



National Bank
of Ukraine

Approaches to stress testing banks in 2021



Specifics of stress testing in 2021

- The National Bank of Ukraine maintains general approaches to annual stress testing:
 - ✓ Two scenarios apply, the baseline and adverse one. Credit, interest rate and FX risks materialize.
 - ✓ Credit risk stems from migration of a portion of loans into NPLs. Parameters of quality deterioration are set individually for large corporate exposures and on portfolio basis for the rest of loans.
 - ✓ Interest rate risk arises through growing cost of funding under the adverse scenario while interest rates on assets remain flat.
 - ✓ Foreign exchange (FX) risk materializes through revaluation of open FX position, as well as, indirectly, through credit and interest rate risks.
- As 2020 was a crisis year, under the adverse scenario GDP falls less drastically, however, this fall assumption is sufficient for stress testing purposes.
- Government and municipal bonds that are accounted at fair value will be revalued in adverse scenario due to yield shock.
- Banks may exclude from forecasts only substantial one-off expenses – for that reason the NBU may set materiality floors and a list of exclusions (for expenses that cannot be considered non-recurrent).
- Income components to which shocks do not apply are assumed constant.
- Key regulatory changes over the stress test horizon will be accounted for in order to assess their impact in a proper way and to avoid double-counting of effects.

Adverse macroeconomic scenarios in other jurisdictions

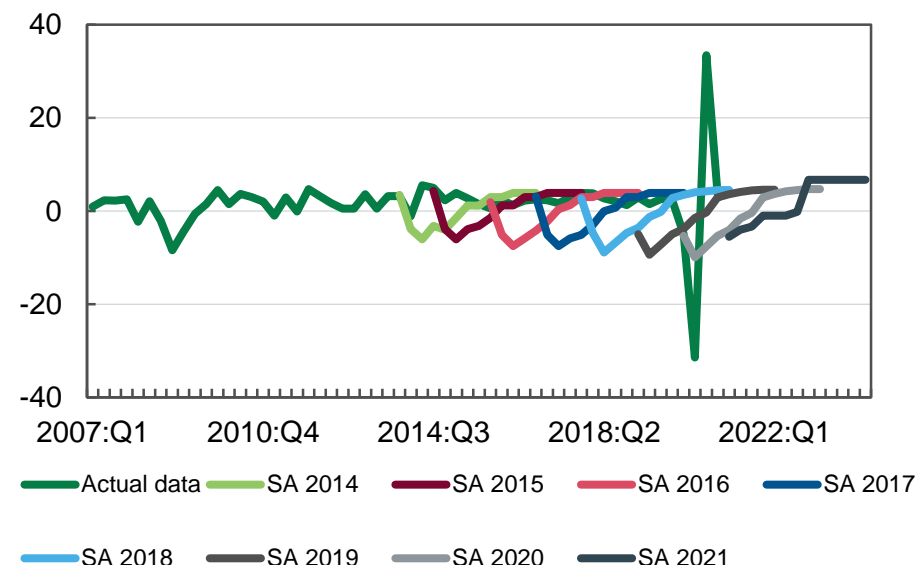
Change in indicators under adverse scenarios, %

Indicator	Jurisdiction	2020*	2021	2022	2023
Real GDP	USA (SA)	-3.5	-3.5	1.1	6.7
	EU	-6.1	-1.5	-1.9	-0.2
	Croatia**	-8.0	-1.5	-2.6	-0.9
Unemployment	USA (SA)	8.1	8.9	10.4	8.8
	EU	7.1	10.0	11.2	12.1
	Greece**	16.3	18.9	22.1	22.2

* Fact. ** The table gives examples of EU countries with most severe assumptions.

Source: Eurostat, IMF database.

Real GDP change in the USA under severely adverse (SA) scenarios, %



- An adverse scenario **is not** a forecast and central banks **do not expect** it to materialize in the coming years.
- Under severely adverse (SA) scenario in the USA assumes a 3.5% decline in real GDP in 2021 even after a 3.5% fall in 2020.
- In the European Union, a crisis in adverse scenario lasts for three more years with a local peak in 2022.
- The unemployment rate in Greece under adverse scenario reaches 22.2% from the current rate of 15.8%.

Adverse stress test scenario in the aftermath of COVID crisis

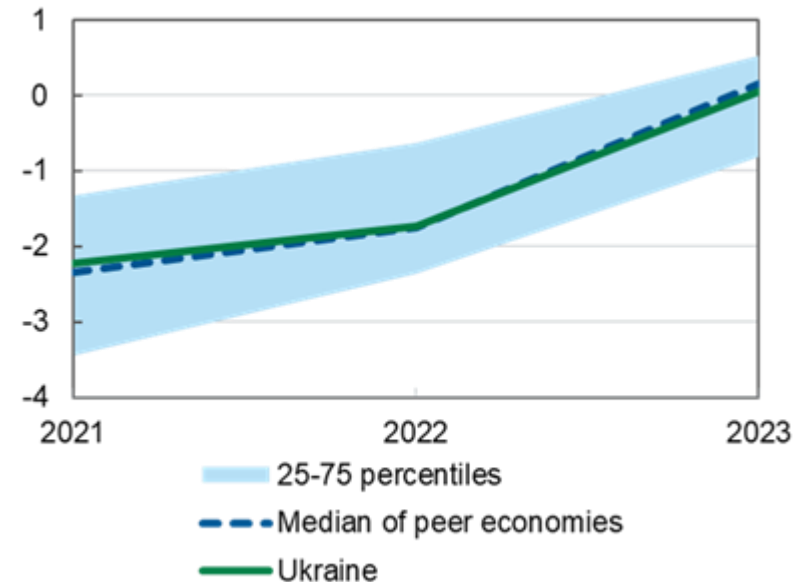
Real GDP change under adverse scenario according to leading central banks/regulators, %

	Jurisdiction	2020*	2021	2022	2023
Bank of England	USA	-3.5	-6.1	7.7	4.7
	UK	-9.9	-3.2	10.0	4.3
	Euroarea	-6.6	-4.3	7.0	4.6
EBA	USA	-3.5	-3.4	-0.5	0.2
	UK	-9.9	-3.6	-0.4	-0.1
	Euroarea	-6.6	-1.5	-1.9	-0.2
FED	USA	-3.5	-3.5	1.1	6.7
	UK	-9.9	-2.3	0.5	6.5
	Euroarea	-6.6	-2.4	0.6	6.5

* Fact.

Source: Eurostat, IMF database.

Real GDP change under adverse scenario for Ukraine (NBU assumptions) vs peer economies* (EBA estimates), %



* Czech Republic, Croatia, Lithuania, Hungary, Poland, Romania, Turkey, Russia, Chile, Columbia.

- In spite of 2020 crisis, the leading regulators assume an adverse scenario with output decline over forecast horizon for 2021 stress test.
- Ukraine's GDP fall under NBU scenario is comparable to a mean decline in peer countries under the EBA scenario.

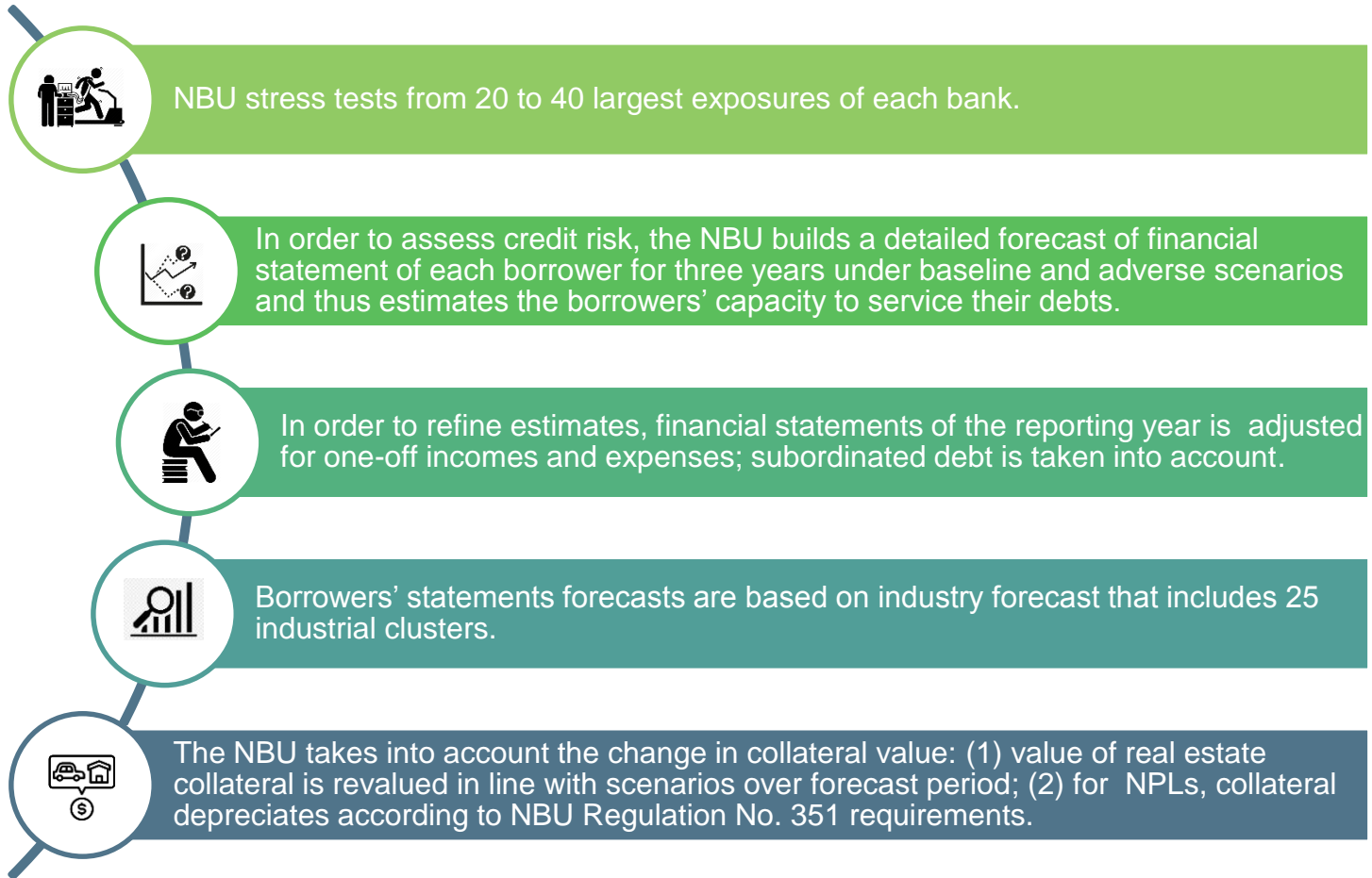
Adverse scenario will reflect a lasting crisis

- Baseline scenario grounds on NBU public forecasts. The source for FX forecast for the baseline scenario – “Focus Economics” (April issue).
- The NBU designed the adverse scenario so that it would be comparable to those of leading central banks:
 - In 2021, real GDP declines by one standard deviation compared to baseline scenario. Therefore, GDP falls by 2.2% in the first year, by 1.7% in the second year, and gradually recovers afterwards.
 - Hryvnia devaluation against US dollar is 29% in the three-year forecast period, the most in the first year, by 16%.
 - Inflation increases moderately due to a slowdown in economic activity and decrease in total demand.
 - An important risk driver under adverse scenario is an increase in fiscal risks and respective rise in yields on government securities.

Indicator	2020*	Baseline scenario			Adverse scenario		
		1 st year	2 nd year	3 rd year	1 st year	2 nd year	3 rd year
		<i>NBU estimates</i>					
Real GDP, % (yoy)	-4.0	3.8	4.0	4.0	-2.2	-1.7	0.1
Nominal GDP, % (yoy)	5.5	18.1	10.1	9.4	10.6	7.2	7.4
Consumer price index, % end of period	5.0	8.0	5.0	5.0	8.6	7.5	7.3
		<i>«Focus Economics» estimates</i>			<i>NBU estimates</i>		
Change in UAH/USD exchange rate (period average), % (yoy)	-4.2	-3.6	-2.8	-1.0	-16.4	-7.7	-4.9

* Fact and NBU estimates.

Approaches to stress testing large exposures are unchanged



Stress test of group reports **yes**

Stress test of state-owned enterprises **yes**

Stress test of investment projects **no***

* If bank assess the exposure as an investment project

Industrial clusters of large borrowers

No.	Cluster name	Vulnerable industries	Gross loans in the system, UAH billions	Gross loans less credit risk, UAH billion	Share of cluster, %	Sample of the ST, billion UAH	Sample of the ST, %
1	2	3	4	5	6	7	8
1	Grain crop growing		50.6	45.5	11.0%	6.3	○ 12%
2	Agriculture, excl. grain crop growing		14.9	12.5	3.0%	3.6	◐ 24%
3	Mining of metal ores		5.2	1.7	0.4%	0.8	○ 15%
4	Other mining industry	✓	7.3	6.5	1.6%	5.1	● 70%
5	Vegetable oil and animal fats production		28.9	13.0	3.1%	8.8	◐ 30%
6	Food, excl. vegetable oil and animal fats production		26.6	15.1	3.7%	4.4	○ 17%
7	Light industry	✓	1.5	1.4	0.3%	0.6	◐ 40%
8	Production of pig iron, steel and ferroalloys		12.7	4.7	1.1%	6.3	◐ 50%
9	Machine building	✓	40.2	10.2	2.5%	12.2	◐ 30%
10	Other processing industries		60.6	30.1	7.3%	10.5	○ 17%
11	Power generation, excl. Renewables		19.2	17.8	4.3%	15.5	● 81%
12	Renewable power generation	✓	42.7	34.7	8.4%	23.1	◐ 54%
13	Construction		32.1	11.1	2.7%	15.3	◐ 48%
14	Wholesale and retail trade in vehicles		4.2	3.4	0.8%	0.8	○ 19%
15	Wholesale of grain and other crop products		27.7	25.6	6.2%	14.3	◐ 52%
16	Wholesale trade in fuel		28.5	12.1	2.9%	11.1	◐ 39%
17	Other wholesale trade		72.3	42.7	10.3%	18.6	◐ 26%
18	Food and pharma retail		8.1	7.3	1.8%	3.4	◐ 42%
19	Other retail trade, except of food and medicine	✓	103.9	6.8	1.6%	6.1	○ 6%
20	Freight transport *		39.9	26.1	6.3%	20.1	◐ 50%
21	Passenger transport	✓	1.8	1.7	0.4%	1.1	◐ 61%
22	Hotels and restaurants	✓	1.7	1.4	0.3%	0.9	◐ 53%
23	Commercial and office real estate	✓	33.6	7.6	1.8%	25.1	● 75%
24	Warehouse and industrial real estate **		32.7	15.5	3.7%	15.6	◐ 48%
25	Other		94.9	59.1	14.3%	40.3	◐ 42%
Total			791.8	413.7		269.9	34%

* Section H "Transport, warehousing, postal and courier activities", except passenger transport..

** Section L "Real estate activities", except for commercial and office real estate.

Calculation based on 6FX, 6GX, 6HX, 6IX files, according to the stress test methodology. Borrowers with an exposure of UAH 2 million and more.

Stress testing assets on portfolio basis

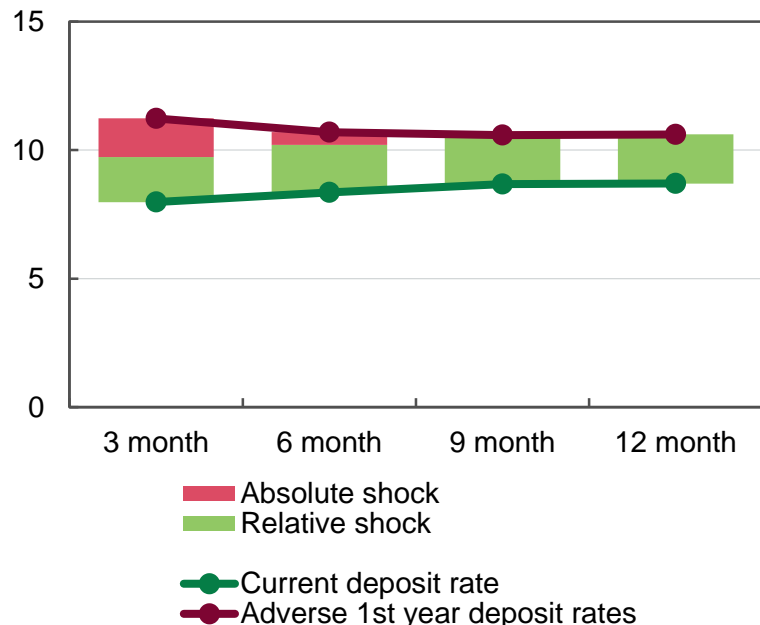
- Ratios of migration into non-performing loans (NPL) are calculated on the basis of macroeconomic scenarios applying multi-factor regression analysis.
- The NBU does not assume recovery from NPL status.
- For retail loans (except for mortgages) that are recognized NPLs for more than a year before the reporting date, the LGD is set at 100%.

Ratios of performing loans migration into NPLs and minimum ratios of loss given default (LGD) of NPLs in the adverse scenario, %

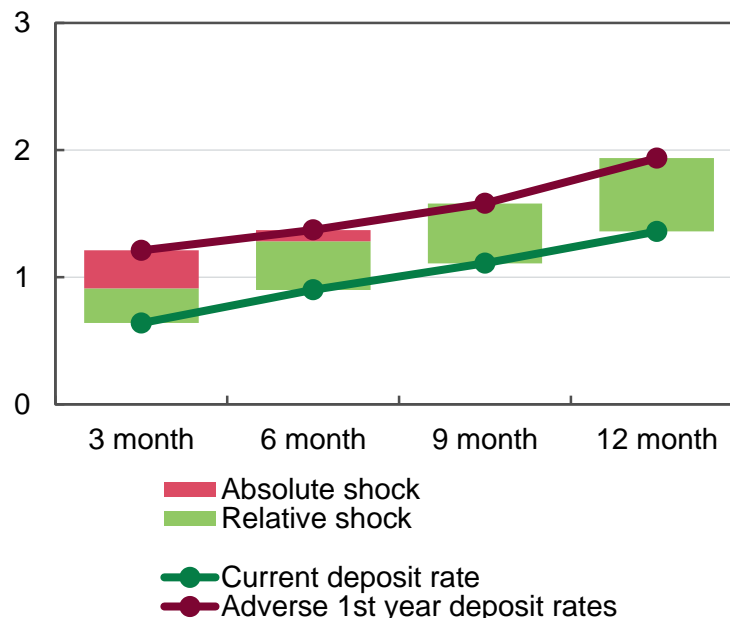
Segment	Currency	Baseline scenario, %			Adverse scenario, %			Minimum LGD
		1 st year	2 nd year	3 rd year	1 st year	2 nd year	3 rd year	
Other corporate loans	UAH	3.3	0.0	0.0	3.9	9.0	0.0	60
	FX	7.7	1.0	0.0	6.7	8.2	4.9	60
Mortgages	UAH	3.6	0.0	0.0	5.1	5.9	0.0	60
	FX	9.8	7.3	6.9	12.1	12.7	10.3	85
Retail loans secured with vehicles	UAH	0.0	0.0	0.0	3.8	1.2	0.0	60
	FX	4.6	3.2	0.9	15.6	11.3	5.0	85
Other retail loans	UAH	1.2	0.0	0.0	6.8	7.1	0.0	85
	FX	10.2	8.4	5.9	9.6	13.2	10.0	85

Assumptions on interest rates on assets and liabilities

Stylized change in interest rate on retail deposits in the hryvnia under the adverse scenario, %



Stylized change in interest rate on retail deposits in USD under the adverse scenario, %

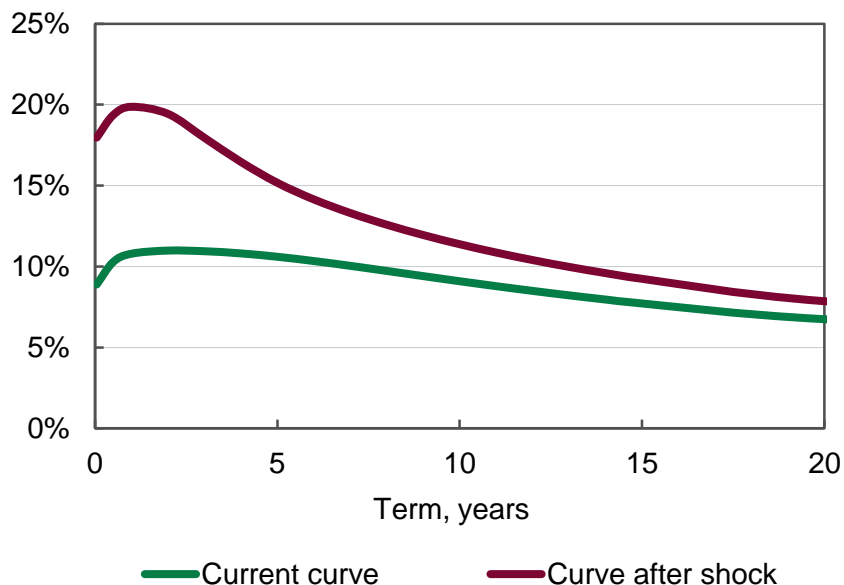


Relative shock reflects a proportionate change against current rate, absolute shock shows a fixed change in percentage points.

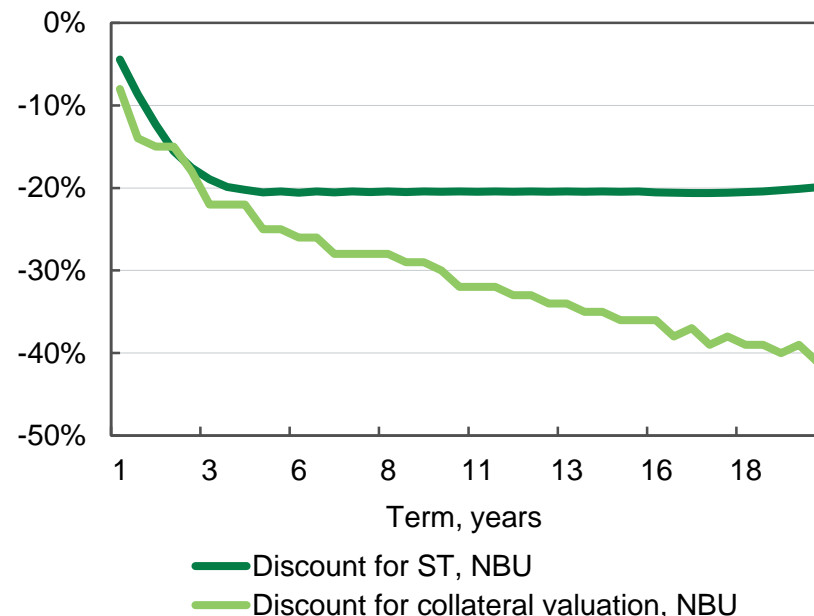
- Interest rates on loans and deposits fall in the baseline scenario.
- In the adverse scenario loans rates are flat while deposit rates rise, thus squeezing banks' net interest margin.
- The NBU applies an additional absolute shock to interest rates on short- and medium-term (up to six months) deposits; the shock is the same for all banks, it is expressed in percentage points.

Revaluation of securities

Shock to spot rates curve in the hryvnia



Haircuts for the hryvnia-denominated government debt securities and municipal securities by maturity



- One of the sources of shock under the adverse scenario is a rise in yields on government and municipal bonds.
- Therefore under the adverse scenario the NBU revalues hryvnia-denominated securities of central and local government, and municipal authorities that are accounted at fair value.
- During a crisis, credit rating is downgraded by two notches under the adverse scenario. This affects credit risk assessment for FX-denominated domestic government debt securities: PD rises from 2.6% to 15.3%.

Forecasting items of profit and loss statement

Interest incomes: evaluated at lesser rate of two: at actual cash proceeds or accrued interest. The rate is calculated separately for performing and non-performing loans by segments of credit portfolio. The rate on NPLs cannot exceed 25% of rate on performing loans.

Interest costs: evaluated at different rates for short- (up to three months, medium- (three to six months) and long-term deposits.

Additionally, a bank may take into account benefits from interest rate swap transactions with the National Bank.

Commission and fee incomes and costs, administrative costs: constant over the whole stress testing horizon.

Cost of provisioning: linked to credit exposure amounted.

Losses from transactions with financial instruments accounted at fair value: designed in view of composition of bank's portfolio, includes the loss of value of securities of central and local government and municipal authorities.

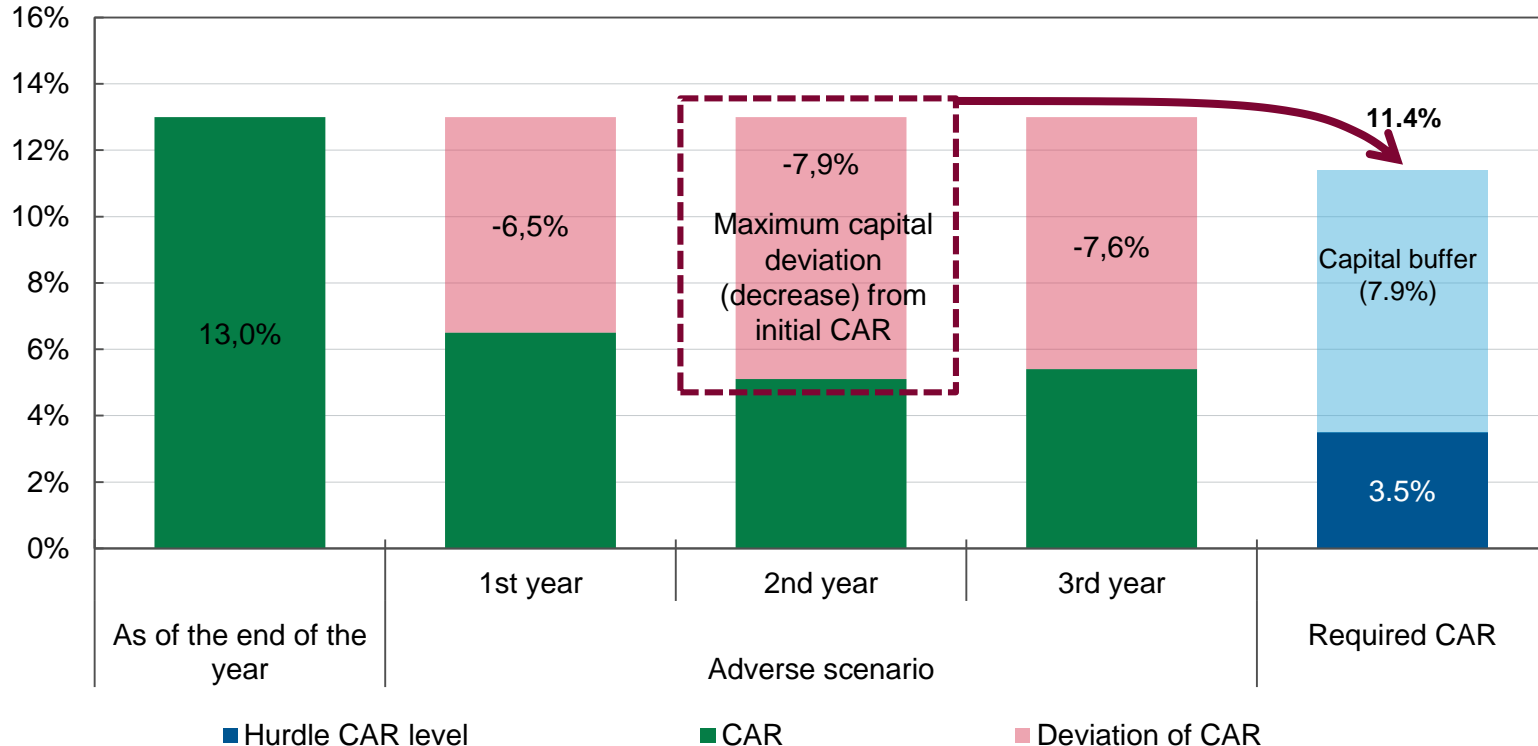
FX revaluations: is a result of revaluation of bank's FX position.

Other incomes and expenses: constant.

One-off (non-recurrent) elements of incomes and costs are not taken into account over forecast horizons.

Approaches to calculation of required capital ratio

Stylized example of calculation of required core capital adequacy ratio of a bank



- Hurdle capital adequacy ratios under the adverse scenario are half of regulatory required ratio.
- Required capital adequacy ratio is calculated in such a way that bank capital is kept over the hurdle even during a crisis.
- Key regulatory changes over the stress test horizon will be accounted for in order to assess necessary capital adequacy ratios for banks and to avoid double-counting of their impact on bank capital.