Box 1.3

MACRO-FINANCIAL RISK SCENARIOS FOR THE STRESS TEST ANALYSIS

Russia's invasion of Ukraine poses significant risks to the macroeconomic and financial environment. These affect both the Spanish economy and the international environment, in particular economies abroad that are important to Spanish banks' business, and have a greater impact on certain economic sectors. This box considers hypothetical scenarios in which the risks to the Spanish financial system's stability identified after the outbreak of the conflict materialise and have a severe impact. Unlike the projections described in the body of this chapter, these scenarios do not provide information on how the economy and the financial environment are expected to perform; instead, they model the impacts (i.e. the changes in macroeconomic and financial variables) that would arise should extreme events, with a much lower probability of occurrence, materialise.[1] The use of this type of extreme scenario is consistent with the goals of prudential regulation, which requires that banks have enough capital to absorb unexpected losses. This ability to maintain their capital adequacy under different scenarios, including those that are farthest away from the baseline expectations, is key to ensuring that financing keeps flowing to households and firms, and to preventing the amplification of the different types of shocks that may impact our economy.

The two adverse scenarios for the Spanish economy assume a series of shocks that exacerbate some recent developments, mainly those related to Russia's invasion of Ukraine and the consequent increase in energy and other commodity prices. The effects of this intensification also spill over to the conditions in the Spanish financial system and to agents' confidence. Impacts on a wide range of economic and financial variables for 2022 and 2023 are drawn from these considerations.

In the case of the adverse scenario, these shocks include a further increase in the energy price and the bottlenecks in international trade having greater effects on European and Spanish prices as a whole. This drives up both headline and underlying inflation and, as a result, the monetary policy response speeds up. In addition, financing conditions deteriorate, which materialises in further increases in Spain's sovereign risk premium and in the spreads in bank lending to households and firms. Furthermore the value of the assets that make up household wealth decreases, with significant declines in both stock prices and house prices.

The severe scenario slightly increases the size of the price shocks compared with the adverse scenario, but the former's main characteristic is the incorporation of a more pronounced worsening of households' and firms' confidence, which causes further falls in the main domestic demand variables (household consumption, housing investment and investment in capital goods). Under this scenario of a greater fall in demand and activity, there is a further rise in risk premia and a greater spread between short and long-term financing conditions and between the yields required on risky assets and safe assets. All these shocks are calibrated quantitatively on the basis of the different variables' recent and historical volatility, with the aim of creating markedly adverse, but plausible, scenarios. Following the usual practice in these exercises, the effect of all these shocks on the macroeconomic projections for the Spanish economy is obtained via simulations conducted using the Quarterly Macroeconometric Model of the Banco de España (MTBE).[2]

A further marked increase in the average year-on-year growth of inflation of up to 3.2 pp (3.6 pp) would be recorded in Spain in 2022-2023 under the adverse (severe) scenario. This general increase in prices would be accompanied by lower GDP growth, with average downturns of 2.8 pp and 5.4 pp under the adverse and severe scenarios, respectively, in addition to a slowdown in house prices, resulting in respective impacts on their average growth in 2022-2023 of -5.3 pp and -8.6 pp, respectively (see Chart 1). The scenarios also capture a deterioration in the financial environment, with increases in short and long-term interest rates and falls in stock market prices (see Chart 2). Under the adverse scenario

1 The use of severe scenarios, which are plausible but have a relatively low probability of occurrence, is an integral characteristic of the main international stress testing exercises. See the scenarios in the EBA's latest European exercise, *"EU Wide Stress Test Exercise (2021)"*, or the scenarios recently defined by the Federal Reserve System for its next exercise, *"2022 Stress Test Scenarios"*.

2 See A. Arencibia Pareja, S. Hurtado, M. de Luis López and E. Ortega (2017), «New version of the Quarterly Model of Banco de España (MTBE)», *Occasional Paper* No 1709, Banco de España.

there is a greater increase in short-term interest rates (2.2 pp for the 12-month EURIBOR), whereas under the severe scenario the greater weakness of demand leads to a smaller rise therein (0.9 pp for the 12-month EURIBOR). The increase in long-term interest rates considered under both scenarios is notable. For example, the average ten-year sovereign bond yield rises by 2.6 pp and 3.0 pp under the adverse scenario and severe scenario, respectively. This contrasts with the type of scenarios envisaged in the exercises of recent years, where, amid low equilibrium real interest rates and inflation that was below the central bank's target, financing costs practically did not increase.[3]

Higher energy commodity costs are one of the main risks crystallised under the adverse scenarios. The input-output tables for the Spanish economy are used to model the uneven impact of this shock on gross value added (GVA) growth in the different economic sectors, on the basis of how intensive energy consumption and production in each sector is. The transportation sector is the hardest hit in terms of nominal GVA under the adverse scenarios, due to its high fuel consumption, which becomes more expensive and squeezes its profitability. Other sectors that are more reliant on energy inputs, such as crop and animal production and certain manufacturing segments, are also relatively harder hit than the average (see Chart 3). The measures recently approved by the Government subsidising a portion of the cost of oil-related products for final consumers will alleviate these impacts. First, demand for oil-related products will decline less. Second, the producer prices of the hardest-hit sectors will rise more moderately and, as a result, demand for the products will also decrease less. The fiscal cost of these measures counterbalances these benefits.

Similar to Spain's case, the adverse scenarios for the foreign economies that are important to Spanish banks are calibrated so that their severity is consistent with the impact of the shocks on the Spanish economy. Internationally, short and long-term interest rates increase in all countries (see Chart 4). Interest rates reaching high levels in some emerging market economies (Brazil and in particular Turkey) under these scenarios reflects their response to inflationary pressures and the rise in risk premia. A further increase in average inflation in 2022-2023 of 5.6 pp (6.2 pp) for Brazil and of 34.3 pp (37.9 pp) in the case of Turkey is projected

Chart 1
ADVERSE AND SEVERE SCENARIOS FOR SPAIN. MACROECONOMIC IMPACT (a)

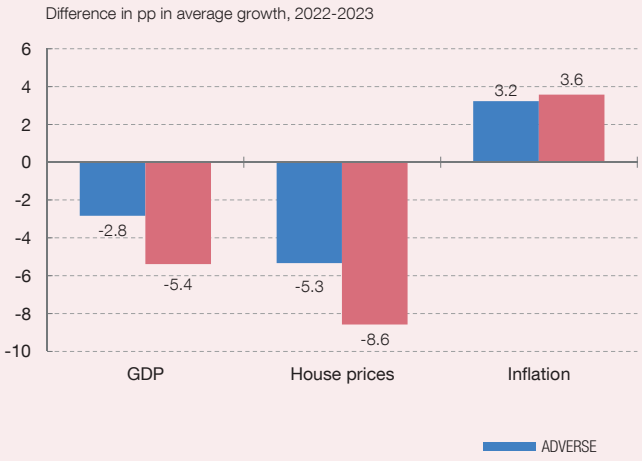
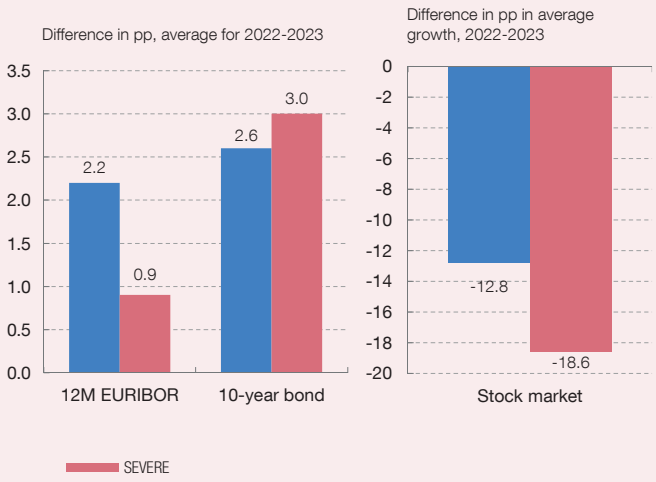


Chart 2
ADVERSE AND SEVERE SCENARIOS FOR SPAIN. IMPACT ON THE FINANCIAL ENVIRONMENT (a)



SOURCE: Banco de España.

a Impacts are defined as the differences in pp in the values of the variables shown compared with the central projections of the analysis.

3 See, for example, the above-mentioned scenario for the EBA's 2021 exercise, *"EU Wide Stress Test Exercise (2021)"*.

under the adverse (severe) scenario. The increase in inflation is widespread and also affects advanced economies. For example, in the case of the United States and the United Kingdom, inflation increases on average in this two-year period by an additional 2.3 pp (2.6 pp) under the adverse (severe) scenario.

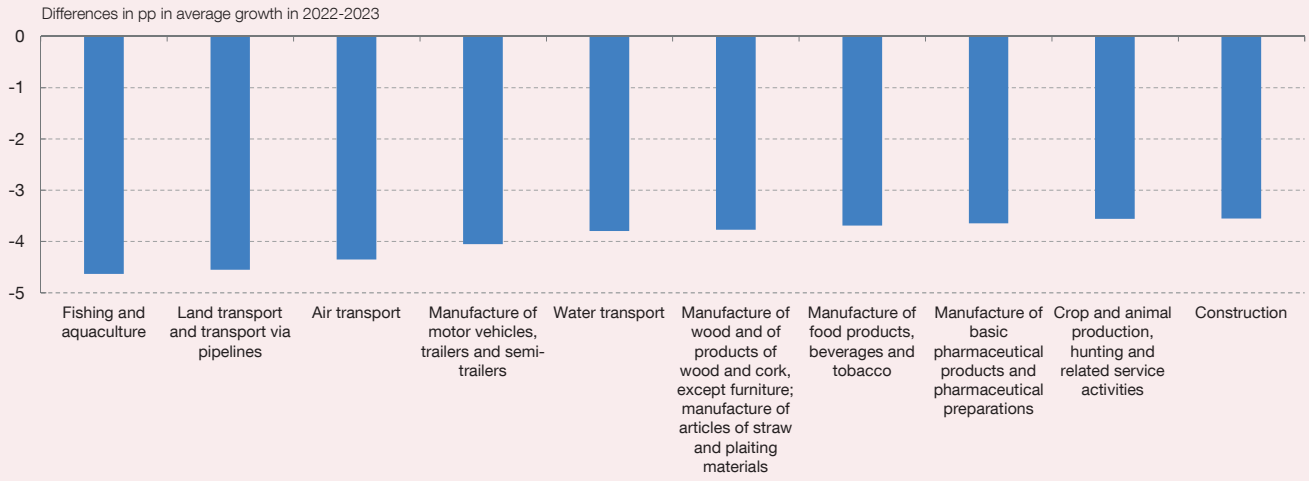
Under both alternative scenarios, real GDP growth falls across the board in the different economies considered (see Chart 5) and the unemployment rate rises. However, the impact is greater on the emerging market economies, which are hit harder by the increase in global uncertainty and the tightening of financing conditions, and experience marked declines in real GDP in some cases (particularly Turkey, whose average growth in 2022-2023 is up to 12.2 pp less under the severe scenario).

The differences in the impact on activity in the emerging market economies are in part a reflection of commodity price developments. Thus, some of the countries considered are net commodity exporters, while others are net importers. This results in the fall in GDP in the Latin American countries (excluding Mexico) being mitigated, as the effects of greater global uncertainty are offset by improvements in their terms of trade. As Turkey is more reliant on energy imports, the opposite effect arises and growth contracts more sharply.

Another important difference across the economies stems from changes in exchange rates. In emerging market economies like Mexico and Brazil, the simulated cumulative impact of currency depreciation due to higher global uncertainty is of approximately 15% (30%) in 2022-2023 under the adverse (severe) scenario and of around 50% for other emerging market economies such as Turkey and Argentina. With regard to the advanced economies outside the euro area, exchange rate shocks are not considered.

Overall, the scenarios consider some markedly adverse macro-financial impacts that are far from the baseline expectations for the Spanish and global economies. While these impacts are unlikely to materialise, they are not implausible. The scenarios thus enable a rigorous analysis of the resilience of the banking sector, and of other sectors to which the scenarios might apply, to the risks faced in the current geopolitical crisis setting.

Chart 3
EFFECT OF THE SEVERE SCENARIO ON NOMINAL GVA GROWTH IN 2022-2023 IN THE 10 HARDEST-HIT SECTORS (a)



SOURCE: Banco de España.

a For the stress tests, impacts on real GVA are used. To take into account the higher prices in energy sectors, the paths to be included in the projection are adjusted.

MACRO-FINANCIAL RISK SCENARIOS FOR THE STRESS TEST ANALYSIS (cont'd)

Chart 4

ADVERSE AND SEVERE SCENARIOS FOR FOREIGN ECONOMIES. IMPACT ON LONG-TERM INTEREST RATES

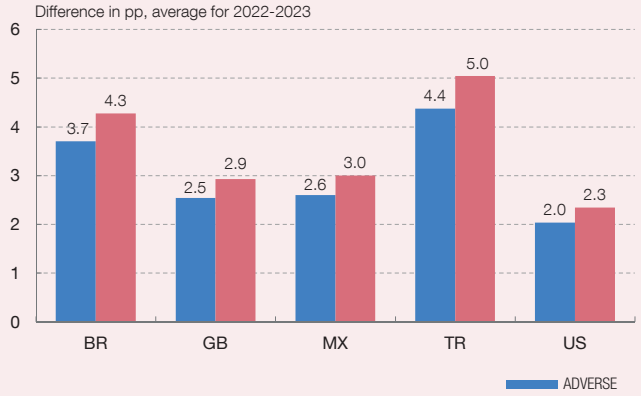
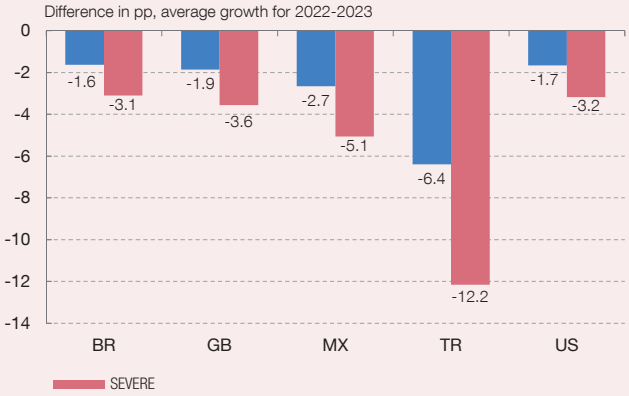


Chart 5

ADVERSE AND SEVERE SCENARIOS FOR FOREIGN ECONOMIES. IMPACT ON GDP GROWTH



SOURCE: Banco de España.