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**Stress-testing in a commercial bank( annotation)**

Stress-testing has become an integral part of risk-management in banks nowadays. Amid current crisis Russian systemically important banks implement this instrument as a tool of forecasting potential losses over a 1-year period for different scenarios –assumptions for risk-factors alterations.

Stress-testing presents a multi-stage procedure of estimating influence of the alterations of various risk-factors commensurate with plausible but exceptional scenarios – on financial stability of a financial organization. The resulting indicators could be financial result, capital and capital adequacy ratios and liquidity ratios. The main goal of stress-testing is to estimate potential losses resulting from stress events which allows banks forecast their demand in capital and liquidity.

It is worth mentioning main principles of stress-testing elaborated in Basel 3 standards. Stress-testing is the obligatory element of corporate management and risk-management in banks;it calls for participation of chief executive management and board of management (when defining limits and confirming scenarios);it should be conducted for different time horizons basing on various complex scenarios including worst-case scenarios and reverse stress-testing. In spite of obvious advantages of stress-testing it has a couple of drawbacks. Firstly, scenarios bear subjectivity and present the most problematic part of the whole stress-testing procedure. Stress-testing doesn’t permit to take into account changing correlations between risk-factors which tend to rise during periods of economic and financial instability.

Stress-tests can be classified differently depending on the following criteria:

* number of risk-factors: one-factor analysis, multi-factor scenario;
* methodology: analysis of sensitivity. scenario analysis, reverse stress-testing;
* different types of risks treatment: individual,complex,integral;
* measure of severity of scenarios: pessimistic, critical and catastrophic
* types of stress-scenarios: historical and hypothetical.

Further on, main methods of stress-testing – sensitivity analysis and scenario analysis are observed. I focus on Basel Committee recommendations for elaborating efficient stress scenarios. Then I present probable classification of stress scenarios which differ by (1)severity, (2)estimation of risk-factors, (3)methodology of their processing and (4)application.

Then I pass to discussing models of stress-testing market risk. At first, it is worth mentioning the most important features of stress-testing portfolio market risk.

* stress-testing should have forecasting ability;
* risk-aggregation should be fulfilled in view of risk-factors correlations or weights of each risk for each financial instrument;
* convexity effects of price behavior of derivatives should be taken into account.

The most widespread model is multi-factor regression model (portfolio revaluation model).The second one is a “tail risk model” which reveals convexity effects of price distribution of derivatives. The third highlighted model is copula model which presents joint distribution of several risk-factors.

 Research of the work consists in stress-testing hypothetical portfolio of containing 5 financial instruments. I elaborate 3 scenarios based on either official statistic data of CB RF, Ministry of economic Development and Ministry of Finance or on historic figures of risk-factors.

First of all, I apply individual models for each instrument and get losses (Value-at-Risk) for all three scenarios:

* for shares: StressVaR;
* for option: “Greks” model;
* for Eurobond: regional factor model

Then I focus on portfolio complex models of stress-testing.The first model is proposed by Regulator in 2014 allows to estimate losses on a chosen date and is based on 2 scenarios-realistic and pessimistic for 5 risk-factors: stock market index, yield of state bonds, yield of corporate bonds, bi-currency exchange rate and PD(probability of default). Despite the fact that this model isn’t complicated, mathematically clear and allows banks assess losses for each significant risk, it doesn’t provide for aggregation of the losses for individual risks.

The second model is based on dispersion-covariance analysis of risk-factors and includes making assumptions of risk-factors alterations in each scenario. The evident advantages consist in including correlations between risk-factors according to different scenarios and forecasting losses on chosen time horizon. The possible drawbacks include subjectivity of scenarios and entangled calculations.

The second model includes the following risk-factors:

* S&P 500 Index;
* USDRUB
* LIBOR 3M;
* Interest key rate of the CB;
* RUB-USD SWAP 5 YR [RUB-USD SWAP 5 YR];
* CPI(consumer price index);
* Eurobond 18 Y spread;
* RTSFN$ INDEX;
* RTSFN$ INDEX
* MICEX Index.

The third model –copula model – is the most efficient and correct model for estimating portfolio risk on a chosen date as it allows to build joint distributions of risk-factors influencing portfolio. The only disadvantage is inability to apply different scenarios for forecasting maximum losses.

Obtained results make it possible to give some recommendations for managing portfolio risk. The methodology of CB has shown necessity to hedge eurobond position which could be conducted through buying put- futures or buying interest swap with short fix rate payments and long floating rate payments.

The dispersion-covariance analysis model demands hedging risks for which risk= factors tend to rise sharply in pessimistic and critical scenarios. Moreover, sale of instruments with more than 2 times augmented volatilities.

The copula model has made it evident that it is worth avoiding concentration of instruments subject to exchange rate fluctuations and to LIBOR rate as losses for realistic scenario overcome losses for pessimistic scenario.