

Stress test methodology

1. Objective of stress tests

Running stress tests by KELER CCP has a double objective:

- on one hand to check that the default fund (TEA or KGA) is of appropriate size at all times, and
- on the other hand to check compliance with the appropriateness of the other financial resources of KELER CCP.

2. Historical scenarios

Similarly to the hypothetical scenarios, the same scenarios are applied on the spot and derivative capital markets, with the difference that more asset classes are traded on derivative capital market (e.g. currencies, commodities). The two scenarios per maturity are exceptions, as they can only be applied on derivative market.

We developed a historical price database of products we clear from January 1998 and identified the periods when the highest volatility was experienced. In line with the Technical Standards we considered a 2-day holding period.

At the development of historical stress scenarios, KELER CCP can look back until the period of the 1998 crisis, a longer lookback period (e.g. time series of 30 years) is not possible. All the stress periods arisen since 1998 are taken into account when developing the scenarios.

For all periods we checked the exact price changes for all product groups. Since 1-1 parameter is defined for each product group, except the currency products, it is obtained by KELER CCP by weighting the price changes of the products within the product group using different methodologies.

- In case of equities, the larger value of the 2-day effective return of the BUX index (leading index of Budapest Stock Exchange for the equities), or the volume weighted 2-day effective return of the blue chip stocks (OTP, MOL, Richter, MTelekom) is considered in the scenarios.
- For government bonds the 2-day basis point change in zero coupon reference rate curve points are considered. These changes are multiplied by the duration of zero coupon bonds that has the same maturity as the reference yield curve points. These values are weighted by the notional value of bonds tradeable on that certain day.
- In case of currencies, stress parameters are determined based on the weighted 2-day effective returns of each currency pair.
- For commodities, stress parameters are based on the weighted 2-day effective returns of the commodities.

Determining historical stress test scenarios for different maturities KELER CCP considered the parameters of the Russian crisis in 1998, global crisis in 2008 based on the fact that the most significant price changes are in these times.

KELER CCP determined the following maturity categories for the groups of products in the two historical scenarios:

- 0-30 days to maturity
- 31-60 days to maturity
- 61-90 days to maturity
- 91-180 days to maturity
- 181-360 days to maturity
- more than 361 days to maturity

3. Hypotetical scenarios

Similarly to the historical scenarios, the same scenarios are applied on the spot and derivative capital markets, with the difference that more asset classes are traded on derivative capital market (e.g. currencies, commodities).

The hypothetical scenarios must cover stress parameter combinations that are not included in the historical scenarios, but their occurrence is plausible. The hypothetical parameters are partly determined based on expert's judgement. The other part of the hypothetical parameters is determined by calculating stress correlations observed in the past period, assuming a linear relationship between the weighted returns of the asset classes.

Among the assumptions used in the development of the hypothetical scenarios, is that Hungary will be downgraded. In this case, taking into account the correlation between the exchange rates of the individual product groups, the prices would fall, government bonds would significantly lose their value due to the yield increase, and foreign currencies would strengthen due to the weakening of the Hungarian Forint. The exchange rate of cross currencies would not be affected by the Hungarian crisis, but the prices of commodities - mainly grains - would increase assuming that capital would concentrate there. Another assumption is that sudden market turbulence is caused by one or more currencies on the foreign exchange market (e.g. shock caused by a war or terrorism, unexpected financial market announcements).

4. Concluding stress tests

We complete stress testing daily, at the level of the clearing entity (own, omnibus client, individually segregated non-clearing member / client) for all scenarios. Only the uncovered exposures are summed to clearing member and group level. In the derivative market the net open interest is taken into account during stress testing. In the spot market, in line with the T+2 settlement cycle, we consider the open risks of 2 days.

After the results of the scenarios are determined, we select the first or the second and the third if their sum is larger exposure(s) with uncovered risk, the worst value(s) are compared to the default fund (TEA or KGA) and the financial resources of KELER CCP to check compliance.