Supervisory stress testing of selected insurance companies

Domestic insurance companies together representing more than 90% of the Czech insurance market participate in the stress tests. The calculations are made by insurance companies themselves using the CNB's methodology, and the correctness of the calculations and the test results are always consulted with the CNB. The test methodology takes into account the nature of business in this sector. The proposed shocks therefore arise mainly from a decrease in the value of investments due to adverse financial market developments, an increased amount of insurance claims and lower insurance premium collection.

Stress test scenario

Adverse macroeconomic scenarios are the starting point for the stress test of domestic insurance companies. The scenarios are designed using the CNB's forecasting model supplemented with an estimate of the evolution of some additional variables which are not directly included in the model. The adverse scenario also contains catastrophe risk, the risk of a decrease in premiums for the two most important classes of non-life insurance and the risk of an increase in the lapse rate in the life insurance portfolio.

Data as of the end of the previous calendar year are used as a basis for calculating profit/loss and solvency indicators in the stress test. The method for valuing assets and liabilities is identical to that required by the Solvency II directive.

Risks assessed in the stress test

Equity risk

The equity risk test covers all equity securities measured at fair value (direct and indirect exposures) and units of collective investment funds to which the look-through approach cannot be applied.[1] Participations the value of which will be deducted from the value of basic own funds under Article 68 of Commission Delegated Regulation (EU) 2015/35[2] are not entered in the test. Different shocks can be applied to equity instruments in one scenario, depending on the issuer's geographical location and the type of instrument:

1) Shares and ownership interests from EEA/OECD countries.

2) Shares and ownership interests from other countries as well as private equity instruments, hedge funds, commodity instruments, other alternative instruments and collective investment funds to which the look-through approach cannot be applied.

The change in the value of equity securities after application of the equity shock (i.e. the loss, -) is calculated as the product of the coefficient of the shock and the value of the security as of the relevant date.

[1] The look-through approach will ensure that the instrument will be revalued according to the ultimate source of risk. For example, in the case of an investment in a collective investment fund investing partly in bonds and partly in shares, the bond and share components are revalued separately.

[2] COMMISSION DELEGATED REGULATION (EU) 2015/35 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).

Real estate risk

The real estate risk test covers all assets whose value is sensitive to the level or volatility of property market prices. They include land and real estate measured at fair value, including property for own use, and direct or indirect holdings in real estate companies generating regular income. They do not include investments in property management and property development companies.

The change in the value of real estate instruments after application of the property shock (i.e. the loss, -) is calculated as the product of the coefficient of the shock and the value of the real estate or real estate instrument.

Calculation of equity and real estate risks

In mathematical terms, the loss arising from revaluation of the relevant assets ΔA_{type} can be expressed as

$$\Delta A_{type} = A_{type,T+1} - A_{type,T} = A_{type,T} \cdot shock_{type},$$

where A_{type} is the value of the equity security, real estate or real estate instrument and $shock_{type,scenario}$ is the coefficient for the relevant A_{type}.

Interest rate risk

A general interest rate shock is applied to all assets and liabilities whose value is interest-rate sensitive. On the asset side, they include debt securities, deposits, bond fund units and interest rate derivatives with a positive fair value as of the reference date. On the liabilities side, they include derivatives with a negative fair value as of the reference date. The change in the best estimate of technical provisions is also tested.

The stress test directly sets the values of the risk-free yield curve, doing so separately for koruna interest rates and foreign currency rates.[3] Yield curves are derived from the CNB's yield curve modelling framework[4] and their evolution is tied to the adverse scenario for the evolution of macroeconomic variables and money market rates arising from the CNB's forecasting model. In addition to the risk-free curve, the scenario calculates the change in volatility adjustment and, consequently, the risk-free curve taking volatility adjustment into account. Some insurance companies use this curve to calculate the level of technical provisions.

The change in the value of interest-rate sensitive assets and liabilities (other than technical provisions) after application of the interest rate shock (the profit/loss, +/-) is defined as the difference between their value as of the reference date and their value calculated on the basis of the risk-free interest rate curve set by the scenario.

[3] The risk-free yield curve refers to the basic risk-free interest rate term structure according to Solvency II. The yield curve for cash flows denominated in the Czech koruna is currently constructed on the basis of interest rate swap yields. In addition to the koruna risk-free yield curve, the scenario includes the euro and dollar yield curves. The euro yield curve is used for all other foreign currency interest-rate sensitive assets and liabilities.

[4] See the thematic article "Decomposition of the Czech government bond yield curve" published by the CNB in Financial Stability Report 2016/2017.

Calculation of interest rate risk for interest-rate sensitive assets and liabilities (other than technical provisions)

In mathematical terms, the profit/loss due to the change in value ΔAL_{IR} resulting from the interest rate shock can be expressed as

$$\Delta AL_{IR} = AL_{IR\_T+1} - AL_{IR\_T} \ ,$$

where AL_{IR_T} is the value of interest-rate sensitive assets and liabilities (except for technical provisions) as of the reference date and AL_{IR_T+1} is their value calculated on the basis of the risk-free interest rate curve according to the scenario.

The interest rate shock is applied to assets and liabilities using the discounted cash flow method. The discount rate is constructed from the risk-free interest rate and a risk margin. The risk margin is the difference between the yield on the asset and the comparable risk-free yield. When the shock is applied, the only the risk-free interest rate changes (in accordance with the scenario), while the risk margin remains unchanged. The exchange rate as of the reference date is used to calculate both values for foreign currency instruments. In other words, the change in the exchange rate defined by the scenario is not taken into account in the case of interest rate risk, as it is taken into account separately in the part devoted to foreign exchange risk.

The change in the value of technical provisions (the profit/loss, +/-) is defined as the difference between the best estimate of technical provisions according to individual defined insurance segments as of the reference date and the best estimate of technical provisions determined using the risk-free interest rate curve according to the scenario. The test differentiates technical provisions for the following insurance segments: life insurance with profit participation, other life insurance, SLT health insurance[5], unit-linked life insurance and non-life insurance.

Calculation of interest rate risk for technical provisions

In mathematical terms, the profit/loss due to the change in the value of technical provisions ΔTR_{IR} can be expressed as

$$\Delta TR_{IR} = TR_{IR\_T+1} - TR_{IR\_T}$$

where TR_{IR_T} is the best estimate of technical provisions according to individual defined insurance segments (life insurance with profit participation, other life insurance and SLT health insurance, unit-linked life insurance and non-life insurance) as of the reference date and TR_{IR_T+1} is the best estimate of technical provisions for the same segments determined using the risk-free interest rate curve according to the scenario (or the risk-free interest rate curve according to the scenario taking volatility adjustment into account).

[5] SLT ("similar to life techniques") insurance is health insurance that is pursued on a similar technical basis to that of life insurance.

Credit spread risk

Credit spread risk applies to interest rate risk-sensitive assets except for government bonds issued by the EEA/OECD or the supranational institutions the EIB, the IBRD and the EBRD.[6] They include in particular corporate debt securities and credit risk-exposed structured instruments whose value is sensitive to the level and volatility of the credit risk premium (credit spread) determined in relation to the risk-free interest rate. The test is performed only on assets whose residual maturity is equal to or longer than one year.

Calculation of credit spread risk

In mathematical terms, the profit/loss due to the change in the value of corporate instruments exposed to credit risk ΔA_{Cr} after application of the credit spread shock can be expressed as

$$\Delta A_{Cr} = \sum_i A_{Cr\_T,i} \cdot shock_{rating_i, residual\_maturity_i} \quad ,$$

where $A_{Cr\_T,i}$ is the value of the *i*-th instrument as of the reference date, $rating_i$ is the credit rating of the issuer (or the rating of the instrument) and $residual\_maturity_i$ is the residual maturity of the instrument in relation to the reference date. The summation is done across all corporate instruments exposed to credit risk.

The rate of decrease in the value of an instrument exposed to credit risk is a function of the credit rating (if there is one) and the residual maturity (in relation to the reference date) of the instrument. The test implicitly covers the risk of default and the risk of a change in credit quality.

If the issuer or the instrument has not been assigned a credit rating, it is placed in the "unrated" category and the respective shock is applied to it. If credit ratings are available from multiple rating agencies, the second best of them is applied. Structured instruments are classified as "unrated" in the test.

Risk of a fall in government bond prices

Government bonds and guarantees issued by states whose residual maturity in relation to the reference date is longer than or equal to one year are subject to this credit risk. A decrease in value dependent on the bond's residual maturity is applied to the individual bonds and, for foreign government bonds, to sovereign ratings. The rate of decrease in the value of the government bonds after application of the shock (the loss, -) is a function of the residual maturity time band and the rating (for foreign bonds) relative to the reference date.

Calculation of the risk of a fall in government bond prices

In mathematical terms, the loss due to the change in the value of government bonds ΔA_{SD} after application of the credit shock can be expressed as

$$\Delta A_{SD} = \sum_i A_{SD\_T} \cdot shock_{rating_i,\ residual\ maturity_i}$$

where $A_{SD\_T,i}$ is the value of the *i*-th government bond as of the reference date, $rating_i$ is the sovereign credit rating (for foreign government bonds) and $residual\_maturity_i$ is the residual maturity of the *i*-th government bond as of the reference date. The summation is done across all government bonds.

[6] Bonds guaranteed by EEA states or their central banks are stress tested for credit spread risk if they are denominated in a currency other than the domestic currency of the given state.

Exchange rate risk

The exchange rate shock is applied to all assets and liabilities, including derivatives denominated in foreign currencies.[7] The profit/loss on foreign currency assets and liabilities after application of the exchange rate shock is defined as the difference between the value of foreign currency assets and liabilities converted using the real exchange rate as of the reference date and the value of the exchange rate in the scenario. Revaluation due to the above-mentioned risks has already been taken into account as regards the individual assets and liabilities.

Calculation of exchange rate risk

In mathematical terms, the profit/loss due to the change in the value of foreign currency assets and liabilities ΔAL_{FX} after application of the exchange rate shock can be expressed as

$$\Delta AL_{FX} = AL_{FX\_T+1} - AL_{FX\_T}$$

where AL_{FX_T} is the conversion of the foreign currency value of assets and liabilities using the real exchange rate as of the reference date and AL_{FX_T+1} is the conversion of this value using the exchange rate in the scenario.

Life insurance risk – an immediate lapse applied to the entire life insurance portfolio

The test covers the impact of an immediate lapse of 10% of the insurance company's entire life insurance portfolio. This shock concerns all life insurance products, including investment life insurance products and SLT health insurance. The shock is applied to all insurance policies, regardless of whether the lapse will cause an increase or a decrease in technical provisions.

Calculation of life insurance risk

The change in the value of technical provisions ΔTR is defined as the difference

$$\Delta TR = TR_{Lapse\_stressed} - TR_{Lapse\_ref}$$

$TR_{Lapse\_stressed}$ is the best estimate of life insurance technical provisions according to individual defined insurance segments (life insurance with profit participation, other life insurance, SLT health insurance and investment life insurance) after the application of an immediate lapse rate of 10%. TR_{Lapse_ref} is the best estimate of the life insurance technical provisions of these segments as of the reference date. The values of technical provisions are reduced by amounts recoverable from reinsurance.

[7] Positions in foreign currencies other than EUR and USD are currently negligible, so the exchange rate risk test only includes positions in EUR and USD.

Non-life insurance risk – insurance premium risk

The test applies a decrease in net earned premiums to the two most important classes of non-life insurance (by volume of net earned premiums, individually for each insurance company). The drop in the profit/loss is then equal to the product of the coefficient of the decrease in net earned premiums and the total amount of net earned premiums for the given year for the two most important classes of non-life insurance. The value of claim settlement costs (including the change in the value of technical provisions) and the value of technical provisions for non-life insurance are unchanged.

Calculation of insurance premium risk for the two most important classes of non-life insurance

The decrease in gross profit/loss is equal to

$$\Delta NPE_{non-life} = shock_{non-life} \cdot NPE_{non-life} ,$$

where $NPE_{non-life}$ is the total amount of net earned premiums for the previous year for the two most important classes of non-life insurance and $shock_{non-life}$ is the coefficient of the decrease in net earned premiums according to the scenario.

Non-life insurance risk – risk of catastrophic damage caused by natural disasters

In an extended scenario the test includes the impact of catastrophic damage caused by floods. It tests the impact of increased flood frequency and the impact of the total damage with regard to the reinsurance programme. The amounts of damage incurred by individual insurance companies are derived from the total damage caused in the Czech Republic on the basis of market share according to the total sum insured for the risk of floods in the Czech Republic as of the reference date. The insurance company will apply the current reinsurance programme (since reinsurance contracts are structured, the insurance company applies the reinsurance programme based on its own experience, for example as regards damage distribution across individual types of property). The insurance company determines its total own retention and its reinsurance reinstatement costs.

Calculation of the risk of catastrophic damage caused by natural disasters

The decrease in gross profit/loss is equal to,

$$NatCat = -\sum_i OwnRetention_{Event_i} - \sum_i ReinstatementCosts_{Event_i}$$

where *NatCat* is the event, *OwnRetention* is own retention and *ReinstatementCosts* are reinsurance reinstatement costs, $Event_i$ are the individual floods defined in the stress scenario.

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