



**METHODOLOGY FOR CARRYING OUT STRESS TESTS  
BY INSURANCE AND REINSURANCE UNDERTAKINGS  
FOR 2015**

**POLISH FINANCIAL SUPERVISION AUTHORITY  
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## 1. Basic changes in the methodology of stress tests for the insurance sector

The Polish Financial Supervision Authority (PFSA) decided to introduce the following changes to the methodology of stress tests to be valid in 2015:

- the term structure of interest rates, as proposed by the PFSA, was actualised on the basis of rates of yield of government bonds with a maturity up to 10 years as of 31 December 2015, as well as the values of shocks for interest rate risk were calibrated on the basis of rates of yields of government bonds with a maturity of 1, 5 and 10 years, for equity risk on the basis of the value of the WIG index for the period from 1 January 2004 until 31 December 2015, and for currency risk on the basis of the EUR/PLN foreign exchange rate for the period from 1 January 2004 until 31 December 2015;
- the range of contracts covered by stress tests for life lapse risk was changed, including the method of calculating shock values and the method for carrying out the stress test,
- for credit risk - reinsurer's bankruptcy and credit risk - asset concentration, the allocation of ratings to the loss giving default was changed on the basis of the draft technical standard on mapping ratings of external credit assessment institutions to credit quality steps, which was delivered by the EIOPA to the EC on 6 November 2015.

## 2. General assumptions

While carrying out stress tests as of 31 December 2015, insurance/reinsurance undertakings should follow the rules of accounting, valuation and solvency valid as of 31 December 2015.

Stress tests are carried out under the assumption that the risk factor changes fully during the last day of the period for which stress tests are performed and the immediate impact of shocks on the financial situation of an insurance/reinsurance undertaking is subject to evaluation. In case the pattern of risks (risk exposure) deviates significantly up or down from the risk exposure during the year from the day stress tests are carried out, the insurance/reinsurance undertaking carries out an additional stress test which takes into account the average annual risk exposure (the average value to be calculated at least on a quarterly basis).

Shocks for interest rate risk, equity risk, credit risk - asset concentration, credit risk - reinsurer's bankruptcy, mortality risk, longevity risk, lapse risk, reserve risk, revision risk and catastrophe risk refer to the risk exposure as of the day stress tests are carried out, while shocks for expense risk refer to events which took place during the last 4 quarters preceding the day stress tests are carried out.

While carrying out stress tests for catastrophe risk, credit risk - reinsurer's bankruptcy, credit risk - asset concentration, expense risk and lapse risk, it should be assumed that these types of risk were related to the payment of compensations and benefits in full, expenses were incurred, or exposures were settled against the entities which went bankrupt.

The evaluation of consequences of the realization of specific types of risk is performed independently of the remaining types of risks, and not jointly (shocks take place independently).

Insurance/reinsurance undertakings should take into account hedge instruments, e.g. interest-rate or equity derivatives, or outward reinsurance.

In case of currencies other than PLN, insurance/reinsurance undertakings should apply the same shocks as those for PLN. No change in FX rates should be assumed in stress tests.

As a simplification, the so-called *immaterial data*, i.e. the share of 1 product or investment is below 1% of total gross technical provisions or total investments respectively, may be omitted. However, the total amount of these immaterial products or investments must not exceed 5% of the share in the total technical provisions or total investments respectively, as well as there should be no impact on the solvency of insurance/reinsurance undertakings in case these products or investments are not covered by stress tests.

Two scenarios should be considered when carrying out stress tests for interest rate risk and non-life catastrophe risk (according to the specification for specific types of risk) and (re)insurance

undertakings should present the more severe out of two scenarios in the SNU reporting application (for each of the mentioned types of risk accordingly).

The more severe scenario for specific types of risk is the scenario in which the value of the solvency ratio (SR), i.e. coverage of the required solvency margin (RSM) or the guarantee fund (GF) with own funds (OF) is lower:

$$SR = \min\left(\frac{OF}{RSM}, \frac{OF}{GF}\right).$$

The more severe scenario for specific types of risk in prospective stress tests is the stress test in which the value of an undertaking's capital after shock is the lowest one.

In case of small mutual insurance undertakings which are obliged to calculate neither the required solvency margin nor the guarantee fund, the more severe stress test is the test which causes a greater decrease in an undertaking's capital.

In case other significant risks not covered by standard stress tests are identified, insurance/reinsurance undertakings should carry out stress tests for such types of risk. The PFSA allows for a possibility to impose additional stress tests on an undertaking upon the verification of results of standard stress tests, which will cover risks related to the specifics of the activity of individual insurance/reinsurance undertakings.

The correctness of the performed standard stress tests and additional stress tests is confirmed with signatures by Members of the Management Board or any other authorised persons according to the representation rules. The correctness of stress tests will be verified under the supervision performed by the PFSA.

### 3. Interest rate risk

Insurance/reinsurance undertakings should carry out two shocks (upward and downward) and present results of one scenario being the more severe one.

Shock values (upward and downward), as calibrated by the PFSA, should be applied in the stress test depending on the maturity of cash flows. The table below presents shock values.

**Table 1. Shocks for interest rate risk<sup>1</sup>**

<b>Maturity (in years)</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
Downward shock	-56%	-73%	-86%	-94%	-98%	-99%	-99%	-97%	-95%	-91%
Upward shock	117%	188%	233%	255%	259%	247%	226%	214%	206%	190%
<b>Maturity (in years)</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20+</b>
Downward shock	-88%	-84%	-80%	-76%	-72%	-69%	-66%	-63%	-60%	-57%
Upward shock	175%	163%	151%	142%	133%	125%	118%	111%	105%	100%

Insurance/reinsurance undertakings shall stress their term structure of the interest rate. However, in case an insurance/reinsurance undertaking is not able to establish its interest rate term structure, it should apply the following term structure, as proposed by the PFSA<sup>2</sup>.

<sup>1</sup> Own calibration by the PFSA.

<sup>2</sup> Calculated on the basis of profitability of Polish government bonds with a maturity up to 10 years (not corrected for credit risk) as of 31.12.2015 (data from Bloomberg).

**Table 2. Interest rate term structure**

<b>Maturity (in years)</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
Interest rate	1.510%	1.653%	1.858%	2.071%	2.282%	2.503%	2.736%	2.878%
<b>Maturity (in years)</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>
Interest rate	2.954%	3.092%	3.222%	3.327%	3.413%	3.485%	3.545%	3.597%
<b>Maturity (in years)</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>
Interest rate	3.641%	3.679%	3.712%	3.742%	3.768%	3.791%	3.811%	3.830%
<b>Maturity (in years)</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>		
Interest rate	3.847%	3.862%	3.876%	3.889%	3.900%	3.911%		

Decrease of interest rates affects the value of technical provisions – in case an insurance/reinsurance undertaking is not able to achieve a rate of return on assets to cover technical provisions at least as high as the technical rate applied to calculate technical provisions, technical provisions should be calculated at a lower interest rate.

The stress test for interest rate risk with regard to technical provisions should be carried out by decreasing the technical rate used for discounting (without taking into account changes in the indexation of benefits) by downward shock for the particular maturity term.

In case of life insurance if interest rates used by life-insurance undertakings at the valuation date were higher for individual products than the maximum technical rate valid from 1 May of the particular year, then:

- in case interest rates used by an insurance undertaking decreased by downward shock were lower than the maximum technical rate, the stress test should be based on the maximum technical rate valid from 1 May of the particular year,
- otherwise, the stress test should be based on interest rates used by an insurance undertaking and decreased by downward shock.

The stress test related to technical provisions for a decrease of interest rates for specific products should not be carried out in case interest rates used by an insurance undertaking were not higher than the maximum technical rate valid from 1 May of the particular year.

The stress test should additionally include the interest rate limitation resulting from the 3-year rate of return on assets covering technical provisions (in accordance with the valid Regulation of the Minister of Finance on specific accounting rules of insurance and reinsurance undertakings). The change in the interest rate in the shock concerns the change in the rate of return on debt instruments during the last year considered in the calculation of the 3-year rate of return on assets covering technical provisions.

Net assets for life assurance where the investment risk is borne by the policyholders and provision for life assurance policies where the investment risk is borne by the policyholders as a simplification, may be excluded from this stress test.

Insurance/reinsurance undertakings may exclude from stress tests for interest rate risk those technical provisions which were covered by bonds held to maturity in case cash flows from such liabilities and assets were matched and in case the interest rate applied in the valuation of these bonds is higher than the technical rate applied for the calculation of these technical provisions.

Insurance/reinsurance undertakings may exclude from stress tests for interest rate risk those life-insurance assets and technical provisions which have characteristics of the so-called saving insurance policies (exempted from the income tax from capital gains) and insurance structured products provided that cash flows from these assets (in terms of their value, currency and terms) correspond to cash flows from liabilities under concluded insurance contracts.

The fact that insurance/reinsurance undertakings take into consideration changes in the indexation rate for annuities (as a result of changes in the rate of return on assets or changes in the inflation

rate) requires an additional stress test to be carried out and its assumptions to be described in a report on stress testing results.

Open-ended investment fund participation units and closed-end investment fund certificates should be subject to stress testing by taking into account the investment fund's structure. To simplify, the structure of investment funds, as proposed by the PFSA, may be applied and is based on the assumption that the share of debt instruments in debt instrument funds is equal to 95%, the share of debt instruments in balanced funds is equal to 45%, while the share of debt instruments in stable growth funds is equal to 65%.

#### **4. Equity risk**

The shock for shares listed on the regulated and non-regulated market and for not listed shares amounts to -53%.<sup>3</sup> The following assumptions should be made with regard to shares and stocks in related entities:

- the stress test for equity risk in domestic related insurance/reinsurance undertakings should be based as the value of changes in equity of domestic related insurance/reinsurance undertakings for the most severe stress test in the particular related insurance/reinsurance undertaking,
- the stress test for equity risk in foreign related insurance/reinsurance undertakings should be based on the half of the standard shock (i.e. -26,5%),
- the stress test for equity risk in related entities other than insurance/reinsurance undertakings should be based on the half of the standard shock (i.e. -26,5%).

Open-ended investment fund participation units and closed-end investment fund certificates should be subject to stress testing by taking into account the investment fund's structure. To simplify, the structure of investment funds, as proposed by the PFSA, may be applied and is based on the assumption that the share of shares in equity funds is equal to 95%, the share of shares in balanced funds is equal to 50%, while the share of shares in stable growth funds in equal to 30%.

Net assets for life assurance where the investment risk is borne by the policyholders and provision for life assurance policies where the investment risk is borne by the policyholders as a simplification, may be excluded from this stress test.

#### **5. Expense risk**

The stress test for expense risk should allow for a 10%<sup>4</sup> increase in acquisition expenses, administrative expenses and claims management expenses during the last 4 quarters before the reporting date stress tests are carried out.

It is allowed to correct reinsurance commissions, if based on expense positions.

Acquisition expenses should be increased to such a level on which an undertaking would take a decision about suspending the sale of an unprofitable product.

In case additional stress tests are carried out as of a day other than the last day of the year, the 10% increase in expenses in the last 4 quarters should be calculated, and afterwards this amount should be added to expenses reported in financial statement as of the day stress tests are carried out.

#### **6. Mortality risk (life insurance undertakings)**

The test should be carried out under the assumption that mortality rates increase by 15%<sup>5</sup> for each age group. The test includes the re-calculation of technical provisions (life-insurance provisions) with the use of life expectancy tables modified by the shock.

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<sup>3</sup> Own calibration by the PFSA.

<sup>4</sup> In accordance with the Commission Delegated Regulation (EU) 2015/35 supplementing the Solvency II Directive.

<sup>5</sup> In accordance with the Commission Delegated Regulation (EU) 2015/35 supplementing the Solvency II Directive.

In order to carry out the stress test, life expectancy tables should be applied (for specific products in the particular period) and mortality rates should be increased by 15%.

- In case mortality rates before applying the shock exceed limits, i.e. mortality rates in the most recent available life expectancy table published by the Central Statistical Office of Poland, increased by 15%, stress tests should not be carried out for a particular product.
- In case mortality rates before applying the shock do not exceed limits, i.e. mortality rates in the most recent available life expectancy table published by the Central Statistical Office of Poland, increased by 15%, but they would exceed the limits upon applying the shock, then mortality rates in the most recent available life expectancy table published by the Central Statistical Office of Poland increased by 15% should be assumed as the stress value.

While carrying out the stress test for mortality risk, insurance/reinsurance undertakings may recognise the decrease of technical provisions for the longevity risk exclusively for those persons who were simultaneously insured against the risk of death and the risk of survival or did possess annuity.

## 7. Longevity risk

The test should be carried out under the assumption that mortality rates decrease by 20%<sup>6</sup> for each age group. The test includes the re-calculation of technical provisions with the use of life expectancy tables modified by the shock.

In order to carry out the stress test, life expectancy tables should be applied (for specific products in the particular period) and mortality rates should be decreased by 20%.

- In case mortality rates before applying the shock exceed lower limits, i.e. are lower than mortality rates in the most recent available life expectancy table published by the Central Statistical Office of Poland decreased by 20%, stress tests should not be carried out for a particular product.
- In case mortality rates before applying the shock do not exceed lower limits, i.e. mortality rates in the most recent available life expectancy table published by the Central Statistical Office of Poland decreased by 20%, but they would exceed the limits upon applying the shock, then mortality rates in the most recent available life expectancy table published by the Central Statistical Office of Poland increased by 20% should be assumed as the stress value.

While carrying out a longevity risk stress test, insurance and reinsurance undertaking may recognise the decrease of technical provisions for the mortality risk exclusively for those persons which were insured both against mortality risk and survival risk or were in possession of annuity.

## 8. Lapse risk (life insurance undertakings)

Life-insurance undertakings should carry out the stress test for lapse risk under the following assumptions:

1. Policyholders immediately lapse or surrender 40% of unit-linked and index-linked life-insurance contracts, while during following periods lapse or surrender rates increase by 5 p.p.;
2. The amount of surrender fees or similar fees must not be higher than those specified in the insurance general terms and conditions, results of the proceedings conducted by the Office of Competition and Consumer Protection, as well the below rates (percentage of the account value):

a) Regular premium:

**Table 3. Maximum amount of surrender fee for contracts with regular premiums.**

Year of the contract's validity	1	2	3	4	5 and following
Maximum value of surrender fee as a percentage of the account value	20%	15%	10%	7%	4%

<sup>6</sup> In accordance with the Commission Delegated Regulation (EU) 2015/35 supplementing the Solvency II Directive.

- b) Single premium: 4% of the account value.
- In relation to decreased surrender fees, 10% of policyholders, who lapsed or surrendered their contracts during the last 3 years (limitation period), will be reimbursed the difference amount between the amount of new surrender fees under court judgments (point 2) and the charged surrender fees;
  - Under unit-linked and index-linked life-insurance contracts, concluded for a period of up to 5 years, expenses related to the insurance agent's commission are equally spread over the insurance period. However, under unit-linked and index-linked life-insurance contracts, concluded for a period of more than 5 years or for an indefinite period, expenses related to the insurance agent's commission are equally spread over a period of at least 5 years. This limitation is not applicable to insurance contracts under which the guaranteed amount of benefits in case of the insured person's death for any reason is higher than ten times the amount of the yearly premium due under this contract during each of the first 5 years of insurance.

In relation to changes in expected lapse rates and the amount of charged fees, the insurance undertaking should also carry out a test on the recovery of deferred acquisition costs.

## 9. Catastrophe risk (non-life (re)insurance undertakings)

Two scenarios should be considered in the stress test for non-life catastrophe risk.

- Flood which caused insured gross losses as 0.16%<sup>7</sup> of the sum of sum insured under all contracts of the undertaking covering the risk of flooding.
- The realization of the greatest insured risk, the man-made catastrophe, or any other catastrophic scenario reflecting the specific risk in the activity of an insurance/reinsurance undertaking. It should be assumed under this scenario that the risk realizes in case of one event, and direct and indirect consequences thereof should be taken into account.

The more severe scenario is applied as the stress test. No stress test which includes the simultaneous occurrence of both scenarios should be carried out, unless the highest risk realized in case of flood.

Reinsurance programmes of insurance/reinsurance undertakings, in particular the catastrophic reinsurance, should be taken into account by calculating the financial consequences of the realization of the risk under the stress test for catastrophe risk in both scenarios.

## 10. Credit risk - reinsurer's bankruptcy (non-life (re)insurance undertakings)

The stress test for credit risk – reinsurer's bankruptcy covers the bankruptcy of the largest reinsurance undertaking (measured by the reinsurer's share in provisions for claims outstanding and in receivables as of the balance sheet date the stress test is carried out), provided that the probability of bankruptcy and the loss given default depends on the reinsurance undertaking's rating<sup>8</sup> and have values, as presented in the below table:

**Table 4. Loss given default according to the reinsurance undertaking's rating<sup>9</sup>**

Loss amount	Fitch Ratings <sup>10</sup>	Moody's Investors Service	Standard and Poor's Ratings Services	AM Best
12%	AAA to AA	Aaa to Aa	AAA to AA	A++ to A+
21%	A	A	A	A to A-

<sup>7</sup> The calibration is consistent with the Commission Delegated Regulation (EU) 2015/35 supplementing the Solvency II Directive. As of 31 December 2014, this would mean approx. PLN 7.97 billion of insured gross losses for the whole insurance sector.

<sup>8</sup> In case more than 1 rating are available, the second highest rating should be applied. In case there is no rating for a reinsurance undertaking, the rating for a group/dominant entity of the group should be used with such information provided in the qualitative questionnaire.

<sup>9</sup> The assignment of ratings on the basis of the draft technical standard on mapping ratings by external credit assessment institutions to credit quality step, which was submitted by the EIOPA to the EC on 6 November 2015.

<sup>10</sup> In case of Fitch Ratings, for domestic ratings being the evaluation of the credit quality with regard to the "lowest" credit risk rating only and exclusively in a particular country (each domestic rating is followed by a specific country identifier, (pol) being assigned to Poland), the following rating scale should be assumed: AAA(pol) - rate A, from AA(pol) to A(pol) – rate BBB, from BBB(pol) to BB(pol) - rate BB, B(pol) – rate B, CCC(pol) - rate CCC, CC(pol) - rate CC, C(pol) – rate C.



Loss amount	Fitch Ratings <sup>10</sup>	Moody's Investors Service	Standard and Poor's Ratings Services	AM Best
27%	BBB	Baa	BBB	B++ to B+
73%	BB and lower	Ba and lower	BB and lower	B and lower
64.5%	Reinsurance undertakings without rating, but fulfilling solvency requirements			
73%	Other reinsurance undertakings without ratings			

## 11. Credit risk - asset concentration

The stress test for credit risk – asset concentration should be carried out if the Herfindahl-Hirschman Index (HHI) for an investment portfolio exceeds 600 points. It should be assumed that counterparties which cause the HHI exceeds 600 points go bankrupt.

In order to calculate the HHI, it is necessary to calculate the share of investments held in individual counterparties in the sum of B investments of the balance sheet decreased by the value of bonds issued by the State Treasury, the value of bonds guaranteed by the State Treasury and the value of shares and other assets which are deducted from own funds in accordance with Art. 148 (2)-(2d) of the Act on the insurance activity and rank these share of investments in the ascending order. In case of investments in investment funds, it is necessary to calculate the share of individual counterparties on the basis of the structure of the fund's investment portfolio according to the fund's recent public financial statements. Afterwards, the Herfindahl-Hirschman Index (HHI) should be calculated in accordance with the formula:

$$HHI = \sum_{\substack{i \neq \text{State Treasury} \\ i \neq \text{related entity}}} [(share\ of\ investment\ against\ a\ counterparty_i)^2 \cdot 10\ 000]$$

The following assumptions should be made with regard to the loss given default:

- the loss amount on shares is equal to 100%,
- for the remaining exposures (bonds other than bonds issued by the State Treasury, bank deposits, cash at bank, etc.), the probability of bankruptcy and the loss given default depend on the issuer's rating<sup>11</sup> and should be consistent with the following table:

**Table 5. Loss given default according to the issuer's rating<sup>9</sup>**

Loss amount	Fitch Ratings <sup>10</sup>	Moody's Investors Service	Standard and Poor's Ratings Services	AM Best
12%	AAA to AA	Aaa to Aa	AAA to AA	aaa to aa-
21%	A	A	A	a+ to a-
27%	BBB	Baa	BBB	bbb+ to bbb-
73%	BB and lower	Ba and lower	BB and lower	bb+ and lower
64.5%	Financial and credit institutions without rating, but fulfilling solvency requirements			
73%	Other institutions without rating			

While carrying out stress tests, it should be assumed that bankruptcies of counterparties take place independently from each other, so losses from the bankruptcy of individual counterparties  $i$  (measured by the nominal loss in the value of assets) should be aggregated in accordance with the following formula:

$$Shock_{aggr.} = \sqrt{\sum_i Shock_i^2}$$

Where:  $Shock_i$  means the nominal decrease in the value of assets (excluding deferred taxes) in case counterparty  $i$  goes bankrupt, while  $Shock_{aggr.}$  means the final aggregated nominal decrease in the

<sup>11</sup> In case more than 1 rating are available, the second highest rating should be applied. In case there is no rating for an issuer, the rating for a group/dominant entities of the groups should be used with such information provided in the quality questionnaire.

value of assets (excluding deferred taxes), for which it is necessary to evaluate the change in the value of technical provisions, deferred taxes, capital and own funds.

## 12. Reserve risk (non-life (re)insurance undertakings)

In the stress test for reserve risk, non-life insurance/reinsurance undertakings should increase by  $\max(8,2\% + DCOP ; 0)$ <sup>12</sup> the value of gross provisions for claims outstanding for motor third-party liability insurance (MTPL insurance). DCOP means the 3-year average level of deficiency of claims outstanding provisions for MTPL insurance and is calculated by an undertaking as:

$$DCOP = -1 + \frac{\sum_{i=2012}^{2014} p_i \cdot \frac{GCP_{i,i+1} + GCOP_{i,i+1}}{GCOP_{i,i}}}{\sum_{i=2012}^{2014} p_i}$$

Where:

$GCP_{ij}$  – the value of gross claims paid (including annuities) for losses incurred until the year  $i$  (including) and paid out in the year  $j$ ;

$GCOP_{ij}$  – the gross claims outstanding provision (including the provision for capitalized value of annuities) for losses incurred until the year  $i$  (including) as of the end of the year  $j$ ;

$p_i$  – weights to the weighted average:  $p_i = \begin{cases} 3 & \text{if } i = 2014 \\ 2 & \text{if } i = 2013 \\ 1 & \text{if } i = 2012 \end{cases}$

## 13. Revision risk

While carrying out the stress test, insurance/reinsurance undertakings should increase the value of all future annuity payments by 3%<sup>13</sup> on a one-time basis, which may be increased as a result of changes in the health status of the person entitle to receive the annuities or changes resulting from legal regulations or court rulings.

## 14. Additional stress tests

### a) Stress tests for other types of risk

In case other significant risks not covered by standard stress tests are identified, insurance/reinsurance undertakings should carry out stress tests for such types of risk. In particular, insurance/reinsurance undertakings should carry out stress tests for these types of risk for which the value of a financial/balance sheet position exposed to a particular risk exceeds 5% of technical provisions/ total assets of an undertaking (depending on the type of risk). These tests cover inter alia the following types of risk:

- the stress test for currency risk in case the value of assets or liabilities in foreign currencies is higher than 5% of the total assets (sudden increase in foreign currency exchange rates by 27% against PLN, or sudden decrease in foreign currency exchange rates by 16% against PLN<sup>14</sup>, with changes in foreign currency exchange rates referring to balance sheet positions, and not transactions in foreign currencies during the year),
- the stress test for morbidity-disability risk for life insurance undertakings, in case the share of products covering morbidity risk, disability risk or risk of incapacity to work, exceeds 5% of technical provisions other than provision for life assurance policies where the investment risk is borne by the policyholders (sudden and permanent increase in disability and morbidity rates by 25%, which are used for calculating technical provisions),

<sup>12</sup> Own calibration by the PFSA.

<sup>13</sup> In accordance with the Commission Delegated Regulation (EU) 2015/35 supplementing the Solvency II Directive.

<sup>14</sup> Own calibration by the PFSA.

- the stress test for catastrophe risk for life insurance undertakings, in case the share of technical provisions for products covering the death of the insured person exceeds 5% of technical provisions other than provision for life assurance policies where the investment risk is borne by the policyholders (sudden increase in mortality rates by 0.15 p.p., which reflect mortality during the following 12 months (expressed as a percentage), used for calculating technical provisions),
- the stress test for credit risk – reinsurer’s bankruptcy for life insurance undertakings, in case the share of reinsurance undertakings in technical provisions and reinsurance receivables exceeds 5% of the value of technical provisions (assumptions consistent with the stress test for non-life insurance undertakings).

### **b) Stress tests based on the average annual risk exposure**

In case the pattern of risk (risk exposure) deviates significantly up or down from the risk exposure during the year from the day stress tests are carried out, an insurance/reinsurance undertaking carries out an additional stress test which takes into account the average annual risk exposure (the average value should be calculated at least on a quarterly basis).

### **c) Prospective stress tests**

In case standard stress tests and stress tests for the remaining types of risk give negative results (insufficient own fund to cover the guarantee fund or the required solvency margin or insufficient assets to cover technical provisions), an insurance/reinsurance undertaking should carry out a prospective stress test for these types of risk for which capital requirements were not fulfilled. Prospective stress tests should be carried out as of 31 December 2016 by considering the assumptions of a financial plan deemed by an undertaking for realization, the assumptions of stress tests as of 31 December 2015, as well as activities described in additional notes to stress tests with regard to explanations to negative results of stress tests.

## **SUMMARY**

The standard scope of stress tests covers the following types of risk:

- for life insurance/reinsurance undertakings:
  - interest rate risk,
  - equity risk,
  - credit risk - asset concentration,
  - expense risk,
  - mortality risk,
  - longevity risk,
  - lapse risk (risk of cancelled contracts),
  - revision risk,
- for non-life insurance/reinsurance undertakings:
  - interest rate risk,
  - equity risk,
  - credit risk - asset concentration,
  - expense risk,
  - catastrophe risk,
  - credit risk - reinsurer’s bankruptcy,

- longevity risk,
- reserve risk,
- revision risk.

Type of risk	Shocks applied										
	Term	Maturity term (in years)									
	1	2	3	4	5	6	7	8	9	10	
Interest rate risk	Downward shock	-56%	-73%	-86%	-94%	-98%	-99%	-99%	-97%	-95%	-91%
	Upward shock	117%	188%	233%	255%	259%	247%	226%	214%	206%	190%
	<b>Term</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20+</b>
	Downward shock	-88%	-84%	-80%	-76%	-72%	-69%	-66%	-63%	-60%	-57%
	Upward shock	175%	163%	151%	142%	133%	125%	118%	111%	105%	100%
Equity risk	Stocks and shares other than in related undertakings: -53%; Stocks and shares in related (re)insurance undertakings other than domestic: -26,5%; Stocks and shares in related domestic (re)insurance undertakings: changing in a (re)insurance undertaking's capital for the most severe stress test.										
Expense risk	10% increase in historic expenses during the last 4 quarters: acquisition expenses, administrative expenses and claims management expenses.										
Mortality risk	15% increase in mortality rates for each age group.										
Longevity risk	20% decrease in mortality rates for each age group.										
Lapse risk	<ul style="list-style-type: none"> <li>• 40% mass lapse of unit-linked and index-linked insurance contracts followed by increase by 5 p.p. of lapses in next years</li> <li>• Surrender fee limited to max 4% of insurance fund for single premium contracts and to 20%-4% of insurance fund for recurring premium contract</li> <li>• 10% of policyholders who lapsed in previous 3 years will receive difference in surrender fee.</li> </ul>										
Catastrophe risk	<ul style="list-style-type: none"> <li>• Flood, which caused gross losses equal to 0.16% of the sum of sums insured for all insurance contracts that cover a flood risk;</li> <li>• Man-made catastrophe or a materialization of the highest insured risk.</li> </ul>										
Credit risk - reinsurer's bankruptcy	Bankruptcy of the biggest reinsurer, measured as a reinsurer share in claims outstanding provisions and receivables (at the date when stress tests are performed), with the probability of default and the loss given default dependant on a reinsurer's rating (Table 4).										
Credit risk - asset concentration	Bankruptcy of a counterparty (other than central government or an entity which shares or other assets are deducted from (re)insurance undertaking's own funds) in which (re)insurance undertaking has a high concentration of investments, assuming that the probability of default and loss given default depends on an issuer's rating (Table 5) whereas the loss given default for equities equals 100%.										
Reserve risk	Increase of maximum (8.2%+DCOP; 0) in the value of provisions for claims outstanding for motor third party liability insurance (DCOP = deficiency of claims outstanding provision).										
Revision risk	Increase by 3% in the value of future annuity payments that may be raised as the result of a change in the health condition of the person receiving the annuity, or changes resulting from legal regulations or court rulings.										