## Macroeconomic scenarios for Solvency Stress Tests

1. **The macroeconomic scenarios include both domestic and international economic and financial variables**. Consistent with the TD STs conducted by the central bank, the set of seven domestic variables include the exchange rate, the rate of the 28-day Cetes (Mexican Federal Treasury Certificates), the Mexican stock index (I PC), the domestic index of economic activity (IGAE), the consumer price index (CPI), commercial bank credit, and the unemployment rate. The set of international variables include the U.S. industrial production index, the West Texas Intermediate oil price, the U.S. three-month Treasury bill yield, the U.S. 10-year Treasury bond yield, the VIX, and the Dow Jones index.
2. **We suggest the TD solvency stress tests examine two sets of macroeconomic scenarios over a three-year horizon**. The first set of scenarios corresponds to short-lived adverse conditions, e.g. the adverse scenarios set, where shocks realize during the first year of the stress test. The second set of scenarios corresponds to severe, protracted shocks, e.g. the severe scenarios set, where shocks realize gradually during the first two years of the stress test. The table below lists the shocks under each set of scenarios.

Assumptions underlying the sets of adverse and severe scenarios



1. **Vector autoregression (VAR) models generated the set of scenarios for the TD STs.** Each set comprise 2000 scenarios. A VAR model captured the dynamics of the international variables under the open economy assumption that domestic variables did not affect U.S. variables and the price of oil. This model generated three-year forecasts for the international variables under the shock assumptions for the adverse and severe set of scenarios (see table above), and assuming no other shocks realized during the three-year test horizon. Another VAR model, where domestic variables were endogenous and international variables exogenous, generated the three-year forecasts for the paths of the domestic variables.
2. **Scenario simulation was consistent with the set of initial shocks.** During the initial phase of the stress test, i.e. 2016 for the adverse set of scenarios, and 2016-17 for the severe set of scenarios, innovations to the domestic variables (error terms) were sampled from the estimated multivariate distribution such that the innovations were within 80 to 120 percent of the values consistent with the arbitrary paths of the variables. After the initial phase, unconstrained innovations were used to simulate the path of the variables for the remainder of the ST horizon.
3. **The adverse and severe sets of ST scenarios are consistent with historical distress episodes**. In particular, the average path of the domestic economic activity index resembles its observed behavior during the 2008 global financial crisis, and the Mexican crisis of 1994, with the average contraction of bank credit harsher in the scenarios than in the past. In both sets of scenarios, the average path of the exchange rate and the unemployment rate reaches levels above historical record highs (Figures 1 and 2). The next two tables present summary statistics.

Set of adverse scenarios



Set of severe scenarios

Source: Haver Analytics and staff calculations.

These scenarios are similar to the severe scenarios reported by the central bank it its *Financial System Report, 2015*, which we reproduce here for convenience:

Banco de Mexico, Financial System Report, 2015 – Group 2 scenarios



Source: Banco de Mexico

1. **The BU stress tests will use a single adverse (severe) scenario where the path of the variables will correspond to the average path of the economic and financial variables under the set of adverse (severe) scenarios.**

Figure 1. Adverse scenarios set: average, maximum, and minimum paths for domestic variables

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| Figure 1. Adverse scenarios set: average, maximum, and minimum paths for domestic variables (cont.) |
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| Figure 1. Adverse scenarios set: average, maximum, and minimum paths for domestic variables (cont.) |
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Note: The figure reports the average path (blue line), and the maximum and minimum paths (red lines) for a set of 2000 simulated scenarios. The adverse scenarios consider industrial production in the U.S. growing 2 percent annually, and the following initial shocks: a 100 bps increase in the U.S. 3-month Treasury bill rate, a 200 bps increase in the U.S. 10-year Treasury bond rate, a two-standard deviation shock to the IGAE, and a rise in the unemployment rate to 5 ½ percent. The shocks to the remaining variables are set equal to a one-standard deviation. All shocks realize gradually during the last three quarters of 2016.

Source: Haver Analytics, and staff calculations.

Figure 2. Severe scenarios set: average, maximum, and minimum paths for domestic variables

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| Figure 2. Severe scenarios set: average, maximum, and minimum paths for domestic variables (cont.) |
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| Figure 2. Severe scenarios set: average, maximum, and minimum paths for domestic variables (cont.) |
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Note: The figure reports the average path (blue line), and the maximum and minimum paths (red lines) for a set of 2000 simulated scenarios. The adverse scenarios consider industrial production in the U.S. growing 1 percent annually, and the following initial shocks: a 200 bps increase in the U.S. 3-month Treasury bill rate, a 400 bps increase in the U.S. 10-year Treasury bond rate, a three-standard deviation shock to the IGAE, and a rise in the unemployment rate to 5 ½ percent. The shocks to the remaining variables are set equal to a two-standard deviation. All shocks realize gradually during the years 2016 and 2017.

Source: Haver Analytics, and staff calculations.