Quantitative Market Risk Assessment for Insurance Companies

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ABSTRACT

The business strategy, the underwriting policy, the investment strategy of insurance companies and some external factors influence their ability to meet liabilities. The risk management mechanism, based on regulatory requirements and the best expertise, should allow to identify and assess all significant risks, including the market risk. The purpose of this research is comparing the European and Russian regulatory requirements for capital calculation for market risks of insurance companies. The methodological base is the comparison analysis of different capital calculation approaches for interest rate, FX, real estate and equity risks in accordance with Solvency II for the European insurers or Regulation 710-P for the Russian insurers. As a result, the author has found the compatibility of regulations to vary depending on the type of the risk in question. Regulations diverge the least when it comes to FX and real estate risks, yet the most in regards to interest rate and equity risks since the Central Bank of Russia has accounted for some national market peculiarities. Overall, the research results have a practical value and could be used by the Russian insurers in transition to the risk-oriented regulation.

Keywords: market risk; risk-based regulation; Solvency II; capital at risk; open foreign exchange position

INTRODUCTION

The main objective of a insurance company is to provide protection to insured persons. To fulfill obligations to insurance companies that accumulate risks of customers, it is important to be aware of their own risks, their causes and consequences. An inverted business cycle in insurance, where a company first receives money for a service and then realizes it, does not make the insurer invulnerable to a range of risks, including market risk. Insurance companies build market risk management systems to control losses or negative changes due to fluctuations and volatility of market prices for assets and liabilities. On the other hand, insurance companies are institutional investors in the capital market. The investment policy of insurers is generally conservative due to the basic function of insurance — providing protection to insured persons in insured risk probability. However, the pro–cyclical behavior of insurers in times of financial crises can increase systemic risk in the financial industry. The desire to control systemic risks and the level of solvency of insurers helps to draw the attention of the regulator to the market risk of insurers.

Development trends of risk management of insurers are explained by the emergence of regulatory requirements (local and international), and the desire of insurers to make business decisions taking into account the concept of risk. In the European Union, the European Insurance and Occupational Pensions Authority (further — EIOPA) is responsible for the institutional insurance environment in terms of rules and regulations, for the Russian Federation the insurance supervisory body (regulator) is the Bank of Russia from 1September 2013. The International Association of Insurance Supervisors (IAIS) promotes financial stability in the global insurance market, which, since 1994, has been compiling the experience of insurance supervisory bodies and developing and publishing principles, standards and guidelines. The IAIS in the "Basic Principles of Insurance"[1] document recommends that supervisory authorities establish requirements for a risk management mechanism, including the inclusion of market risk in the list of risks to be considered by the insurer.

In 2011, at the time of development of the requirements, IAIS recognized the different level of maturity of regulators and insurance markets worldwide in terms of risk management, however, it assumed that the development of local requirements will be in the direction of the stated principles. At the identification stage, the insurer is expected to determine the nature of the risk, to analyse internal and external factors, possible effects and to assess the relationship between risks (in normal practice and under conditions of stress).

IAIS Glossary[2] defines market risk as the risk of negative changes in capital due to unattainable changes in the level or volatility of market value of assets and liabilities.

Market risk issues in insurance companies have long attracted the attention of researchers. With regard to market risk, researchers examine the activities of insurance companies under different interest rates [1–4]. Life insurance companies have to forecast interest rates on the 30–40 year horizon. In the lower interest rates scenario, life insurers incur losses if the current rate is below the rate of reserve and they lack the funds to pay the guaranteed return. J. H. Holsboer [1] concluded that government regulation of the level of reserve obligations, as well as the use of risk management tools, can reduce the negative effect of low interest rates on life insurers. In particular, starting in 2001, German insurance companies should, at the request of the regulator, create a certain reserve for the low–rate scenario. According

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[1] Insurance Core Principles and Methodology. International Association of Insurance supervisors. URL: https://www.iaisweb.org/page/supervisory-material/insurance-core-principles-and-comframe//file/89018/iais-icps-and-comframe-adopted-in-november-2019 (accessed on 25.04.2021).

[2] IAIS Glossary. International Association of Insurance supervisors. URL: https://www.iaisweb.org/index.cfm?event=getPage&nodeId=25241 (accessed on 25.03.2021).

German Actuarial Association (DAV), the regulatory approach, relevant until 2018, led to over-reservation, which, on the contrary, could create obstacles to the protection of insured persons. In the work C. Eckert [2] it has been proven that the new approach proposed by the DAV and adopted by the German regulator to create a reserve for protection against low interest rates does not have the disadvantages of the old method and contributes to better protection of insurers. Higher interest rates can bring higher returns on fixed-income financial assets to insurers, increase the attractiveness of shares and, at the same time, reduce the value of bonds estimated at fair value. In the work T.K. Jensen et al. [3] the authors conclude that for American insurers, the negative effect of interest rate increases prevails over possible bonuses.

The introduction of Solvency II stimulated the emergence of studies on the valuation of capital at market risk [5–9]. In particular, in the work N. Gatzert et al. [5] is carried analysis of credit and market risk assessment of capital using standard formula and internal model. The authors note that the calculation of the standard formula may be supplemented by calculations of the internal model in cases of imperfection, namely — under capital requirements for bonds with low ratings (e.g., government bonds of Spain, Greece) and over-capital for bonds with good credit quality. In addition, the authors stressed the important role of the internal model in its own assessment of risks and solvency. In the work A. Braun et al. [8] the authors highlight the disadvantages of the standard formula Solvency II, which estimates capital at market risk, and emphasize the usefulness of the internal model, including the expected return on assets and their temporal comparability with liabilities.

A number of foreign research [10–12] were aimed at finding optimal investment strategies for insurers in the face of changing regulatory capital requirements.

Articles of Russian authors in the recent period can be divided into three groups. The first group focuses on specific risk groups (credit, operations) [13–14]. In particular, in the work E.V. Aldukhova et al. [13] it was determined that the credit risk requirements of Russian insurers are based on European regulatory practices, with the exception of a number of features explained by the state of the national market. In the work K.E. Tourbina [14] the author analyses the peculiarities of the insurer's operational risks, compares the norms of foreign regulation in the field of insurance (Solvency II Directive) with the practice of managing the operational risks of other financial institutions. The second group of works is devoted to the problems of bankruptcy of insurance companies [15–17]. In research by A.V. Larionov, E.S. Salina [15] was present a complex system of indicators, the use of which helps to predict the insurance company's default at an early stage. In the work K.S. Eremina, J.A. Tarasova [16] shown the influence of factors of the macroeconomic environment on the number of cases of bankruptcy of insurance companies, the inverse proportional dependence of bankruptcy on the size of the company and confirmed the influence of problems with auditing, high reinsurance costs and deficiencies in corporate governance at risk of bankruptcy. Results of another research by J.A. Tarasova and E.S. Fevraleva [17] showed, that the insurers' bankruptcy is significantly affected by the insurance coefficient, which is equal to the ratio of insurance premiums to net profit, and coefficients from the group of indicators of financial sustainability. In the third group of research [18–24] the authors considered the prospects of development of the Russian insurance market in the context of a risk-oriented approach to its regulation.

According to the representatives of the Bank of Russia, the main purpose of capital formation is to ensure financial stability and fulfillment of the obligations of the insurer [18]. The preceding approach to assessing the financial sustainability and solvency of insurers considered only insurance risk when determining regulatory capital requirements. V. Chistyukhin et al. [19] noted

the insufficiency of these requirements for the establishment by the Bank of Russia of an effective system of supervision of the activities of insurers, which has a preventive character and is able to take into account the risk profile of an individual company. S.V. Pushkarev [20] in his research, he stressed the appropriateness of tightening regulatory requirements if this would lead to increased financial stability of insurers and increased confidence of insurers.

In the work of V.V. Barabanova [21] it is indicated that to ensure the competitiveness of Russian insurers it is necessary to closely comply with international standards in terms of quantitative and qualitative parameters, as well as the structure and format of disclosure of information. In addition, in the work of [21] the author argues the need to implement a proportional regulation instrument within the risk-based regime in the insurance industry, because it simultaneously allows to comply with existing norms without additional pressure on the operational efficiency. Among the positive effects of risk-oriented regulation are increased financial stability of insurers, increased market transparency, among the negative consequence — continued concentration on the insurance market of the Russian Federation. In the work [23, 24] was stressed importance of prudential supervision. In particular, in the work L.D. Baklanova et al. [24] the authors noted that the tightening of regulatory requirements contributes to the exit from the market of unreliable players, but does not solve the problem of the loss of financial stability. Based on foreign experience, in order to complete the financial recovery of the insurance market, the authors proposed to supplement the existing control functions with a model of preventive supervision, which is based on a three-year horizon of continuous compliance with regulatory requirements and a projection of internal risks and solvency. However, there is still no work by Russian researchers on the assessment of market risk of insurance companies in different regulatory regimes, which confirms the scientific novelty of the article.

The article consists of three sections. The first section is considered the components of market risk and its valuation tools used by insurers. The second section is introduced market risk capital requirements in the standard formula for European insurers. The third section is devoted to the rules of estimation of capital under market risk of Russian insurance companies. Finally, conclusions on the comparability of national and European guidance on the market risk of insurers are presented.

CONCEPT OF MARKET RISK FOR INSURANCE COMPANIES

Directive 2009/138/EU of the European Parliament and of the Council of 25 November 2009 "On the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II)" (further — Directive Solvency II[3]) defines market risk as the risk of losses or negative changes in the financial condition of the insurer due to direct or indirect influence of volatility of market prices of assets, liabilities and financial instruments. Types of risks that are classified as market risks are reflected in *Table 1*.

The following factors influence the market risk of the insurance company:
• internal factors (differences in maturity and/or interest rate revisions for the insurer's assets and liabilities; differences in amount of requirements and liabilities denominated in currency or subject to exchange rate; structure of financial assets) [25, 26];
• external factors that determine the state of the financial market (crises, state policy regarding the interest rate, etc.).

Market risk is assessed using risk metrics for a range of risks (percentage, currency), capital calculations according to regulatory requirements and internal assumptions, and stress–testing and scenario analysis tools. Some indicators are discussed below.

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[3] Directive 2009/138/EU of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II). URL: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02009L0138–20140523&from=EN (accessed on 21.04.2021).

Table 1

Types of market risks

Types of risks	Risk description
Interest rate risk	The sensitivity of the values of assets, liabilities and financial instruments to changes in the term structure of interest rates, or in the volatility of interest rate
Currency risk	The sensitivity of the values of assets, liabilities and financial instruments to changes in the level or in the volatility of currency exchange risk
Property risk	The sensitivity of the values of assets, liabilities and financial instruments to changes in the level or in the volatility of market prices of real estate
Equity risk	The sensitivity of the values of assets, liabilities and financial instruments to changes in the level or in the volatility of market prices of equities

Source: compiled by the authors using Solvency II.

The risk–metric of the investment portfolio interest rate is based on the sensitivity of the company's assets when the interest rate changes by 1 basis point (Dollar Duration, DV 01):

$$DV\,01 = -\,P*\text{Dur}_{\text{mod}}*\Delta i\,, \qquad (1)$$

where P — value of the portfolio, which sensitive to interest rate fluctuations; Dur_{mod} — modified duration of portfolio; Δi — interest rate changes by 1 basis point.

Insurers use Open Foreign Currency Position to estimate foreign exchange risk (OFCP). OFCP is used to reflect the sensitivity of the insurer's financial result to changes in exchange rates. OFCP in a separate currency is considered as the difference between assets and liabilities denominated in one currency other than the insurer's base currency. The positive value of OFCP indicates that when the exchange rate increases relative to the base company, the negative value of OFCP leads to losses when the foreign currency grows relative to the base currency. Positive OFCP value denoted by "long" position, negative — short. In addition to OFCP in currency, are also distinguished the balancing OFCP as the difference between the absolute sums of all short and long positions. If the insurer seeks to minimize currency risk in a separate currency and/or in general, he will take the effort to note the balancing OFCP to zero.

The next tool to assess market risk is stress–testing, which should assess the impact of the implementation of stress scenarios on the risk–metrics, positions and financial result of the insurer. Among the prevalent scenarios, the following should be highlighted:
• stress testing based on historical scenarios (crises 2008–2009, 2014–2015 years);
• analysis of interest rate sensitivity (interest rate increases of 1, 3, 5, 10%);
• analysis of sensitivity to changes in exchange rates (growth of foreign currency against ruble per 10, 20, 30 rub.).

The following sections are considered the requirements for measuring capital at market risk in different regulatory regimes.

ASSESSMENT OF THE MARKET RISK OF EUROPEAN INSURERS

Since 01.01.2016, the EU operates the solvency regime — Solvency II, which provides for the calculation by European insurers of regulatory capital requirements for all significant risks, including market risk. Solvency II's main purpose is to increase the reliability of the insurance market by providing more effective protection of the insured interests [27]. Capital measure can be estimated using a standard formula or an internal model that must be approved by the regulator. Consider further the provisions of the standard formula for the different components of market risk according to Solvency II.

Property risk

Article 174 of the Delegated regulation[4] prescribes for European insurers the definition of capital at risk of real estate price change as a loss of equity due to a 25% decline in real estate value.

Currency risk

In accordance with article 188 of Delegated regulation, capital under currency risk is calculated as the sum of claims against each individual foreign currency.

The main currency of listed shares is determined by the country of listing. For shares not listing, the main currency is determined by the country of presence of the issuing company.

The amount of requirements for each currency is determined by the maximum possible loss of its own funds under stress compared to the amount of its own funds (OF)

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[4] Delegated Regulation. Commission Delegated Regulation (EU) 2015/35 of 10 October 2014 supplementing Directive 2009/138/EC of the European Parliament and of the Council on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II) Text with EEA relevance. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015R 0035 (accessed on 03.05.2021).

in the base scenario (2). In the scenario of growth of own funds under stress, the required foreign exchange risk capital is assumed to be 0. As a stress, Solvency II requires a 25% decrease or increase in the base currency (euro).

$$MKT_{\text{currency } i} = \max\left(MKT_{\text{currency } i}^{\text{up}}; MKT_{\text{currency } i}^{\text{down}}\right), (2)$$

where $MKT_{\text{currency } i}$ — estimation of capital requirements at foreign exchange risk for one currency; $MKT_{\text{currency } i}^{\text{up}}$ — changes in the insurer's own funds due to currency increase; $MKT_{\text{currency } i}^{\text{down}}$ — changes in the insurer's own funds due to currency reduction; $MKT_{\text{currency } i}^{\text{up/down}} = \max((CC_{\text{before shock}} - CC_{\text{after shock}}^{\text{up/down}});0)$.

An example of calculating the currency risk according to Solvency II is presented in *Table 2*.

Interest rate risk

In accordance with article 165 of Delegated regulation capital at interest risk is calculated as the maximum loss of equity in the scenario of lowering or increasing the interest rate against the base scenario (3):

$$SCR_{\text{int}} = \max\left(MKT_{\text{int}}^{\text{up}}; MKT_{\text{int}}^{\text{down}}\right), \qquad (3)$$

where SCR_{int} — assessment of capital requirements at interest risk; $MKT_{\text{int}}^{\text{up}}$ — changes in the insurer's own funds due to interest rate increase; $MKT_{\text{int}}^{\text{down}}$ — changes in the insurer's own funds as a result of interest rate reduction; $MKT_{\text{int}}^{\text{up/down}} = \max((CC_{\text{before shock }\%} - CC_{\text{after shock }\%}^{\text{up/down}});0)$.

To get your own funds in a base or stressful scenario is required from the discounted value of the assets exposed to interest risk, subtract the liabilities exposed to interest risk. An example of calculation for the risk module interest rate is presented in *Table 3*.

Equity risk

Equity risk sub-module reflects the sensitivity of financial instruments to various shocks. Solvency II proposes to divide financial instruments into two groups for capital calculation:

An example of currency risk calculation

1*	2*	3*	4*	5*	6*	7*
	Value before shock	Value after shock		$MKT^{up}_{currency\ i}$	$MKT^{down}_{currency\ i}$	$MKT_{currency\ i}$
		Foreign currency appreciation	Foreign currency depreciation			
Assets	90 $	112,5	67,5			
Liabilities	100$	125	75			
CC = Assets-Liabilities	−10 $	−12,5	−7,5			
Total				= −10 − (−12,5) = 2,5	= −10 − (−7,5) = −2,5 => = 0	2,5

Source: compiled by the author using Solvency II.

Note: * Column 1 — object type, column 2 — market value of the assets/liabilities before stress; columns 3 & 4 — market value of the assets/liabilities after stress in compliance with Solvency II; columns 5–7 show the results of currency risk calculation in line with the formula (2).

Type 1: shares included in listing of the European Economic Area (EEA) and the Organisation for Economic Cooperation and Development (OECD) countries;

Type 2: shares not included in Type 1.

Shocks applicable to different types of shares are reflected in *Table. 4*.

Classification criteria for strategic investments are reflected in article 171 of Delegated Regulation.

Estimation of equity requirements for two types of shares is calculated as a delta of equity due to applicable shocks. To calculate the final value of the capital at risk of change of the shares accumulate taking into account the correlation between the two types of shares (4):

$$SCR_{equity} = \sqrt{SCR^2_{type1} + 2*0,75*SCR_{type1}*SCR_{type2}} , (4)$$

where SCR_{equity} — estimation of capital requirements at risk of changes in the value of shares; SCR_{type1} — estimation of capital

requirements at risk of changes in the value of Type 1 shares; SCR_{type2} — estimation of capital requirements at risk of changes in the value of Type 2 shares.

ASSESSMENT OF MARKET RISK OF RUSSIAN INSURERS

Issues of financial sustainability and solvency of insurers have traditionally been paramount for the insurance supervisory authority. Risk–oriented regulation, in the opinion of the Bank of Russia, due to adequate and comprehensive risk assessment of insurers' activities should contribute to increasing the competitiveness and investment attractiveness of the insurance sector. Since the publication of the Concepts of introduction of risk-oriented approach to regulation of the insurance sector in the Russian Federation[5] (further — Concept)

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[5] Concepts of introduction of risk-oriented approach to regulation of the insurance sector in the Russian Federation (approved by the Bank of Russia). Consultant Plus

Table 3

Example of calculation for the risk module interest rate

1*	T 2*	Value before shock 3*	Yield 4*	Discounted cash flow before shock 5*	Interest rate growth			Interest rate decline			CC before shock%ljr 12*	MKT^{up}_{int} 13*	MKT^{down}_{int} 14*	SCR_{int} 15*
					Shock 6*	Yield 7*	Discounted cash flow 8*	Shock 9*	Yield 10*	Discounted cash flow 11*				
Bond 1	1	90 000	5.96%	84 938	70%	10.1%	81 720	75%	1.5%	88 679				
Bond 2	2	110 000	6.13%	97 660	70%	10.4%	90 217	65%	2.1%	105 428				
Bond 3	3	140 000	6.37%	116 324	64%	10.4%	103 913	56%	2.8%	128 859				
Bond 4	5	170 000	6.76%	122 576	55%	10.5%	103 293	46%	3.7%	142 100				
Bond 5	7	260 000	7.02%	161 703	49%	10.5%	129 582	39%	4.3%	193 866				
Assets		770 000		583 201			508 724			658 931				
Reserve 1	1	100 000	5.96%	94 375	70%	10.1%	90 800	75%	1.5%	98 532				
Reserve 2	2	90 000	6.13%	79 904	70%	10.4%	73 814	65%	2.1%	86 259				
Reserve 3	3	140 000	6.37%	116 324	64%	10.4%	103 913	56%	2.8%	128 859				
Reserve 4	4	200 000	6.57%	155 086	59%	10.4%	134 447	50%	3.3%	175 761				
Reserve 5	5	200 000	6.76%	144 207	55%	10.5%	121 521	46%	3.7%	167 176				
Liabilities		730 000		589 896			524 495			656 587				
Total											–6695	9075	Max (–9039;0) = 0	9075

Table 4

Shocks for equity risk calculation in line with Solvency II

	Type 1		Type 2	
	Strategic equity investments	Non-strategic equity investments	Strategic equity investments	Non-strategic equity investments
Shock	22%	39% + SA*	22%	49% + SA

Source: compiled by the author using Solvency II.

Note: SA — SA — the symmetric adjustment based on the average level of the equity index for the last 3 years (the SA shall not be lower than −10% or higher than 10% in line with Article of 172 of the Delegated Regulation.

in 2017, Bank of Russia systematically began work on risk–based supervision. Modules of risk-oriented approach to regulation of the insurance sector in the Russian Federation are similar to the components of the European regime Solvency II. Against the background of significant asymmetry in the regional development of Russian insurers, the researchers confirm the need to introduce differentiated approaches to the regulation of federal and regional insurers in accordance with the principles of Solvency II, proposing to assess the quality and level of risks of all insurers, but following the principles of proportional regulation [28].

In the Concept the Bank of Russia announced plans of compatibility of future national legislation with international principles, in particular with the requirements of the European regime Solvency II.

Compliance with the requirements, prescribed in Regulation 710-P,[6] which the Bank of Russia approved in 2020, is a significant challenge for many insurers, as it may require a change in the structure of asset allocation. At the same time, according

to the Bank of Russia, the information raised for calculate the capital for risks can be used by the companies themselves to improve the quality of management [18].

From 01 July 2021, in accordance with the requirements of the new Regulation 710-P, Russian insurers are obliged to calculate additional capital for the implementation of concentration risk. In the paper [13] the authors based on the definition of Solvency II Directive, referred the risk of concentration to credit risk. Below are the sub-modules related to market risk that will take effect for Russian companies from 01 July 2022, similar to the components of the standard formula Solvency II, discussed above.

Real estate price risk

In Regulation 710-P, this sub-module is calculated for residential and non-residential real estate, fixed-term real estate transactions. The estimation of the capital of changes in real estate prices is formed on the basis of the scenario of a fall of 25 and 10% of the value of non-residential and residential real estate, respectively.

Exchange rate risk

Foreign exchange risk sub-module in Regulation 710–P applies to assets, liabilities of the insurer, determined in foreign currency or dependent on the foreign exchange rate

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(in accordance with the publication on the website of the Bank of Russia from 20 August 2017) (accessed on 20.04.2021).

[6] Bank of Russia Regulation No. 710-P "On individual requirements for financial stability and solvency of insurers". (approved by the Bank of Russia). Consultant Plus (in accordance with the publication on the website of the Bank of Russia from 23 April 2020) (accessed on 20.04.2021).

Scenarios of foreign currency changes against RUB, %

Scenarios	Date	01.07.2022	01.07.2023	01.07.2024	01.07.2025
Foreign currency appreciation		10	18	33	44
Foreign currency depreciation		0	−3	−7	−9

Source: Regulation 710-P.

according to the contract, as well as term transactions. Capital is defined as the maximum value of possible losses under conditions of depreciation or growth of the foreign exchange rate. Possible losses are calculated as a positive OFCP difference in the base scenario (no change in foreign exchange rate) and OFCP under stress, summarizing the difference in the value of forward transactions in the base and stress scenarios. Read more in the formula (5):

$$R_{1\,currency} = max\{\left(max(\Delta OFCP^{up};0) + \Delta D_{cur}^{up}\right);$$

$$\left(max(\Delta OFCP^{down};0) + \Delta D_{cur}^{down}\right)\}, \quad (5)$$

where $\Delta D_{cur}^{up/down}$ — difference in the value of forward transactions in the base scenario and growth (up) /decline (down) scenarios of the foreign exchange rate; $\Delta OFCP^{up/down}$ — OFCP difference in base scenario (no foreign exchange change) and OFCP under stress; OFCP — difference in assets and liabilities determined in foreign currency or dependent on foreign currency under the contract.

Currency risk capital is calculated in the context of foreign currencies in accordance with the scenarios of the exchange rate against the Russian ruble (*Table 5*).

The approach is identical to the standard Solvency II formula, except for the shocks themselves.

Interest rate risk

Interest rate risk is determined for bonds, bank deposits,[7] loans and forward transactions,

and the amount of the life insurance. Capital is defined as the maximum value of the loss obtained in the analysis of the decline or increase in the interest rate scenarios. In appendix 3 and 4 of Regulations 710-P, interest rate scenarios are presented by currency (ruble / other than ruble) and according to the road map for the gradual transition to new requirements for the regulatory calculation of capital at interest risk.

The assessment of capital in a scenario is carried out according to three components:
- interest rate exposure of assets;
- percentage risk exposure of life insurance reserves;
- change in the value of forward transactions as a result of the stress scenario.

More in formulas (6), (7):

$$R_{\%} = max\left(R_{\%}^{up}; R_{\%}^{down}\right), \quad (6)$$

where $R_{\%}$ — assessment of capital requirements at interest risk; $R_{\%}^{up/down}$ — assessment of capital requirements at interest risk as a result of interest rate increases or decreases.

$$R_{\%}^{up/down} = \sum_{m=1}^{M}(MD_m * P_m *$$

$$* RF_m * St_{\%m}^{up/down}) + \Delta D_{\%}^{up} - \Delta Res_{\%}^{up/down}, \quad (7)$$

where MD_m — duration of assets; RF_m — interest rate depending on currency and period; $St_{\%}^{up/down}$ — shock depending on currency and period; $\Delta D_{\%}^{up}$ — difference in the value of forward transactions in the base scenario and growth scenarios (up) / decline (down) interest rates; $\Delta Res_{\%}^{up/down}$ —

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[7] Exceptions are deposits, the conditions of which are provided for a return within 5 days from the date of presentation of the requirements.

An example of interest rate risk calculation

	MD_m	P_m	RF_m	Shock (+)	Shock (−)	$R_\%^{up}$	$R_\%^{down}$	$R_\%$
1*	2*	3*	4*	5*	6*	7*	8*	9*
Bond 1	1	90 000	5.96%	58%	−31%	3 111	−1 663	
Bond 2	2	110 000	6.13%	55%	−29%	7 417	−3 911	
Bond 3	3	140 000	6.37%	54%	−28%	14 447	−7 491	
Bond 4	5	170 000	6.76%	48%	−27%	27 581	−15 514	
Bond 5	7	260 000	7.02%	42%	−26%	53 661	−33 219	
Total						106 217	−61 798	106 217

Source: compiled by the author using Regulation 710-P.

Note: * Column 1 — asset name, column 2 — modified duration, column 3 — market value of the asset; column 4 — zero-coupon yield curve as of 31/05; columns 5, 6 — in compliance with Appendices 3&4 of Regulation 710-P, effective as from 01.07.2025; columns 7–9 show the results of interest rate risk calculation in line with formulas 6 and 7.

Example of Scenarios of increase in the term structure of interest rates, %

Relation / Maturity in years	1	2	3	5	7	10
Solvency II	+70	+70	+64	+55	+49	+42
Regulation 710-P	+58	+55	+54	+48	+42	+34

Source: Directive Solvency II & Regulation 710-P.

difference between the life insurance reserves in the base scenario and the rate scenario; M — number of assets; P_m — cost of the asset.

The final value of the capital at the reporting date will depend on the amount of assets, life insurance reserves involved in the calculation (if relevant), temporary structure of the investment portfolio, the value of the coupon-free yield curve for government bonds, the value of the coupon–free yield curve for US government securities and the selected rate-change strategy according to Appendix 3 and 4 of the Regulations 710-P.

Example of calculation of interest risk capital under Regulation 710-P for property insurer is presented in *Table 6*.

Table 8

Comparative analysis of Solvency II and Relation 710-P. Market risk capital requirements

Type of risk	Similarities SII and 710-P	Differences SII and 710-P	Comparability
Interest rate risk	1. Module considered in standard formula 2. The final value of the capital depends on the duration of the asset	1. In SII more severe shocks to the interest rate 2. Regulation 710-P does not require the provision of stress testing for life insurance reserves other than life insurance	There are insignificant differences
Currency risk	1. Module considered in standard formula 2. The final capital value depends on the size of the open currency position	1. Regulation 710-P provides for more severe shocks in the foreign exchange growth scenario	Almost full compliance
Equity risk	1. Module considered in standard formula 2. The final value of the capital depends on the types of shares in the portfolio	1. SII introduces the concept of shares belonging to strategic investments 2. In SII, capital depends on the type of shares and the country of origin of the issuer 3. Capital in Regulation 710-P depends primarily on the country of origin of the issuer (Russian Federation or not. 4. In SII more severe shocks to interest rate risk	Significant differences
Property risk	1. Module considered in standard formula 2. The same stress–test to shock 25% of non-residential property prices	1. Regulation 710-P provides for capital to shock residential property prices by 10%	Almost full compliance

Source: compiled by the author.

Feature of the requirements of the Russian legislation on capital at interest risk is the absence of requirements for stress-testing of reserves for insurance other than life insurance. In addition, Regulation 710-P applies less severe shocks to changes in the interest rate compared with European regulation (*Table 7*).

Equity risk

In Regulation 710-P, capital at the risk of changes in the value of shares is calculated for shares, term transactions, issuer options and other contracts, the payment of which is determined depending on the value of the shares.

Capital at risk of equity change is estimated using the formula (8):

$$R_{equity} = \sum_{m=1}^{M} P_m * I_m + \Delta Derivative_{equity}, \qquad (8)$$

where R_{equity} — assessment of regulatory capital requirements at risk of changes in the value of shares; P_m — value of shares; I_m — rate of depression of share values rate by country;
$\Delta Derivative_{equity}$ — difference in the value of forward transactions, options, other contracts, the payment for which depends on the value of the shares as a result of stress.

The Central Bank of the Russian Federation sets the reduction coefficients of the share price, depending on the region of the issuer of the shares and the effective date of the requirements. The most severe testing shocks will expect to 01 July 2025 and account for 18 and 25% for issuers of the Russian Federation and other issuers respectively.

CONCLUSION

Comprehensive risk assessment of the insurance organization improves the quality of insurance protection and is an important condition for the sustainable development of the insurance industry. Changes in Russian regulation by the Bank of Russia will require insurers to improve risk management systems in general, approaches to capital valuation in particular.

The authors of domestic studies confirm the expediency of implementation of prudential risk–oriented supervision. Theoretical contribution of this article lies in the comparative analysis of the Russian and European regulation with regard to the assessment of capital under market risk for the first time in the academic domestic literature. The article identifies that the new requirements in Regulation 710–P largely repeat the standards in force for European insurers, however, differences have been identified and the degree of comparability of regulatory requirements has been determined (*Table 8*). The practical significance of the article lies in the possibility of using materials in educational activities when studying the features of risk management in the insurance industry.

The presence of discrepancies in the Russian regulation regarding Solvency II is due to peculiarities of the insurance market, which the Bank of Russia could not ignore when developing legislation on the solvency of insurers. Reduced requirements (compared to Solvency II) with regard to the percentage risk and equity risk for Russian insurance companies, they provide opportunities to build a less conservative investment strategy, taking into account a risk — return — equity balance. Insurance company needs to have sufficient capital to absorb losses in crisis situations to remain solvent. Since even the ruble's volatility has historically been higher than 25% in the recent outlook, more severe shocks to the currency risk assessment for Russian insurers are justified and should reduce the amount of foreign exchange risk losses.

Despite the partial equivalence of the Solvency II regime, it is important to note the positive trends in the development of proactive market risk management by insurance companies. Time to see how the structure of insurers' investment assets will change as a result of the entry into force of Regulation 710–P. However, insurance companies will increasingly adopt advanced risk management practices. Step-by-step transition to risk-oriented regulation allows Russian insurers to prepare in advance for the new coordinate system to increase the reliability of the protection provided.

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