changes. If the indicator position in the standard or actual chain of ratios is referred to as its serial number, then this number plays the functions of its rank. With the inversions in the indicators ratio, the ranks of the indicators change compared to the normative ones.

The mismatch between the normative and actual series of change rates of the indicators included in the standard chain of rations is estimated by modified rank correlation coefficients. The modification is connected with the fact that the number of comparisons for determining the actual ranks is equal to the number of not half, but all empty elements of the matrix. In addition, since the coefficients used are intended to assess the consistency of the series, the inconsistency is estimated using only the subtracted element of their modified formulas. Thus, the assessment of the risk of the resource exchange process inconsistency with its optimal standard is made based on the following calculation formulas (5, 6).

The modified Kendall coefficient T used to estimate the inconsistency of the series:

$$T = ,$$

(5)

where - is the inversion in the matrix of resource exchange dynamics;

i - is the column number of the resource exchange dynamics matrix;

i - is the row number of the resource exchange dynamics matrix;

N - is the number of indicators included in the model. The modified Spearman coefficient r used to estimate the inconsistency of the series:

(6)

where – is the indicator rank in the standard matrix of resource exchange dynamics;

 – is the indicator rank in the actual matrix of resource exchange dynamics.

The modified rank correlation coefficients serve to assess the risk of mismatch in the rank series and can serve as indicators of the level of risk dynamics of the resource exchange process of the insurer's stakeholders, resulting in the loss of its financial balance. The classical Spearman coefficient is used to estimate the level of pairwise proximity of the ranks of the compared and standard series. In the proposed modification, it can be used to assess the level of mutual deviation of these ranks, being a volume indicator of the inconsistency of the compared rank series or a volume indicator of the risk of financial balance loss.

3. Results

Using the indicated analysis tools, we assess the risk dynamics of the resource exchange inequality for the following regional insurance companies.

OJSC IC "Bask", Belovo, registration number №518.

JSC "Insurance Business Group", Voronezh, registration number 3229, short name "IBG".

LLC IC "Granta", Kazan, registration number No. 2042.

LLC IC "Siberian House of Insurance", Kemerovo, registration number 2335.

For the OJSC IC "Bask", Belovo, the calculations are as follows (Tab. 3).

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Table3. Pace of indicators change for OJSC IC "Bask" activity

	2013	**2014**	**2015**	**2016**	**2017**
tGIP	-0.331	0,014	0.264	0.032	-0.764
tOK	-0,248	0.298	0.112	0.464	0.071
tTA	-0.562	-0.060	0.307	0.235	0.070
tIR	0.181	-0.262	0.471	0.103	-0.080
tEIR	-0.353	-0.041	0.103	0.172	0.025
tIC	-0.163	-0.142	0.138	0.301	-0.038
tNP	-0.889	0.026	4.405	1.126	-3.231
tEIC	-0.128	-0.134	0.356	-0.121	-0.120
tC	-0.430	0.408	-0.446	-0.111	0.581

Source: calculated on the basis of the data of the balance sheets of OJSC IC "Bask", posted on the official website of the Central Bank of the Russian Federation for 2012-2017 [electronic resource], from http://www.cbr.ru/static/fcsm/publication/2013-12-31/acc_518.xls;
http://www.cbr.ru/static/fcsm/publication/2014-12-31/acc_518.xls;
http://www.cbr.ru/static/fcsm/publication/2015-12-31/acc_518.xls;
http://www.cbr.ru/static/fcsm/publication/2016-12-31/acc_518.xls;
http://www.cbr.ru/static/fcsm/publication/2017-12-31/osbu_518.xls (date of address 28.10.2018).

Using the data from tab. 3 we can form a matrix of actual preferences in the dynamics of resource exchange indicators for each year of the analyzed period, which has the following form for 2013 (Tab. 4).

Table4. Matrix of preferences in the resource exchange of OJSC IC "Bask" in 2013

	tGIP	**tOK**	**tTA**	**tIR**	**tEIR**	**tIC**	**tNP**	**tEIC**	**tC**
tGIP		1	-1	1	-1	1	-1	1	-1
tOK	-1		-1	1	-1	1	-1	1	-1
tTA	1	1		1	1	1	-1	1	-1
tIR	-1	-1	-1		-1	-1	-1	-1	-1
tEIR	1	1	-1	1		1	-1	1	-1
tIC	-1	-1	-1	1	-1		-1	1	1
tNP	1	1	1	1	1	1		1	1
tEIC	-1	-1	-1	1	-1	-1	-1		-1
tC	1	1	1	1	1	-1	-1	1	

Source: own calculations

To calculate the risk coefficient for deviations from the standard of resource exchange, we use the auxiliary Tab. 5.

Table5. Risk coefficient calculation for non-equivalent resource exchange of OJSC IC "Bask", 2013

	Inversions	Standard rank (rank stand.)	The number of cases when the row indicator is greater than the compared one	Actual rank (rank act.)	Y= rank stand. - rank act.	Y^2
tGIP	4	1	4	4	3	9
tOK	4	2	3	3	1	1

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tTA	4	3	6	6	3	9
tIR	3	4	0	1	3	9
tEIR	3	5	5	5	0	0
tIC	6	6	3	3	3	9
tNP	2	7	8	7	0	0
tEIC	6	8	1	2	6	36
tC	2	9	6	6	3	9
Total	34					82

Source: own calculations

Therefore:

T = 0.472.

This coefficient varies from 0 to 1, therefore the risk level of balance loss, which ensures financial stability for the "Bask" company in 2013, was average.

r = 0.341.

The value of this coefficient also varies from 0 to 1 and this case if small.

According to the proposed methods, the calculation of the risk of the financial balance loss was carried out for effective resource exchange throughout the entire analysis period and the following results were obtained (Tab.6).

Table6. Risk indicators of financial balance loss of OJSC IC "Bask" over the period 2013 – 2017

	2013	2014	2015	2016	2017
The risk of financial balance loss	0.472	0.472	0.430	0.444	0.444
Volumetric characteristic of the risk of financial balance loss	0.341	0.541	0.291	0.291	0.444

Source: own calculations

Based on the proposed methods the calculation of the risk of financial balance loss in the course of resource exchange with other stakeholders included in the analysis of regional insurance companies was carried out. The following results were obtained for JSC "Insurance Business Group", Voronezh (Tab. 7, 8).

Table7. The of change rate in the performance of JSC "Insurance Business Group"

	2013	2014	2015	2016	2017
tGIP	0.206	0.348	0.154	-0.084	-0.110
tOK	0.052	-0.258	0.133	0.116	0.022
tTA	-0.027	7.886	11.213	-0.022	0.299
tIR	0.576	-0.327	0.485	-0.074	0.456
tEIR	0.050	-0.257	0.050	0.384	-0.209
tIC	0.042	0.418	0.600	0.897	0.078
tNP	-0.289	-0.584	7.134	-0.640	0.262
tEIC	-0.385	0.599	1.185	0.593	-0.510
tC	0.207	0.494	-0.120	0.121	-0.166

Source: calculated on the basis of the balance sheet data of JSC "Insurance Business Group", posted on the official website of the Central Bank of the Russian Federation for 2012-2017 [electronic resource], from http://www.cbr.ru/static/fcsm/publication/2013-12-31/acc_3229.xls; http://www.cbr.ru/static/fcsm/publication/2014-12-31/acc_3229.xls; http://www.cbr.ru/static/fcsm/publication/2015-12-31/acc_3229.xls; http://www.cbr.ru/static/fcsm/publication/2016-12-31/acc_3229.xls; http://www.cbr.ru/static/fcsm/publication/2017-12-31/osbu_3229.xls (date of address 28.10.2018).

Table8. Indicators of the risk of financial balance loss of JSC "Insurance Business Group" during the period of 2013-2017

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	2013	**2014**	**2015**	**2016**	**2017**
The risk of financial stability loss	0.361	0.639	0.5	0.625	0.417
Volumetric characteristic of the risk of financial stability loss	0.308	0.633	0.375	0.642	0.3

Source: own calculations

For LLC IC "Granta", Kazan, the results can be presented as follows (Tab. 9, 10).

Table9. Pace of indicators change for LLC IC "Granta" activity

	2013	**2014**	**2015**	**2016**	**2017**
tGIP	-0.351	0.094	3.511	2.862	0.232
tOK	0.009	0.002	0.008	-0.002	0.034
tTA	-0.028	0.001	0.221	0.387	0.401
tIR	-0.294	0.040	5.073	2.020	0.740
tEIR	-0.117	-0.011	2.082	3.648	0.350
tIC	-0.347	-0.029	1.041	4.158	1.189
tNP	1.679	-0.967	42.966	8.980	0.575
tEIC	-0.255	-0.027	2.562	1.016	0.106
tC	-0.228	0.026	2.306	5.801	0.806

Source: calculated on the basis of the balance sheet data of LLC IC "Granta", posted on the official website of the Central Bank of the Russian Federation for 2012-2017 [electronic resource], from http://www.cbr.ru/static/fcsm/publication/2013-12-31/acc_2042.xls, http://www.cbr.ru/static/fcsm/publication/2014-12- 31/acc_2042.xls;http://www.cbr.ru/static/fcsm/publication/2015-12-31/acc_2042.xls; http://www.cbr.ru/static/fcsm/publication/2016-12-31/acc_2042.xls; http://www.cbr.ru/static/fcsm/publication/2017-12-31/osbu_2042.xls (date of address 28.10.2018).

Table10. Indicators of the risk of financial balance loss of LLC IC" Granta" during the period of 2013-2017

	2013	**2014**	**2015**	**2016**	**2017**
The risk of financial stability loss	0.528	0.269	0.639	0.764	0.694
Volumetric characteristic of the risk of financial stability loss	0.433	0.242	0.483	0.579	0.571

Source: own calculations

For LLC IC "Siberian House of Insurance", Kemerovo, there were obtained the following values (Tab.11, 12).

Table11. The change rate in the performance of LLC IC "Siberian House of Insurance", Kemerovo

	2013	**2014**	**2015**	**2016**	**2017**
tGIP	0.185	0.060	0.535	0.003	0.035
tOK	2.999	0.025	-0.015	-0.013	-0.247
tTA	-0.012	-0.012	-0.020	-0.020	0.001
tIR	0.223	0.306	0.234	0.032	0.169
tEIR	0.083	0.224	0.295	0.202	0.031
tIC	0.053	0.106	0.290	0.295	0.388
tNP	-0.743	2.696	0.696	0.224	-6.775
tEIC	0.410	-0.352	-0.810	0.661	-0.193
tC	0.375	0.142	0.171	0.043	0.331

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Table12. Indicators of the risk of financial balance loss of LLC IC "Siberian House of Insurance" during the period of 2013-2017

	2013	2014	2015	2016	2017
The risk of financial stability loss	0.472	0.542	0.514	0.708	0.569
Volumetric characteristic of the risk of financial stability loss	0.408	0.5	0.429	0.783	0.5

Source: own calculations

To test the assessment of the adequacy of the proposed methodology for prudential supervision of the risk dynamics of the financial balance loss, the values of the risk of nonequivalent exchange with stakeholders were compared with the indicator of sufficiency of insurance reserves for the period from 2013 to 2017 calculated as the ratio of insurance reserves to insurance premiums, based on the data (Tab. 13).

Table13. Indicators of insurance reserves adequacy of OJSC IC "Bask" for the period of 2013-2017

	2013	2014	2015	2016	2017
Insurance reserves adequacy indicators	0.822183	0.598102	0.696514	0.744664	0.653328

Source: same as Tab. 3.

We use a graphical presentation of the results of the analysis.

The same methodology was used to implement calculations for other companies included in the study. The results are shown in tables (tab. 14, 15, 16) graphic figures (fig. 2, 3, 4).

Table14. Indicators of insurance reserves sufficiency of JSC "Insurance Business Group" for the period of 2013-2017

	2013	2014	2015	2016	2017
Insurance reserves adequacy indicators	0.63	0.776347	0.642344	0.725806	0.666986

Source: same as Tab. 7.

Table15. Indicators of insurance reserves adequacy of LLC IC "Granta" for the period of 2013-2017

	2013	2014	2015	2016	2017
Insurance reserves adequacy indicators	0.822183	0.598102	0.696514	0.744664	0.671140

Source: same as Tab. 9.

Table16. Indicators of insurance reserves adequacy of LLC IC "Siberia House of Insurance" for the period of 2013-2017

	2013	2014	2015	2016	2017
Insurance reserves adequacy indicators	0.63	0.776347	0.624274	0.642344	0.725806

Source: same as Tab.11.

The graphs show that the companies under study usually have an inverse relationship between the rate of the risk of the resource exchange inequality and the level of insurance reserves sufficiency. That is, the lower the of insurance reserves adequacy, the higher the risk of inequality of exchange.

For some companies, the proposed model for assessing the risk of non-equivalent resource exchange is adequate for the entire period of analysis.

A number of companies had not had this adequacy until 2014, when we could observe a partial dependence of the analyzed indicators: a decrease in the reserves sufficiency corresponds to a decrease in the of exchange nonequivalence risk. The reason for this phenomenon may be the inaccuracy and inconsistency of the data provided in the reports, the control over which was toughened after assigning in

2014 the responsibility for the supervision of non-financial organizations to the Central Bank of Russia. After 2014, all companies included in the analysis have an inverse relations between the rate of risk of non-equivalent exchange with stakeholders and the level of technical reserves adequacy established for the obligations fulfillment. This means that the proposed model can be used in the system of prudential supervision of risks of financial stability loss of regional insurance companies due to the in equivalent resource exchange between stakeholders.

4. Conclusion

It is commonly known that preliminary prudential regulation presupposes a system of standards, going beyond which indicates to the negative dynamics in the development of insurance activity and entails requirements for the regulator to take measures to reduce negative trends.

The principles of prudential supervision in the Russian insurance market put forward in research and practical proposals have the form of a series of in equations that limit the most negative values of indicators that describe the company's financial position. The disadvantage of this approach is the lack of attention to the control over factors that can influence these negative trends. Considering the inequality of resource exchange as one of these factors, the authors suggest an approach to prudential control over negative trends in this field of insurance company's activity.

To assess the risk level, the source of which is in equivalent exchange, a standard has been proposed, the compliance with which implies the compliance with the exchange equivalence. Regular monitoring for accordance with the standard balance of the main indicators of insurance activities ensures guaranteed compliance with regulatory requirements, the fulfillment of insurance commitments to policyholders, profitability of investors' capital, and meeting their commitments to intermediaries, staff and management.

The proposed standard can be a tool for monitoring technical risks. If, on the basis of stress testing, a certain numerical margin is provided for in the standard ratios of resource exchange, then these ratios will make it possible to control the sufficiency of the capital being formed to compensate for insolvency due to non-technical (entrepreneurial) risks as well.

Since the roles of stakeholders as resource providers, in developed, developing, and medium insurance companies are different, that implies the specificity of resource exchange standards for these two classes of companies.

The stable position of the regional insurer is determined by the degree of the commitments of the insured to the insurer, which accumulates its client-related capital and the resources it acquires in accordance with their importance and necessity for the company are ranked as follows:

policyholder resources> shareholder resources> human resources, managerial, entrepreneurial and organizational resources > resources of intermediaries   In this situation, the insured is a key stakeholder.

During the period when client capital is secured and the company's position on the market is stabilized, a different distribution of the stakeholders' roles is required.

For a developed company that has stabilized its presence in the market, the standard sequence will be different. Shareholders acquire the status of a key stakeholder, and the basic significance chain of resources takes the following form: shareholders' resources> resources of policyholders> human resources, managerial, entrepreneurial, organizational resources, etc> resources of intermediaries.

Based on the key chain of ratios, it became possible to determine a set of financial indicators, as well as a standard series of their dynamic ratios, indicating a balance in the insurer's resources it needs.

The calculation of the actual indicators ratios makes it possible to assess the risks of decline and equivalent spending of exchange with stakeholders, leading to the insurance company stagnation. The normative and actual ranks of ranks are compared for their consistency by calculating the Kendall and Spearman rank correlation coefficients. The calculation of these coefficients is modified to assess inconsistencies, allowing you to assess the risk of insufficient resources for insurance activity.

The proposed methods have been evaluated when analyzing the risks of the non-equivalent exchange of regional insurance companies.

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