BOX III.2
INTERNATIONAL COMPARISON OF STRESS SCENARIOS

Stress tests on the financial sector have become increasingly important over the past several years, especially in the wake of the global financial crisis (Baudino et al., 2018). They are classified as either bottom-up or top-down. The former are generally organized by the respective supervisor, in coordination with the financial institutions themselves (generally banks), and are based on highly disaggregated data and scenarios defined by the authority. In the case of the latter, the monetary or financial authority designs the scenarios and directly applies them to the exposures, using less detailed regulatory and administrative data, for the purpose of macroprudential analysis (Jobst et al., 2013). In the case of Chile, the CBC has published top-down stress tests since 2005, with the goal of evaluating the aggregate resilience of the banking system. The results and conclusions are regularly reported in the *Financial Stability Reports* and also discussed with the respective supervisor and with market agents.

To position the stress tests conducted by the Central Bank of Chile in the international context, this box highlights the assumptions and scenarios used and compares them to international benchmarks.

Guidelines for the CBC tests

The CBC stress tests measure market and credit risks, considering two stress scenarios for the dynamics of the economy: severe and adverse. The severe scenario is defined based on recent fragility episodes, namely, the Asian crisis and the global financial crisis. The adverse scenario, in turn, is based on the fifth percentile of the forecasts presented in the *Monetary Policy Reports.* This design seeks to generate scenarios that are extreme, but plausible, in line with recommendations by the Bank for International Settlements (BIS, 2018), which are described in chapter III of this Report.

International experience

In the United States, the U.S. Federal Reserve (Fed) applies the Dodd-Frank Act Stress Test (DFAST) and determines the underlying parameters and assumptions. In the most recent version, the Fed assessed the capital of 18 banks under hypothetical economic stress scenarios (Board of Governors of the Federal Reserve System, 2019). The tests were based on three stress scenarios with varying degrees of complexity: severely adverse, adverse, and a global market shock and counterparty default component. The first features a deep global recession, accompanied by nine quarters of stress for the real estate market and corporate debt markets. The second includes weak economic activity across all economies, with a moderate reduction in asset prices and rising volatility. Finally, the third further incorporates a specific module for the international economy, with a severe recession in the Eurozone, the United Kingdom and Japan and a somewhat milder recession in developing Asia. The configurations can vary in accordance with current economic conditions and are periodically revised in the Board's Policy Statement on the Scenario Design Framework for Stress Testing.

The Bank of England (BoE) defines an adverse scenario and assesses the associated capital needs. At the end of this year, the test covers the seven largest banks in terms of local loans (BoE, 2019). The scenario incorporates: (i) macroeconomic stress in the United Kingdom (U.K.), which lasts for five years; (ii) financial market stress consistent with the former; and (iii) an independent module incorporating stress from misconduct and its costs. For the 2019 test, the BoE defined a stress scenario that features a drop in world GDP and in the GDP of the United States, the Eurozone, and China. With regard to the domestic economy, the stress scenario includes a GDP contraction of 4.7%, while the unemployment rate reaches 9.2% in the second year of the test. Real estate prices also fall for residential and commercial properties, among other effects. Most recently, the BoE introduced into the scenario a variable associated with a disorderly exit of the United Kingdom from the European Union (a no-deal Brexit).

In Australia, the Reserve Bank (RBA) is in charge of carrying out the top-down stress test, which encompasses impacts on bank solvency and liquidity and considers interconnectedness and systemic risk, among other factors. In 2019, the RBA analyzed the system based on a small group of major banks (International Monetary Fund, 2019). The tests contemplate a baseline and an adverse scenario over a horizon of three years. The baseline scenario is anchored on estimates from the World Economic Outlook, including output growth, the unemployment rate, house price indices, liquidity and the exchange rate. The adverse scenario, in turn, includes three sets of shocks: a drop in house prices; lower world growth, especially in China; and less favorable global financial conditions than expected.

The Bank of Spain (BdE) has applied its Forward-Looking Exercise on Spanish Banks since 2013. The most recent version of the test covers four bank groups. In this case, the tests are coordinated by the European Banking Authority, which defines the methodology (European Banking Authority, 2018), and the European Systemic Risk Board. The tests identify four sets of risk: (i) a sudden repricing risk to spreads in global financial markets; (ii) feedback between low growth and banks with weak profitability; (iii) sustainability risks in public and private debt; and (iv) liquidity risk in the nonbank sector.

The BdE includes the baseline and adverse scenarios over a three-year horizon, with a GDP contraction, a house price correction, reductions in variable-income prices, consumption and investment shocks, etc. Current risk variables are also analyzed. For example, the 2018 test also considered a severe GDP contraction in emerging markets, with a focus on Turkey, India, and Russia.

One of the most widely discussed issues in the literature is the severity of the stress scenarios, which, because the tests are forward looking, requires making judgements in their design and calibration. The degree of severity of the scenarios used can be evaluated by comparing the biggest economic contractions in the different economies with the magnitudes applied in the most recent stress test exercises. For example, the U.S. scenario implies a somewhat larger contraction than recorded in 2009, while the United Kingdom analyzes a drop that is smaller than its historical trough. Chile, in turn, is in the middle of the severity range in terms of the economy's historical GDP contractions, but the unemployment rate is closer to the levels recorded in economic stress periods (table III.4).

TABLE III.4
International comparison of stress scenarios
(percent)

	Crisis year	Annual GDP change (peak to trough) (1)	Unemployment rate
United States	1982	-4.97	9.70
	2009	-5.39	9.25
United Kingdom	1980	-6.23	6.80
	2009	-6.79	7.54
Spain	1993	-4.81	22.16
	2009	-7.75	17.86
Australia	1983	-5.25	9.96
	2009	-1.91	5.56
Chile	1999	-7.84	11.16
	2009	-7.88	11.31

Stress scenarios			
United States	Severely adverse	Δ-8.00pp (2)	10.00
United Kingdom	Stress	Δ -4.70pp	9.50
Spain	Stress	Δ -4,00pp	25.00
Australia	Adverse	Δ-2.50pp	9.90
Chile	Adverse and severe	[-4,00; -5,30]	[10,3; 10,9]

(1) From maximum to minimum, with three year tolerance, based on the exercise horizon.
(2) Accumulated over quarters.

Source: Central Bank of Chile based on information from World Bank, Bank of Spain, Bank of England, Fed, IMF and RBA.

Final comments

The above analysis reveals that the main entities responsible for applying stress tests at the global level design scenarios with the objective of reflecting financial situations that could affect the banking system. In this sense, they use major historical changes, as well as potential shocks that have not necessarily affected the country in the past, but that could have an impact in the future. This is the case for house price reductions, which in some cases have not been recorded in the past, or the inclusion of modules for unprecedented events like a no-deal Brexit. The stress test applied by the Central Bank of Chile follows the same trend, and the applied magnitudes are in the mid-range of severity in the sample of countries presented in this box.