1. Bank of Slovenia Stress Tests

In keeping with its practice of the last few years, the Bank of Slovenia again conducted stress tests this year. In addition to the macro stress tests, as part of the ordinary supervisory process the Bank of Slovenia conducts simulations of micro stress tests using a bottom-up approach to examine the sensitivity of an individual bank to selected shocks. Here it should be noted that micro stress tests are merely one of many supervisory tools, and as such are intended primarily for internal use by the supervisor. The macro scenarios in the two stress test approaches are similar, to ensure comparability of results. Individual shock simulations are also carried out: they differ in each stress test approach, and are largely aimed at assessing individual significant risks (credit risk, refinancing risk, etc.). After being discussed by the Governing Board of the Bank of Slovenia, the results of the two stress test approaches are presented to the banks with the aim of drawing attention to their sensitivity to individual types of potential shock. The findings of the micro stress tests are also applied directly in the ICAAP-SREP dialogue as one of the risk profile indicators of an individual bank, and consequently also provide the basis for determining higher risk-based capital needs for the bank.

With the aim of ensuring maximum transparency and providing an objective external assessment of the approaches and methods for conducting stress tests, in April 2012 the stress tests (macro and micro) were conducted in conjunction with the IMF's FSAP (Financial Sector Assessment Program),[1] whereby at the proposal of the IMF mission improvements and upgrades were made to the macro stress test methodology. The results presented take the fullest possible account of these improvements.

In autumn 2012 the Bank of Slovenia upgraded the integrated approach to macro stress tests by means of an assessment of the sensitivity of the credit portfolios of an individual bank to a macroeconomic shock, a refinancing shock and a realised market risk shock. The assessment of credit risk was made using the upgraded credit risk model.

MICRO STRESS TESTS

1.1. Summary of micro stress tests: general scenario

In accordance with the Bank of Slovenia's macroeconomic scenario based on forecasts for macroeconomic aggregates in 2013 and 2014 published in April 2013, two scenarios were projected for 2013 and 2014: a baseline scenario and an adverse scenario. While the baseline scenario is based on the projections of fundamental macroeconomic parameters for 2013-2014, the adverse scenario assumes that in 2013 economic growth will be two standard deviations in GDP growth lower than under the baseline scenario before returning to the baseline level in 2014. Under the adverse scenario interest rates in both years are 2 percentage points higher than under the baseline scenario. In addition to a **credit risk shock**, the general scenario includes the **shock of a risk of changes in prices of EU government securities** (central and local government securities) and the **shock of higher funding costs**.

On the basis of the assumed macroeconomic parameters the Bank of Slovenia determined the changes in PDs and LGDs via which the **credit risk shock** is applied across individual portfolios (institutions, corporates, retail banking), which resulted in an increase in the proportion of non-performing claims and an increase in impairments and provisioning, and consequently had an impact on the operating result and capital.

The changes in PD (probability of default) were estimated for all sectors on the basis of the credit risk model, which is assessed on a sample of non-financial corporations. The model uses a definition whereby a business entity is in default if in a specific year it is more than 90 days in arrears at any

[1] Republic of Slovenia: Financial System Stability Assessment, IMF Country Report No. 12/325, December 2012 (published online at http://www.imf.org/external/pubs/ft/scr/2012/cr12325.pdf)

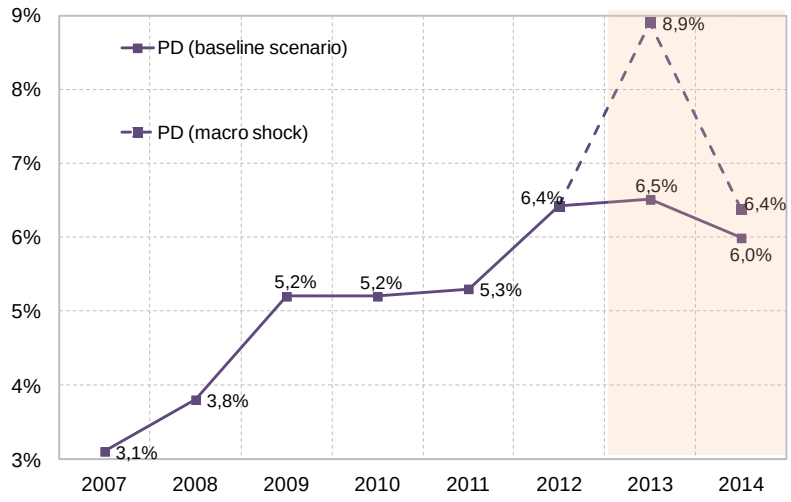
bank.[2] In the model the probability of default is explained by means of variables that are specific to the individual business entity (size, age, liquidity, indebtedness, cash flow, efficiency, blocks placed on the transaction account, and the number of relations between the entity and banks), and by means of macro variables that reflect the cyclical nature of PD. Of the latter, real GDP growth and the interest rate are included in the model. The PD projections for 2013 and 2014 are based on the assumption that there is no change in the values of business entities' variables, and that they are the same as the values in 2012. The PD forecast thus depends solely on the forecast changes in macroeconomic variables. Two of the aforementioned scenarios were simulated:

1. Baseline scenario: takes account of the GDP growth forecasts published in the Bank of Slovenia's April 2013 Macroeconomic Developments and Projections, which stood at -1.9% for 2013 and +0.5% for 2014. The changes in the reference interest rate are determined on the basis of futures contracts.

2. Adverse (macro) scenario:
   - GDP growth that is two standard deviations lower in 2013, and a return to the baseline scenario in 2014. This means GDP growth of -8.7% in 2013 and +0.5% in 2014;
   - it is assumed that a renewed global recession would entail a sovereign downgrading and an increase in the risk premium;
   - for this reason the interest rates on bank borrowing taken into account are 2 percentage points higher in 2013 and 2014, and the rise cannot be passed through in full to the non-banking sector but instead acts to the detriment of the interest margin.

After a significant increase in PD in 2012, under the baseline scenario the forecast is that PD will increase slightly again this year, when a further contraction in GDP is forecast. A slight improvement in the economic situation in 2014 will reduce PD by 0.4 percentage points. In the shock of lower economic growth and higher interest rates, relative to 2012 PD is 2.5 percentage points higher in 2013 and 0.04 percentage points lower in 2014.

Figure 1: **Probability of default, %**



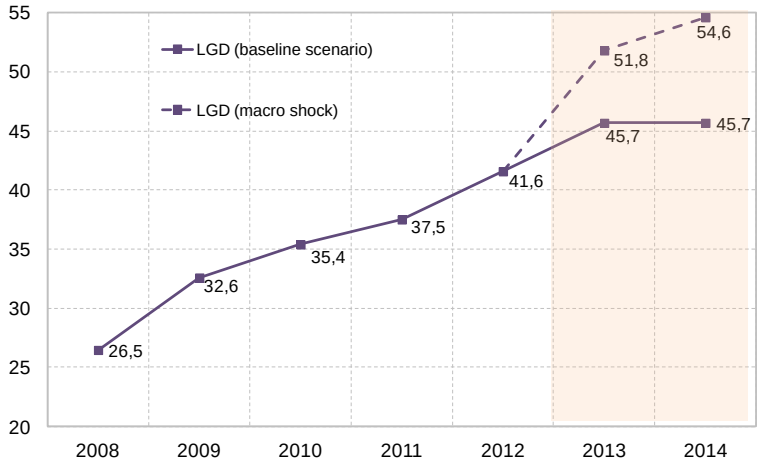
Source: Bank of Slovenia

LGD is loss given default, the percentage loss in the event of default. It is calculated as the level of coverage of claims in default (more than 90 days in arrears or a client rated D or E) by the impairments created for these claims. This is an approximation for LGD as estimated by the banks, and is not the actual value of LGD. The values of LGD for the baseline and adverse scenarios in 2013 and 2014 were determined on the basis of past changes in LGD at the level of the total portfolio.

[2] Given the binary nature of the dependent variable, the model has been assessed using a random effects probit model

Under the baseline scenario the increase in LGD in 2013 is assumed to be the same as that in 2012, i.e. 4.1 percentage points. Given the weak economic growth, LGD in 2014 remains at the same level as in 2013. Under the adverse scenario, where a recession of similar depth of that in 2009 is envisaged for 2013, the increase in LGD was calculated on the basis of the increase in 2009 and 2010. This yields an increase in LGD of 10.2 percentage points in 2013, and an additional 2.8 percentage points in 2014 (relative to 2012).

Figure 2: **Coverage of claims in default by impairments, as a measure of loss given default, %**



Source: Bank of Slovenia

The changes in PDs and LGDs were applied to the banks' credit portfolios reduced for the problematic assets transferred to the Bank Assets Management Company (BAMC), and the credit parameters of individual banks as at 31 December 2012. The stress test simulations included 20 banks and savings banks in the Slovenian banking system.

As a result of higher funding costs and the loss of interest income from claims against defaulters, the calculation also takes account of a decline in **net interest income** under the baseline scenario (7.3% relative to 2012) and the adverse scenario (13.7% relative to 2012). The determination of the decline in net interest income took account of the percentage increase in the proportion of classified claims against debtors more than 1 year in arrears, and the projected rise in interest rates under the adverse scenario. **Net non-interest income** remains unchanged under all the scenarios, the one-off effects of the prepayment of hybrid instruments realised by certain banks in 2012 having been eliminated.

Table 1: **Changes in parameters for calculating the effects of different scenarios**

		Baseline scenario		Adverse scenario	
	2012	2013	2014	2013	2014
PD	6,42	6,51	5,99	8,9	6,38
LGD	41,6	45,7	45,7	51,8	54,6
change in PD from 2012, %		1,40%	-6,70%	38,63%	-0,62%
change in PD from 2012, percentage points		+0.09 p.p.	-0.43 p.p.	+2.48 p.p.	-0.04 p.p.
change in LGD from 2012, percentage points		+4.1 p.p.	+4.1 p.p.	+10.2 p.p.	+13.0 p.p.
Net interest income (change from 2012, %)		-7,30%	-7,30%	-13,70%	-13,70%
Net non-interest income (change from 2012, %)		unchanged			

Source: Bank of Slovenia

The **scenario of a risk of changes in prices of EU government securities** assumes a further fall in prices of these securities as a result of further sovereign downgradings of EU countries. The haircuts applied to the portfolio of government securities were determined on the basis of changes in the prices of these securities between 1 January 2011 and 5 November 2012. Where there was a lack of data, the haircuts used were those determined by the EBA.

The haircuts were only applied to EU government securities with a residual maturity of more than 1 year. The effect of the shock is mitigated by impairments previously created and all revaluations recognised via profit or loss.

Table 2: **Haircuts for government securities portfolios**

	Haircuts, %
Slovenia	21,7
Germany	5
Austria	10,3
Belgium	14,6
France	9,9
Netherlands	4,3
Italy	17,4
Poland	4,4
Slovakia	8,2
Czech Republic	10
Finland	4,4
Hungary	27,8
Lithuania	4,8
Ireland	29
Denmark	6,6
Sweden	3,1
Luxembourg	4,2
Cyprus	12,2
Estonia	4,6

Source: Bank of Slovenia

The calculated effect of the shock was only taken into account in the adverse scenario, where half of the effect is taken into account in the income statement for 2013, and half in the income statement for 2014.

The basis for the calculation of the two micro stress scenarios for 2013 and 2014 was data from the closing consolidated accounts for 2012. The calculations were made on a static balance sheet basis, which means that in both years and under both scenarios balance sheet categories were unchanged (zero growth) and the type and breakdown of transactions remained unchanged.

Impairments and provisioning reduce the capital requirements, as a result of which 8% of impairments and provisioning are deducted from the capital requirements in the individual scenarios and in the individual years.

Given the assumptions of the general scenario, there was an increase in the requisite impairments and provisioning for credit risk and sovereign risk and a decline in net interest income, which resulted in a decline in the banks' operating result and capital. The current corporate income tax rate having been taken into account, only 83% of profit/loss was included in the capital calculation.

1.2. Results of micro stress tests (spring 2013)

Under the baseline scenario the deficit in capital to achieve the minimum capital adequacy requirement amounted to EUR 228 million in 2014. The deficit under the adverse scenario amounted to EUR 1,459 million.

Ten banks were already failing to meet the Core Tier 1 capital ratio by the end of 2012, the deficit in capital amounting to EUR 274 million. The total deficit in 2014 would increase to EUR 954 million under the baseline scenario, and to EUR 2,403 million under the adverse scenario.

Table 3: **Results of micro stress tests**

	Banking system				
EUR thousands and %	2012	Baseline scenario		Adverse scenario	
		2013	2014	2013	2014
Net impairments and provisioning	1.549.290	1.020.589	936.609	2.258.211	1.877.923
of which: Impairments for government securities	0	0	0	355.326	355.326
Pre-tax profit/loss	-751.778	-508.077	-424.096	-1.812.285	-1.431.997
Capital for capital adequacy purposes	4.293.840	3.872.136	3.520.136	2.789.643	1.601.086
Capital requirements	3.014.637	2.932.990	2.939.708	2.862.406	2.892.829
Overall capital adequacy	11,39	10,56	9,58	7,80	4,43
Deficit in capital for capital adequacy purposes	0	-60.643	-228.372	-433.666	-1.459.321
Core Tier 1 capital	3.586.398	3.164.694	2.812.694	2.082.201	936.604
Core Tier 1 capital ratio	9,52	8,63	7,65	5,82	2,59
Deficit in core Tier 1 capital	-273.961	-588.160	-954.211	-1.286.853	-2.403.210

Source: Bank of Slovenia

1.3. Simulation of required capital increase at banks deriving from supervisory requirements and transfer of assets to BAMC

In addition to the deficit in capital deriving from the transfer of assets to the BAMC, the amount of the required capital increase at banks should also take account of the minimum supervisory requirements deriving from the SREP, within the framework of which the amount of capital sufficient to cover all the risks to which banks are exposed over the period of the upcoming one year is determined. The amount of capital thus determined is significantly higher than that sufficing to meet the minimum capital requirement of 8%. Detailed figures are given in Table 4.

Table 4: Simulation of required capital increase at banks

		Banking system overall (banks and savings banks)			Three banks			Banking system excluding three banks		
		Core Tier 1 capital ratio	Tier 1 capital ratio	Overall capital adequacy	Core Tier 1 capital ratio	Tier 1 capital ratio	Overall capital adequacy	Core Tier 1 capital ratio	Tier 1 capital ratio	Overall capital adequacy
Overall capital adequacy (31 Dec 2012)										EUR thousands and %
Overall capital adequacy	1	9,55	9,76	11,40	7,93	8,22	10,07	11,12	11,26	12,69
Supervisory requirements										
Minimum supervisory requirement	2		9,20	11,50		9,50	11,90		9,20	11,40
Deficit in capital to minimum supervisory requirement	3		-284.226	-380.204		-227.431	-321.535		-56.835	-58.670
Estimated effect of transfer of assets to BAMC										
Estimated deficit in capital from revaluation for transfer to BAMC	6		-327.086	-327.086		-188.336	-188.336		-138.750	-138.750
Deficit in capital deriving from supervisory requirements and effects of transfer to BAMC										
Total deficit	5=3+6		**-611.312**	**-707.290**		**-415.767**	**-509.871**		**-195.585**	**-197.420**
New ratios taking account of capital increase deriving from total deficit in capital after allowing for supervisory requirements and effects of transfer to BAMC										
Overall capital adequacy*	6	11,45	11,66	13,30	10,71	11,00	12,86	12,17	12,30	13,74
Stress test results										
Deficit in capital from stress tests (baseline scenario, two-year time horizon)	7	-954.211		-228.372	-716.295		-166.885	-237.916		-61.487
New ratios taking account of capital increase deriving from stress tests										
Overall capital adequacy*	8	12,12	12,33	13,97	11,84	12,13	13,98	12,38	12,52	13,95

Source: Bank of Slovenia

* The recalculation of new capital adequacy ratios taking account of the assessment of the capital increase deriving from the transfer to the BAMC and supervisory requirements or the capital increase deriving from the stress tests was made on bank capital adequacy data as at the end of 2012, whereby capital was increased by the relevant amount of the capital increase while the capital requirements remained unchanged. This is a static recalculation of ratios that does not take account of future changes in the banks' balance sheet structure.

National Reform Programme 2013-2014, MoF (published online at http://www.mf.gov.si/si/delovna_podrocja/evropski_semester/nova_evropska_razvojna_strategija_do_2020/nacionalni_reformni_program/)
Stability Programme 2013 Update, MoF (published online at http://www.mf.gov.si/si/delovna_podrocja/evropski_semester/programi_stabilnosti_in_konvergencni_programi/)

MACRO STRESS TESTS

1.4. Summary of macro stress tests (autumn 2012)

The macro stress tests were conducted in autumn 2012, and were based on the banks' balance sheet figures available at September 2012 and the figures for the banks' classified claims and capital for June 2012. All the figures were on an individual basis. An integrated approach was employed, where the baseline scenario is based on forecasts for the banks' performance in the next two years. These forecasts derive from the forecasts for macroeconomic developments (Price Stability Report, October 2012) and certain other exogenous variables. The macro scenario of lower GDP growth and higher interest rates was carried out on the baseline scenario defined in this manner. In the piecemeal approach, where the baseline scenario is defined by the assumption of a static, i.e. unchanged, balance sheet, analysis of credit risk, refinancing risk, the risk of a change in prices of government securities and contagion risk was also conducted.

Integrated approach (macro scenario)

The macro shock, which is the combined shocks of GDP growth in 2013 that is lower by two standard deviations, i.e. 6.5 percentage points, and interest rates that are 2 percentage points higher in 2013 and 2014, has the largest impact on growth in loans and on the banks' operating result. Estimated growth in loans to the non-banking sector is 3.5 percentage points less than under the baseline scenario in 2013 at -8.5%, and 5.6 percentage points less in 2014 at -8.4%. The proportion of total classified claims more than 90 days in arrears reaches 20% by the end of 2014. Under the shock there is an operating loss of EUR 662 million in 2013 and EUR 356 million in 2014. The increase in the loss is the result of higher impairment costs and a decline in net interest and non-interest income. The increase in impairments is the result of the higher default rate caused by the economic recession, higher interest rates and a contraction in lending. The decline in net interest income is the result of a decline in turnover, higher interest rates and an increase in the proportion of bad claims. Capital adequacy is 0.2 percentage points lower than under the baseline scenario in the first year of the shock and 0.3 percentage points lower in the second year of the shock, the decline in capital requirements caused by the contraction in lending having been taken into account. The Core Tier 1 capital ratio stands at 8.5% at the end of 2014, down 0.6 percentage points on the baseline scenario.

The strength of the integrated approach is that it takes account of the interactions between the impacts of the macroeconomic shocks on the balance sheet, the income statement and capital adequacy. Its weakness is that it is conducted at the aggregate level, and therefore does not take the specifics of individual bank portfolios into account. In the assessment of the impact of the shock on capital adequacy, the surplus capital of the banks with high capital adequacy covers the other banks' deficits, and the capital deficit at the level of the banking system is therefore underestimated. For this reason the stress tests were also conducted using a piecemeal approach for each bank separately.

Credit risk (piecemeal approach)

The baseline and stress scenarios for credit risk were assessed using static (constant balance sheet over time) and dynamic (taking account of forecasts) approaches. Expected loss from credit risk was calculated for individual banks according to the formula EL=PD*LGD*EAD, where all clients more than 90 days in arrears in loan repayments or rated D or E are classed as in default. The changes in PD were estimated for all sectors on the basis of the credit risk model, which was assessed on a sample of non-financial corporations.

The stress scenario was defined as a decline of 6.5 percentage points in economic growth, to -7.2% in 2013. Economic growth returns to the baseline scenario level in 2014. A rise in the risk premium in the event of renewed global recession is simulated under the scenario by a rise of 2 percentage points in interest rates in both years. There is also a sovereign downgrading. The simulation therefore includes an assessment of a fall in prices of government securities, taking account of a premium of 10%.

Expected loss from credit risk in 2013 is the same under both approaches, static and dynamic, at EUR 782 million under the baseline scenario and EUR 1,658 million under the shock scenario. Expected loss from credit risk in 2014 is larger under the static approach, at EUR 682 million after the shock. Because the static approach does not take account of the contraction in turnover, the effect on the income statement and capital adequacy is greater in this instance than under the dynamic approach. The operating loss amounts to EUR 1.4 billion in 2013 and EUR 460 million in 2014. Under the stress scenario the deficit in capital for meeting an overall capital adequacy ratio of 8% amounts to EUR 1 billion for 11 banks after two years. The banks' deficit for meeting a Core Tier 1 capital ratio of 9% is EUR 1.6 billion. Four banks maintain an adequate Core Tier 1 capital ratio under the stress scenario. Under the dynamic approach, which also takes account of the contraction in turnover and the consequent decline in capital requirements, the deficit in capital for meeting an overall capital adequacy ratio of 8% amounts to EUR 570 million after two years of the shock, while the deficit in Core Tier 1 capital amounts to EUR 1,068 million.

Refinancing risk

The analysis of refinancing risk simulated the shock of a freeze in funding on the wholesale markets, which was applied to the balance sheets from September 2012. Given the assumptions, the banks largely adjust to the shock by reducing loans to the non-banking sector. The banks under majority foreign ownership, on which this shock has the heaviest impact, reduce their loans by 18.3% over the course of the shock. Given their different investment structure, the banks under majority domestic ownership are able to cover a larger portion of the loss of funding by reducing other investments, and by reducing loans to a lesser extent. By the end of the shock loans to the non-banking sector are down 3.8% at the large domestic banks, and down 1.9% at the small domestic banks, which are least exposed to the refinancing shock.

The impact of the shock on net interest income amounts to EUR 80 million over the entire period of the shock. The expected loss (EL) from credit risk is similar in both years, at EUR 760 million in 2013 and EUR 740 million in 2014. The operating loss in both years of the shock amounts to just under EUR 300 million. Two banks fail to meet the requirement for an overall capital adequacy ratio of 8% after two years of the shock. Twelve banks have a deficit in meeting a Core Tier 1 capital ratio of 9%, in the total amount of EUR 518 million.

Market risk

The majority of investments in government securities comprise investments in Slovenian government securities. Investments in German, Austrian, Belgian and French government securities also account for a significant proportion. In the event of a repeat of the largest fall in prices of Slovenian government securities recorded in the observation period of January 2011 to November 2012, which was 22%, the banks would have to disclose revaluations of EUR 864 million. In the event of a sharp fall in prices of all government bonds in which the banks hold investments, the banks would have to disclose revaluations of EUR 951 million. The banking system's overall capital adequacy would decline to 9.2% in such an event.

Contagion risk

Contagion risk was assessed from the point of view of solvency. The results reveal that there are ten banks in the Slovenian banking system that are a potential source of contagion for other banks, while it is primarily the small banks that are exposed to contagion risk.