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SWEDEN

FINANCIAL SECTOR ASSESSMENT PROGRAM

TECHNICAL NOTE—STRESS TESTING

October 2017

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TECHNICAL NOTE

STRESS TESTING

Prepared by
Monetary and Capital Markets Department

This Technical Note was prepared in the context of the Financial Sector Assessment Program in Sweden, led by Martin Čihák. It contains technical analysis and detailed information underpinning the FSAP findings and recommendations. Further information on the FSAP program can be found at http://www.imf.org/external/np/fsap/fssa.aspx

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Glossary

AFS	Available for Sale
BU	Bottom up
CCP	Central Clearing Counterparty
CET1	Common Equity Tier1
COREP	Common Reporting Framework
CVA	Credit Valuation Adjustment
EBA	European Banking Authority
EIOPA	European Insurance and Occupational Pensions Authority
FI	Finansinspektionen
FINREP	Financial reporting
FSAP	Financial Stability Assessment Program
HFT	Held for Trading
ICR	Interest Coverage Ratio
IMF	International Monetary Fund
LCR	Liquidity Coverage Ratio
NSFR	Net Stable Funding Ratio
OTC	Over-the-Counter
PD	Probability of default
PIT	Point-in-time
RAM	Risk Assessment Matrix
RWA	Risk Weighted Assets
SCR	Solvency Capital Requirement
SEB	Skandinaviska Enskilda Banken
STeM	Stress Test Matrix (for FSAP stress tests)
TD	Top down
TTC	Through-the-Cycle
SEK	Swedish Krona
UCITS	Undertaking for Collective Investment in Transferable Securities
WEO	World Economic Outlook

EXECUTIVE SUMMARY

Stress tests covered three major segments of the domestic financial sector, with an emphasis on the largest financial institutions. Within the banking industry, this included the four largest banks that together constitute over 75 percent of the banking system by assets; the four largest life insurance providers and three non-life insurers, with 78 and 53 percent market share in terms of gross written premiums, respectively; and around 850 investment funds representing 95 percent of the industry's total net assets. Stress tests of non-financial corporations were also implemented and were used to validate corporate inputs used in the banking stress tests.

The resilience of the Swedish banking system was tested against solvency, liquidity, and contagion risks. Solvency stress tests were implemented by the FSAP team (TD), the banks (BU) and the authorities (Riksbank and FI). For the BU stress tests of banks, banks followed the methodology used in the last EU-wide (EBA) stress testing exercise. Regarding the top down stress tests, the FSAP team followed a balance sheet approach and the Riksbank utilized a simple solvency framework based on projection of credit losses. To assess the potential impact of negative shocks on the capital requirements, solvency stress tests were conducted against two sets of hurdle rates. While the regulatory hurdle only included the minimum capital requirements, the supervisory hurdle rate took into account all of the current capital requirements, including the capital conservation buffer, countercyclical capital buffer and the systemic risk surcharge. The FSAP team's TD approach also considered future changes to corporate risks weights. The TD liquidity tests assessed the resilience of banks to short and medium term liquidity shocks, using the liquidity coverage ratio (LCR), NSFR and maturity ladder analysis, both on an aggregate basis and by currencies. The contagion analysis was implemented by the Riksbank and covered domestic interbank exposures.

The solvency stress tests considered two scenarios—baseline and stress—a range of sensitivity checks and single factor shocks. The baseline scenario followed the IMF's April 2016 *World Economic Outlook* projections for Sweden. The stress scenario considered Sweden-specific risks as well as spillovers from a recession in the Nordic and Baltic region. The scenario took into account the experience of other countries in the 2008/2009 crisis, and the severity and dynamics of the main macro and financial variables during the two largest recessions in Sweden's modern history (1991–1993 and 2008–2009). While the stress scenario mirrored the EBA's 2016 adverse scenario for Sweden for the first three years, it included more severe interest rate and exchange rate shocks, similar to those seen in previous crises in Sweden and abroad. Single factor shocks performed by the banks assessed the banks' vulnerability to more severe interest rate, market risk and concentration shocks and a shutdown of the foreign exchange swaps market.

The solvency stress test suggests that banks would be resilient to a severe economic distress. While the results were generally consistent across different approaches, the IMF and the authorities' TD approach produced lower capital ratios than the EBA test. For the IMF test, this was because of the inclusion of more severe interest rate and exchange rate shocks and IMF's more conservative projection of credit losses in the stress scenario. As for the authorities' test, this was due to large projected credit losses. In particular:

- Under the IMF approach, one bank would fall below the supervisory hurdle rate and no bank would breach the regulatory hurdle rate over the stress testing horizon. This highlights the importance of capital buffers the banks have already built. The system-wide CET1 ratio would fall by 2.5 percentage points in 2016 relative to the base year (or 2.5 percentage points relative to the baseline scenario in 2016) and by additional 1.5 percentage points in 2017–2018. The system-wide "all-in" leverage ratio would fall by 0.3 percent point in the downturn period (from 4.1 percent in 2015 to 3.8 percent in 2018). In the BU test, one bank would fall below the supervisory hurdle rate and the system wide CET1 would fall by 2.3 percentage points during the first three years of the stress horizon. In the authorities' stress test, all banks would fall below the supervisory thresholds and the system wide CET1 would fall by 4.9 percentage points during the period of downturn.

- Capital ratios in the years of downturn (2016–2018) were driven by lower net interest income, higher provisions for credit losses (on corporate exposures in particular) and increases in risk weighted assets. Under the IMF approach, banks reported negative profits mainly due to the impact of the sharp increase in funding costs that depressed net interest income highlighting the importance of the link between solvency and liquidity. Provisions for credit losses increased seven times by 2018 (comparing to four times in EBA test and twenty times in the authorities' test) due to a severe contraction of the real economy. Finally, trading income, which was mostly affected by losses on fixed income investments due to higher yields, played a modest role in dynamics of net income. Higher risk weighted assets (RWAs) were largely a results of higher probability of defaults (PDs) and depreciation of SEK. For most banks, losses on corporate loans over the stress scenario were larger than losses on household loans. This suggests that financial stability monitoring framework could benefit from a more balanced scrutiny of corporate vulnerabilities.

- Single factor shock analysis showed that while losses due to individual materialization of severe interest, market and concentration shocks would be manageable, increase in RWAs due to shutdown of FX swaps markets would entail higher capital needs.

- The exercise also suggested that the risks surrounding projections of credit losses are large and that this likely led to underestimation of credit losses in EBA and IMF stress test.

The incorporation of the recent supervisory initiative that will increase corporate risk weights indicates a significant impact on capital ratios. Higher corporate risk weights reduced the system wide CET1 ratio in both the baseline and stress scenario. Under the IMF approach, this pushed three additional banks below the supervisory threshold in the stress scenario and one bank in the baseline scenario.

Bank liquidity stress tests suggest that banks could withstand severe funding and market liquidity shocks, but there are pockets of vulnerability. Banks are broadly resilient to shocks as characterized by withdrawal of funds and haircuts on liquid assets similar to Swedish LCR and Basel III NSFR standards. However, some banks would face greater short term and medium term liquidity pressures when subjected to additional increases in parameters. Moreover, the maturity ladder

exercise suggests that maturity mismatches are large for some banks reflecting heavy reliance on wholesale funding in foreign exchange to finance longer term loans.

While the contagion analysis suggests that the spillover risk between the four largest banks is limited, the analysis was subject to important caveats. Limited contagion effects were a consequence of interbank exposures that were brought down significantly by collateralization. However, the contagion analysis likely underestimated the spillover effects since it did not capture all interbank exposures. The exercise also did not take into account the default risk outside the banking sector, including abroad. Furthermore, other liquidity risks related to illiquid collateral of covered bonds or risk that can materialize at the same time of Swedish bank's default—such as the possibility of an investor flight in a situation of extreme distress—were not captured by the exercise.

Swedish insurance companies are, on aggregate, sufficiently capitalized to withstand severe shocks on financial markets. Life companies, while facing a large decline in their own funds given their large sensitivity to market risks, start from high capitalization levels before stress, whereas in the non-life sector the immediate impact of the stress is less pronounced. Two companies did not meet the solvency capital requirement after stress, resulting however in only a small capital shortfall. Pockets of vulnerability can be identified for both life and non-life insurers in large holdings of equity and in the strong interconnectedness with the domestic banking sector. Profitability is expected to recover quickly after stresses have materialized. On the underwriting side, both life and non-life companies are resilient to severe shocks if they occur in isolation: Higher longevity, pandemics and catastrophic events are unlikely to create major solvency issues. Re-investment risk will pose a challenge in the next years: As nearly three quarters of fixed-income assets will expire in the next five years, with average coupon rates of more than 3 percent, insurance companies may have to explore ways of adjusting their products even further (effectively lowering the guaranteed interest rates) or making changes to their asset allocation.

Liquidity analysis of investment funds suggests that corporate bonds markets may face stress in the event of large redemption shocks. The liquidity risk in the investment funds' industry was assessed by analysis geared to measure whether markets would be able to absorb severe redemption pressures in the event where funds are forced to liquidate positions. Assets sold by investment funds and hit by a redemption shock were compared to turnover data. The results of the analysis suggest that corporate markets would be under stress in the tail event of severe redemptions. This illustrates the danger that funds that invest in corporate might sell these assets at a fire-sale discount to meet redemptions. Fire sale risks stemming from investment funds trying to meet redemptions in other bonds' and equity markets appear small. The results do not, however, take into account that materialization of liquidity risks in other sectors that hold same assets would put additional pressures on market capacity to absorb assets sold by all sectors. Therefore, the exercise likely overestimated the markets' capacity to absorb assets sold during times of stress.

The overall stress testing exercise suggests that there is room for improvement in the individual components of authorities' stress testing framework (Table 1). These include improving the liquidity and solvency stress testing framework; addressing data gaps by collecting all interbank exposures and conducting a network analysis on a regular basis including by using

market-price based approaches; as well as designing and performing regular liquidity stress tests for investment funds.

	Table 1. Sweden: Stress Testing Recommendations	
	General	**Time**[1]
1	For macroprudential purposes, conduct regular (e.g. on annual basis), comprehensive stress tests for all major financial sectors and the non-financial sector that capture the impact of macro-financial factors, cross-country spillover, including by using market-price based network analysis and stress testing and feedback effects between financial institutions and interactions between solvency and liquidity (FI, Riksbank).	NT
	Banking	
2	Improve scenario-based solvency stress tests; map the results of the FI household stress test into credit losses on mortgage exposures under the solvency stress test scenario; start running corporate sector stress tests and continuously monitor the health of the corporate sector; link liquidity and solvency risks (FI, Riksbank).	I
3	Start collecting granular data on available and required stable funding consistent with the Basel III NSFR for all significant currencies to monitor the Basel III NSFR on a regular basis (FI).	I
4	Improve the cash flow liquidity stress testing framework (FI).	I
5	Collect all interbank exposure data, and run network analysis on a regular basis. Supplement the spillover analysis with approaches that extract interconnectedness risks from market prices (Riksbank).	I
	Insurance	
6	Develop and perform macroprudential stress tests for the insurance sector which complement the Solvency II Standard Formula and the Own Risk and Solvency Assessment, and require insurance undertakings to meet additional capital requirements where the risk profile deviates significantly from the Standard Formula (FI)	NT
7	Follow up inaccurate or incomplete reporting at an early stage to ensure that any significant misreporting is not embedded in analytical work (FI)	I
	Investment Funds	
8	Develop and perform liquidity risk analysis for the mutual fund industry on a regular basis (FI).	I

[1] C = continuous; I (immediate) = within one year; NT (near term) = 1-3 years; MT (medium term) = 3-5 years

INTRODUCTION[1]

1. This note explains the stress testing approach that the 2016 Financial Sector Assessment Program (FSAP) took to assess risks in the Swedish financial sector and provides the results of the tests. Stress tests of banks, insurance companies and mutual funds were performed based on supervisory data provided by the authorities and the banks (Table 2).

- For banks, solvency, liquidity and contagion stress tests were performed. Solvency stress tests were implemented by the FSAP team (TD), the banks (BU) and the authorities (Riksbank and FI). Liquidity stress test were performed by the IMF based on the supervisory data. A contagion stress test was implemented by the Riksbank given the confidentiality of the information. For the BU stress tests of banks, banks followed the methodology used in the last EU-wide (European Banking Authority (EBA)) stress testing exercise. Regarding the TD stress test by the authorities for the banks, the authorities ran a simple solvency framework based on projection of credit losses.[2]

- With regard to insurance companies, the FSAP team undertook TD solvency stress tests and requested from the companies the calculation of BU solvency stress tests. One of the scenarios used in the BU exercise was aligned with the EU-wide insurance sector stress test which was carried out in parallel by the European Insurance and Occupational Pensions Authority (EIOPA).

- For investments funds, the exercise was limited to liquidity stress tests undertaken by the FSAP team.

Table 2. Sweden: Summary of FSAP Stress Tests

FSAP stress tests

BANKING SECTOR			INSURANCE SECTOR		MUTUAL FUNDS
IMF TOP DOWN	AUTHORITIES TOP DOWN	BOTTOM UP (EBA)	IMF TOP DOWN	BOTTOM UP	IMF TOP DOWN
solvency	solvency	solvency	solvency	solvency	
liquidity					liquidity
contagion					

[1] The note was prepared by Ivo Krznar (banking sector stress test, investment funds stress test), Timo Broszeit (insurance sector stress test), and Jack Chen (scenarios) under the guidance of Liliana Schumacher. Dale Gray provided results of contingent claims analysis, prepared with Rima Turk and Andy Jobst. The FSAP team would like to express its deepest gratitude to counterparts at Finansinspektionen and Riksbank for close collaboration in facilitating this comprehensive stress testing exercise.

[2] For details of the framework for the solvency stress test by the authorities see Riksbank Financial Stability Report 2013:1 and Finansinspektionen "Stability in the financial system", December 2015.

2. The rest of the note explains in detail the solvency and liquidity stress tests that were conducted in the context of the 2016 Sweden FSAP. After reviewing the main assumptions of the two scenarios used for solvency tests, the next section presents three different approaches of the FSAP's solvency stress test of the banking sector, analyzes the results of the tests and reconciles the findings of different test results. The findings of the liquidity stress testing exercise are presented in the third section. The last section of the banking sector stress tests pertains to the contagion analysis. The banking sector section is followed by the stress-test analysis of the insurance sector. The note finishes with the liquidity stress test of investment funds.

SCENARIOS

3. The solvency tests examined two macroeconomic scenarios: baseline and stress scenario over a five-year risk horizon.[3] The baseline scenario followed the IMF April 2016 WEO projections for Sweden (Table 3). The stress scenario mirrored the EBA 2016 adverse scenario for Sweden but with more severe interest rate and exchange rate shocks (Panel 1 and Table 3).[4] It took into account the experience of other countries in the 2008/2009 crisis, and the severity and dynamics of the main macro and financial variables during Sweden's two largest recessions in its modern history (1991–1993; 2008–2009). Therefore, the stress scenario considered Sweden-specific risks as well as spillovers from a recession in the Nordic and Baltic region.

4. For solvency tests both scenarios had a five-year horizon (2016–2020) and were common to all financial institutions. For institution-specific risks which are not well captured by the scenario, the exercise comprised single factor stress tests. Liquidity test of banks and mutual funds were performed separately from the solvency test. Rather than using scenario driven shocks they used one-off shocks calibrated based on either regulation (liquidity tests of banks) or historical evidence (liquidity tests of investment funds).

5. The stress scenario reflected materialization of the global, regional and domestic risks (Appendix II) that results in a deep recession (Panel 1). Recovery was dampened by domestic balance sheet adjustments, so the overall GDP profile was somewhat "L-shaped". In particular, the scenario featured the following:

- Swedish exports, investment, and employment were hit by a sharp but temporary global recession, potentially originating in the euro area and China (see Risk 2 in RAM in the Appendix II). Real GDP declines by 6.9 percent three years after the initial shock, investment falls by about

[3] An important difference between the IMF approach and banks' approach was the forecast horizon of the stress test. While the banks used a three-year forecast horizon for the banking stress test, the IMF and the authorities test focused on a stress testing horizon that spans five years. Having a longer scenario was important to capture fully the effects of the recession in the stress scenario which, in this case, lasted for three years. For the same reason, other FSAP have used a five-year scenario as well. For examples, please see Andreas A. Jobst, Li Lian Ong and Christian Schmieder, 2012, A Framework for Macroprudential Bank Solvency Stress Testing: Application to S-25 and Other G-20 Country FSAPs, IMF Working Paper, WP/13/68.

[4] While the EBA adverse scenario was used as the stress scenario for the IMF TD approach, the April 2016 WEO projections, which were more optimistic than EBA baseline, were used as the baseline scenario owing, partly, to the EBA 2016 baseline scenario becoming dated. As a result, the deviation between the baseline projection and the stress scenario was larger in the IMF exercise compared with the corresponding deviation in the EBA 2016 exercise.

17 percent, and the unemployment rate rises by about 5 percentage points. Decline in economic activity had important effects on credit losses.

- Market sentiment would change due to reassessment of underlying global risks and also of the Swedish specific risks, which increased financing costs for the Swedish banking system and domestic credit conditions (see Risk 2). Comparing to EBA, the IMF stress scenario considered a slightly larger spread of the Swedish long term bond yields over the German bunds (by about 50bps on average for the first two years) reflecting mostly the growth differentials in the scenario and the fact that IMF did not view Sweden as a safe haven in the stress scenario. This also implied that the krona would depreciate somewhat over the same horizon.

- Together, these two shocks, and a change in household sentiment, would trigger substantial (about 32 percent in three years) decline in house prices (see Risk 1) that deepens and prolongs the decline in consumption and also results in a sizable decline in residential investment. While the decline in consumption is somewhat moderated by the operation of automatic fiscal stabilizers, household income falls owing to the sharp increase in unemployment. The decline in house prices would also imply higher covered bond yields and higher losses on mortgage loans. In the scenario, higher covered bonds' yields result in higher mortgage rates. Increases in lending rates were, however, constrained by the EBA guidance. All lending rates were calculated using EBA guidance on pass-through caps on the margin earned on new assets (Box 20 in the EBA methodology note) and the change in sovereign spread. Sovereign spreads were backed out using the EBA guidance on pass-through floors on the margin earned on new liabilities (Box 19 in the EBA methodology note) and the dynamics of covered bonds yields from the IMF stress scenario. Different funding costs were calculated using the EBA guidance on pass-through floors on the margin earned on new liabilities and the dynamics of the change in sovereign spreads. Using the EBA constraints had an important effect on net interest income of the banks.

- In this context, inflation expectations would fall leading inflation to decline further below the target (see Risk 5). In turn, this would increase households' real debt burden slowing domestic demand growth, with a further impact on GDP and unemployment.

- Riksbank would respond by keeping the interest rate low at -0.5 percent until mid-2019 before gradually raising it. However, there is a risk that monetary policy transmission becomes less effective in negative territory and as central banks in other advanced economies further reduce their policy rates. Both of these risk factors would require the Riksbank to lower the policy rate even further. This risk was explored in in the sensitivity analysis ("low for long"), where it was assumed that policy rate will be 100bps lower than in the stress scenario.

- Growth would recover somewhat in the medium term (i.e. three years after the initial shock) as the external environment improves. However, the export pick-up would not translate into a broader and stronger recovery as households repair their balance sheets slowly, seeking to align debt levels with the significantly reduced value of their assets. Moreover, export related incomes would benefit a relatively small portion of the population. Hence, growth would remain relatively low in years 4 and 5 of the stress scenario meaning that the level of GDP would remain well short of its initial level.

- The Swedish banks have extensive operations in the Nordic region; in addition, Swedbank and SEB have significant exposures to the Baltic area. Therefore, the Sweden-specific scenarios were supplemented with a baseline and stress scenarios for the Nordic and Baltic region. Moreover, an assumption of the resurgence of the geopolitical conflict Russia/Ukraine was assumed to depress growth prospects in the Baltic area and declining oil prices would hinder the growth performance in Norway and Denmark.

Table 3. Sweden: Baseline and Stress Scenario

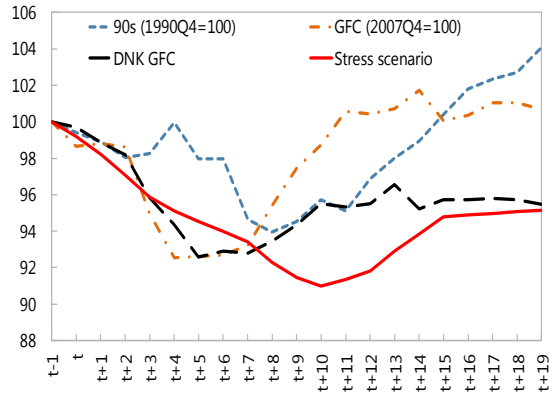
Baseline (WEO)	2015	2016	2017	2018	2019	2020
Levels (billions of 2014 national currency units, unless stated otherwise)						
Real GDP	4078.6	4228.2	4347.0	4456.0	4559.9	4658.0
Investment	988.9	1041.8	1088.5	1136.9	1185.9	1233.5
Unemployment rate	7.4	6.8	7.0	7.2	7.2	7.2
HICP index	100.7	101.8	103.3	105.0	107.3	109.6
Real house prices (1981=100)	129.2	140.2	147.4	153.6	152.3	149.1
Nominal house prices	135.4	148.3	158.0	167.5	169.7	169.7
Short term interest rate (percent)	-0.2	-0.2	0.4	1.0	1.6	2.2
Long term interest rate (percent)	0.7	0.6	1.2	1.7	2.3	2.9
2-year covered bond yield (percent)	0.2	0.1	0.7	1.3	1.9	2.5
5-year covered bond yield (percent)	0.9	0.6	1.2	1.7	2.3	2.9
Equity prices	1562.5	1531.0	1607.3	1693.6	1852.6	2004.4
KIX	112.6	108.5	106.9	105.7	104.9	103.4
percent changes (percent)						
Real GDP growth		3.7	2.8	2.5	2.3	2.2
Investment growth		5.3	4.5	4.4	4.3	4.0
Inflation (HICP)		1.1	1.4	1.7	2.2	2.1
Nominal house prices (yoy change)		8.5	6.6	6.0	1.3	0.0
Equity prices (yoy change)		-2.0	5.0	5.4	9.4	8.2
KIX (yoy change)		-3.7	-1.4	-1.1	-0.8	-1.4

Stress scenario	2015	2016	2017	2018	2019	2020
Adverse scenario						
Real GDP	4078.6	4050.0	3912.2	3798.9	3874.3	3943.7
Investment	988.9	984.8	879.1	819.9	818.1	827.9
Unemployment rate	7.4	8.2	10.1	12.6	13.5	13.5
HICP index	100.7	96.8	96.5	97.1	97.7	98.5
Real house prices (1981=100)	129.2	109.0	95.9	92.0	90.8	94.6
Nominal house prices	135.4	109.4	95.5	92.1	91.5	96.1
Short term interest rate (percent)	-0.2	-0.5	-0.5	-0.5	-0.4	0.1
Long term interest rate (percent)	0.7	2.4	2.0	1.9	2.0	2.5
2-year covered bond yield (percent)	0.2	1.5	2.5	3.0	3.5	3.9
5-year covered bond yield (percent)	0.9	2.3	3.4	4.0	4.6	4.9
Equity prices	1562.5	1165.1	1210.3	1415.8	1550.8	1682.4
KIX	112.6	115.6	126.1	124.0	120.3	113.8
percent changes (percent)						
Real GDP growth		-0.7	-3.4	-2.9	2.0	1.8
Investment growth		-0.4	-10.7	-6.7	-0.2	1.2
Inflation (HICP)		-3.9	-0.3	0.6	0.7	0.8
Real house prices (yoy change)		-15.6	-12.0	-4.1	-1.3	4.2
Nominal house prices (yoy change)		-19.2	-12.7	-3.5	-0.7	5.0
Equity prices (yoy change)		-25.4	3.9	17.0	9.5	8.5
KIX (yoy change)		2.7	9.1	-1.6	-3.0	-5.4

Source: EBA and fund staff calculations.

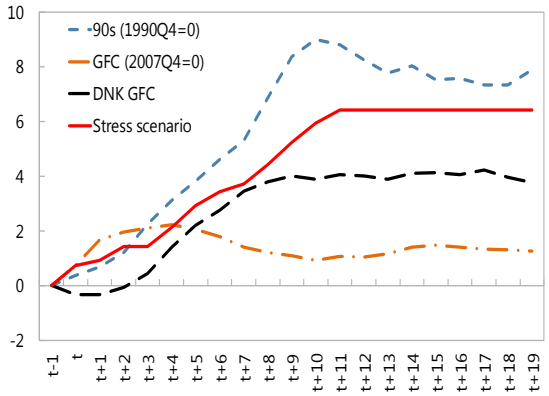
Figure 1. Sweden: Stress Scenario and Previous Recessions in Sweden and Denmark

Real GDP
(Index)



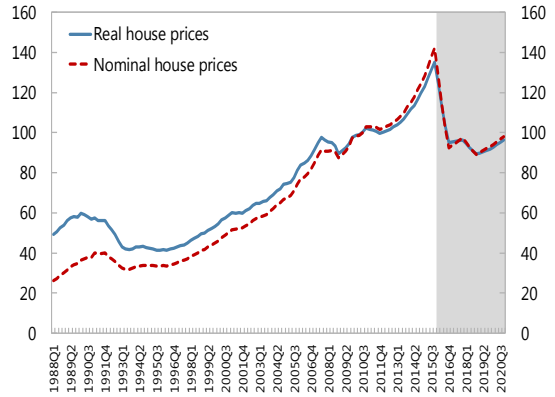
Sources: EBA and fund staff calculations.

Relative Change in Unemployment
(Percentage points)



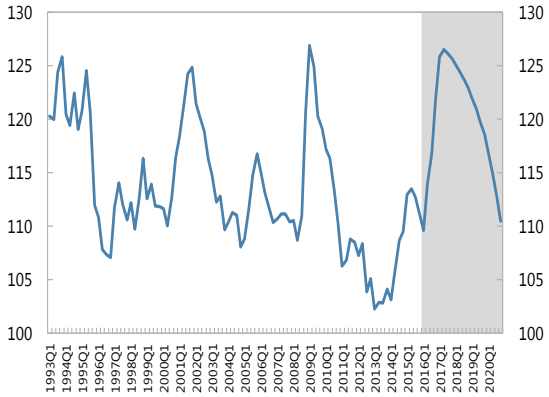
Sources: EBA and fund staff calculations.

House Prices
(Index, 2004=100)



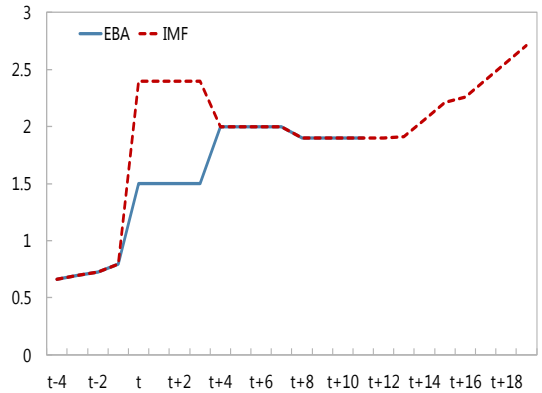
Sources: EBA and fund staff calculations.

Nominal Exchange Rate
(KIX, Index)



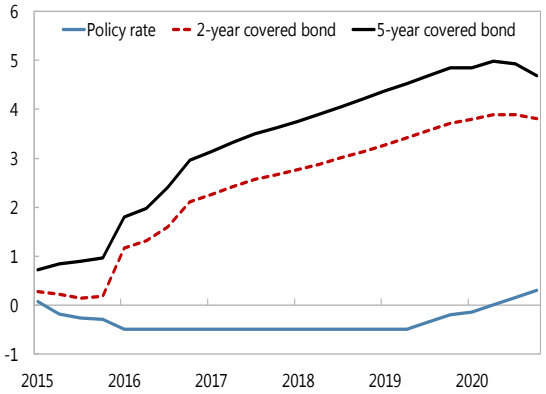
Sources: Fund staff calculations.

Long Term Interest Rate
(Percent, t = 2015Q4)



Sources: EBA and fund staff calculations.

Interest Rates
(Percent)



Sources: Fund staff calculations.

IMF'S TOP-DOWN SOLVENCY STRESS TESTS OF BANKS

6. This section explains the FSAP team's TD solvency stress tests of banks. The section covers: (i) data and the scope of the test; (ii) the state of the largest four banks and their vulnerabilities; (iii) the capital definitions and standards that was used for calculating and reporting results; (iv) the stress test methodology and the use of satellite models to map the macroeconomic scenarios into credit losses, income projections, balance sheet items and risk weighted assets; (v) the behavioral assumptions governing capital actions in the stress test scenarios; and (iv) the results of the IMF TD exercise.

A. Data and Scope of the Test

7. The stress tests covered the four largest banks which account for about 75 percent of the banking sector's asset. This is the same coverage as in Riksbank and BU stress test which not only insured comparability of results but also possibility of sharing data needed to perform IMF stress test. The cut-off date of the data was December 30, 2015. Minimum capital requirements used as hurdle rates were consistent with the Swedish capital regulatory standards that reflect Basel III capital requirements and Sweden-specific buffers and pillar 2 add-ons.

8. The test followed the balance sheet-based approach, which assessed solvency of individual banks under the two scenarios through changes in net income and RWAs. Therefore, this approach resembled the bottom up stress test. The supervisory, consolidated data of individual banks provided by the authorities and banks were used to perform the solvency stress test.

B. Four Largest Banks: Overview

9. While the size of total assets of four largest banks have remained stable since the last FSAP, the share of loans and securities increased. Total assets of the four largest banks at the end of 2015 represent around 300 percent of nominal GDP. Loans were still the largest asset representing 56 percent of total assets, followed by securities (15 percent). Both asset classes increased by 5 percentage points since end of 2011, while advances to banks and derivatives portfolio shrank. Most of the securities portfolio represented liquid assets (covered bonds and sovereign bonds) that banks hold to meet possible outflows. Relatively large share of covered bonds (30 percent of liquid assets) held by banks to comply with liquidity regulations gives rise to contagion risks due to interconnectedness. The share of mortgages increased by 5 percentage point and reached 50 percent of the loan portfolio at the end of 2015. On the other hand, the share of corporate loans decreased from 47 percent to 42 percent. Almost half of the exposures of the largest banks were assets in foreign subsidiaries and branches, predominantly in other Nordic countries, with some differentiation among the banks.

10. On the liabilities side, long term funding via covered bonds has increased since the last FSAP. Around 60 percent of total funding is in foreign exchange, mostly reflecting large share of assets in foreign currency. However, part of the foreign funds is swapped into SEK to fund assets in SEK. Customers deposits, the largest funding source of the largest banks (representing 30 percent of liabilities), have been broadly (as a share in liabilities) stable since 2011. On the other hand, the share

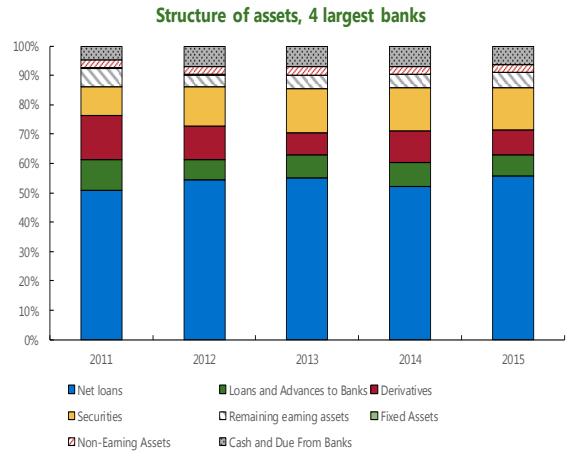
of long term, wholesale sources of funding, mostly covered bonds, increased by 5 percentage points and reached 25 percent of total liabilities. In addition to deposits and long term bonds, other short term bonds, both in SEK and foreign currency, represented sizeable share of total funding (30 percent of total funding). Capital and capital ratios of largest banks have greatly increased in recent years. However, the leverage ratio has increased at lower speed suggesting that the increase of capital ratios was primarily driven by lower risk weights, rather than higher capital.

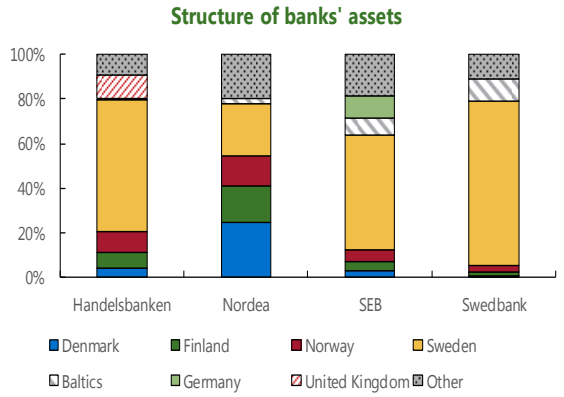
11. The largest banks have performed well in the negative rates environment with solid profitability underpinned by the strong loan re-pricing power. The high level of profitability, measured by return on equity, was primarily driven by low credit losses and nonperforming loans (NPLs), high fees, and continued efforts to improve cost efficiency. Banks' net interest margin has been very stable despite the negative interest rates environment which had put pressures on other banks in the euro area. The large share of wholesale funding has been a factor that partly mitigated the impact from the zero interest rate floor on retail deposit. More importantly, with about 70 percent of mortgages having floating rate contracts, banks re-price mortgage interest rates every three months allowing them to maintain a constant margin regardless of fluctuations in funding costs.

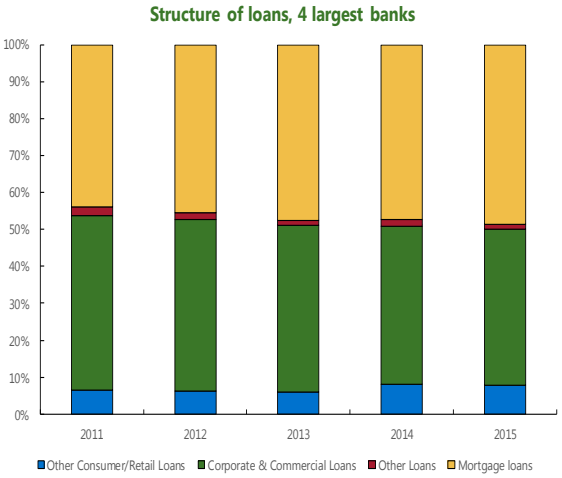
12. Vulnerabilities related to high share of wholesale funding, including in foreign currency, large credit portfolios and high degree of interconnectedness were at the core of the bank stress testing exercise:

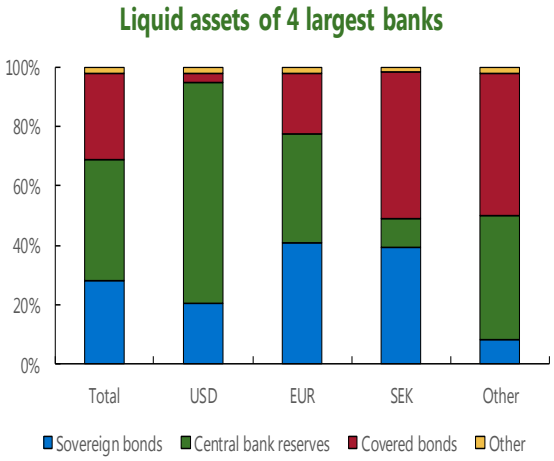
- Credit risks from banks' exposures to residential mortgages, in particular in the event of changes to interest rates and unemployment rates;
- Credit risks from banks' exposures to corporates, triggered by slower growth, higher financing costs to large and small corporates;
- The effects of higher funding costs under the stress scenario;
- Roll-over risks, arising from funding of illiquid loans with shorter term/wholesale instruments, including in foreign currency;
- Counterparty credit risks from failure of swaps counterparties to meet their obligations; and
- Contagion risks from the large interconnectedness among banks through the interbank and swaps market and holdings of each other's debt.

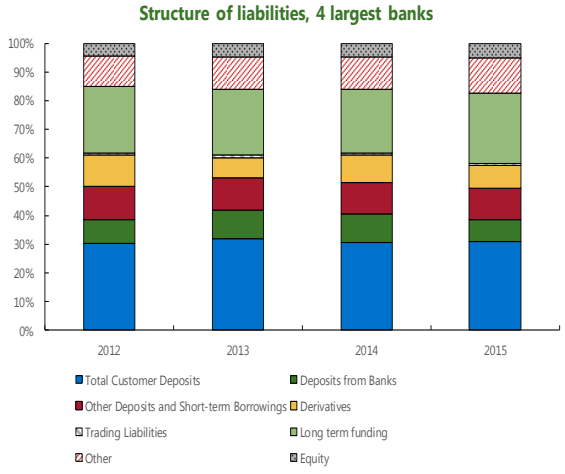
Figure 2. Sweden: Balance Sheet and Income Statement Information, Four Largest Banks

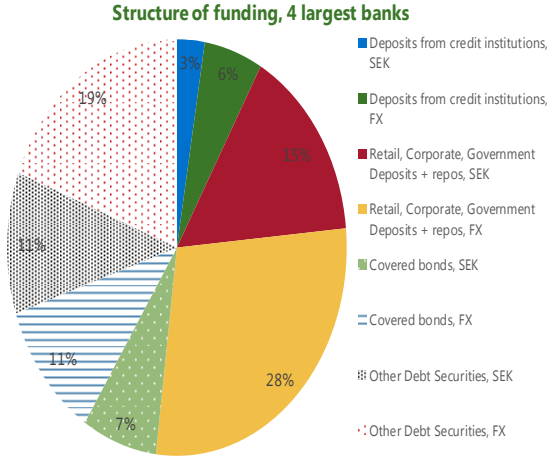






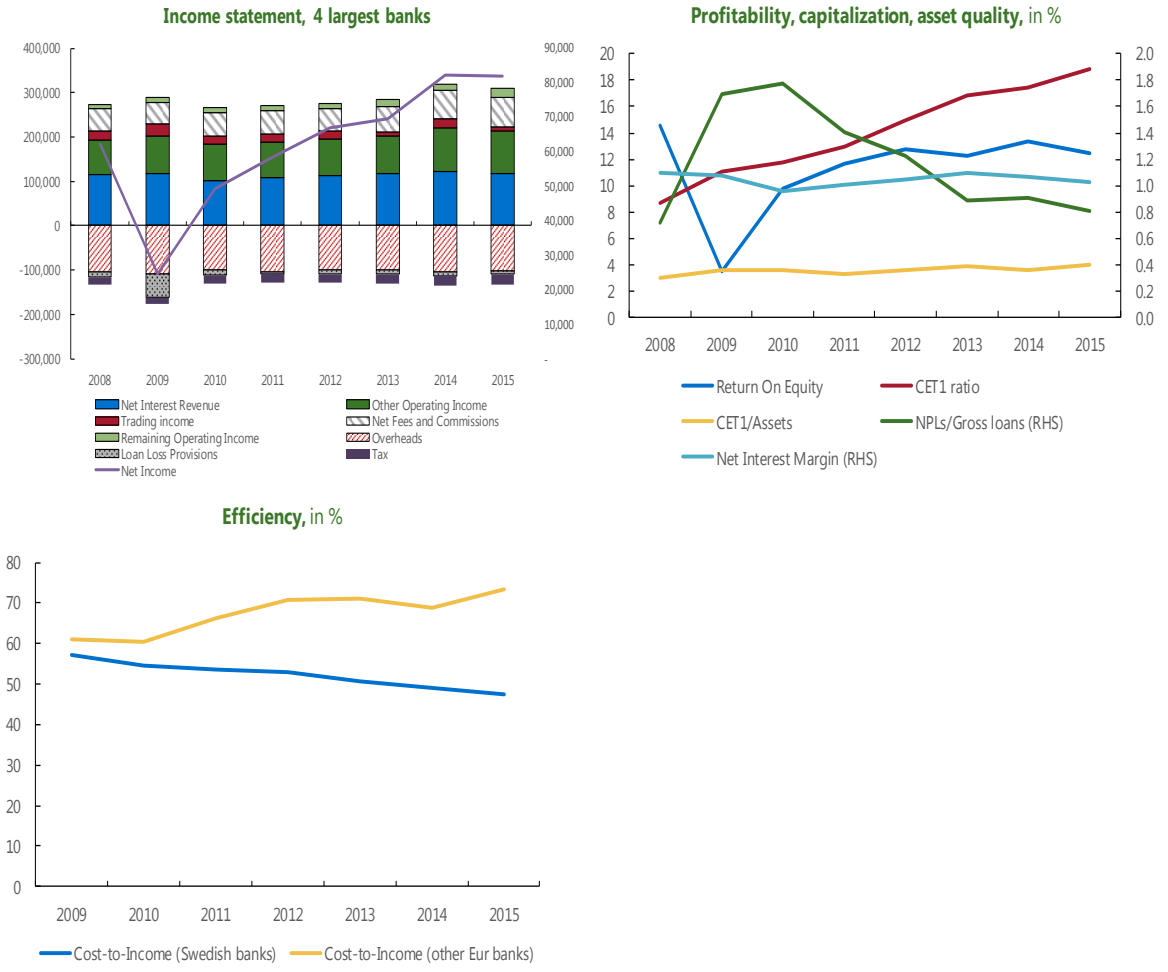






Source: Statistics Sweden and Bankscope.

Figure 2. Sweden: Balance Sheet and Income Statement Information, Four Largest Banks (concluded)



C. Capital Standards

13. Hurdle rates were defined in terms of common equity tier 1 (CET1) ratios. The capital definition applied in the stress test corresponded to that required by Swedish regulation. To assess the potential impact of negative shocks on the capital requirement metrics over the five-year risk horizon, solvency stress tests were conducted against two sets of hurdle rates. The hurdle rates were "individualized", i.e. calculated for each bank as a function of projected exposures and different mortgage floors in Sweden and Norway (Table 4).

- *A "regulatory" hurdle rate* was defined as the CET1 ratio that does not include any buffers and therefore includes a minimum Basel III capital requirement, Pillar 2 own-fund requirements associated with pension risk, concentration risk and interest rate risk in the banking book and the" microprudential" capital requirements for Swedish and Norway mortgage (mortgage floors, 15 percent).

- *A "supervisory" hurdle rate*[5] took into account all capital buffers (in addition to capital elements of the regulatory hurdle rate): "macroprudential" mortgage floors (10 percent), capital conservation buffer, countercyclical capital buffer and the common equity systemic risk surcharge of
  5 percent.

14. The impact on the Basel III leverage ratio was also considered. It was assumed that the total exposure grows at the rate of total assets. Regulatory adjustments were assumed to stay constant at the 2015 level and tier 1 capital was defined on the fully phased-in basis.

15. Basel III phase-ins and phase outs were incorporated in the definition of capital. Consistent with the national regulatory arrangement, 100 percent of projected AOCI was incorporated into CET1 capital from 2016 onwards. The nominal value of goodwill, intangible assets, and DTAs was held constant. Since there are no phase-ins of deductions from CET1 and provision factors are equal to 100 percent there were no effects of deductions on CET1 ratios over the stress testing horizon.

Table 4. Sweden: Hurdle Rates (in percent)

	2015-2020						
I. Minimum Common equity tier 1 (CET1)	4.5						**Regulatory threshold (I to III.)**
II. Capital requirement in Pillar II, excl systemic risk and risk weight floor	Held constant and equal to 2015q4						
III. "Microprudential" mortgage floors (15%)	Calculated based on projection of exposures in Sweden and Norway and mortgage floors						
IV. "Macroprudential" mortgage floors (10%)	Calculated based on projection of exposures in Sweden and Norway and mortgage floors						
V. Countercyclical capital buffer	Calculated based on projection of exposures in Sweden and Norway and respective CCB rates						
VI. Capital conservation buffer	2.5						
VII. Systemic risk buffer	3.0						
VIII. Specific Pillar II risks	2.0						
IX. Supervisory threshold (I. to VIII.)	Different for each bank						
Phase in of deductions from CET1	100	100	100	100	100	100	
Phase out of existing AOCI capital adjustments	100	100	100	100	100	100	

Source: Finansinspektionen and staff calculations.

[5] This supervisory threshold does not take into account that some buffers might be released in a crisis.

D. Projection of Risk-Weighted Assets Over the Scenarios

16. Three components of RWAs for each bank were projected: credit RWAs, market RWAs and operational RWAs:

- *Credit risk:* The IRB formulas were used to calculate and project credit RWAs for each asset class reported by the banks (Table 5). Through-the-cycle PDs which were updated to reflect the increase in point-in-time PDs. Point in time PDs for different economic sectors over the stress testing horizon were calculated using projected credit losses for each economic sector (see paragraph 22),[6] LGDs (reported by banks in 2015Q4 for each economic sector) and projected exposure at default. Exposures included both standardized and IRB exposures and their projection was consistent with projection of loans and total assets (see below) but also taking into account the dynamics of the exchange rate and defaulted loans. Credit RWAs for trading, equity, and securitization were taken from the bottom-up exercise.

- *Market and operational risk:* Since there was no meaningful way to project RWAs for operational and market risks, they were taken from the bottom up exercise.

17. Credit RWAs for corporate exposure were considered as well to take into account the recent FI's initiative[7] to increase risk weights for corporate exposures. Consistent with the new regulatory initiative, the average risk weights for exposures to corporate sector was set to 30 percent from the end of 2016 onwards. For those banks whose risk weight on corporate exposure was already above 30 percent, their PDs were recalculated such that the average risk weight on corporate exposure increased by 2 percentage points.

E. Models and Behavioral Assumptions

18. Historical quarterly data, simple panel regression,[8] duration and maturity gap models were used to forecast each banks' main components of balance sheets and income statement items (Table 6). The models were intended to capture how the balance sheet, RWAs, and net income of each bank are affected by the macroeconomic and financial conditions described in the scenarios. Projections of balance sheets (Step 1) over the stress testing horizon (Figure 1) were used for the purposes of calculation of credit risk RWAs and income statement items (Step 2). Projections of RWAs and net income, with assumptions on dividend distribution and AOCI, determined capital ratios over the stress testing horizon (Step 3). Asset disposals and acquisitions over time were not considered.

[6] All credit losses by economic sectors were assumed to grow at the same rate as total credit losses.

[7] Please see http://www.fi.se/Folder-EN/Startpage/Press/Press-releases/Listan/New-methods-for-banks-risk-weights-and-capital-requirements/.

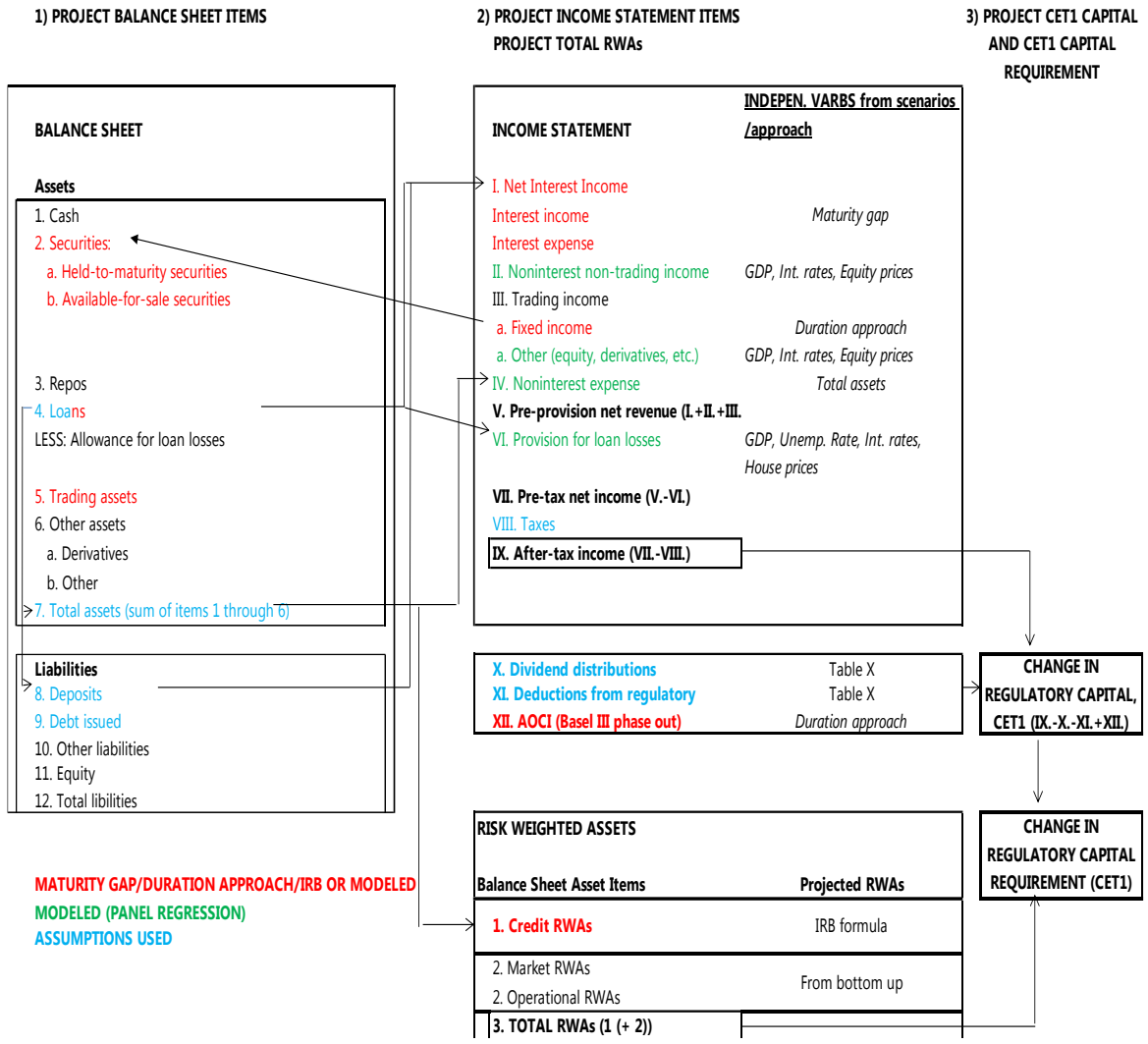
[8] Panel regression models included models with fixed effects estimated over the period from 1989 to 2015.

Table 5. Sweden: Asset Classes Mapping for Calculation of Credit RWAs

Column A (IMF mapping for calculation of credit RWAs)	Column B (asset classes submitted by banks)
1. Residential mortgages	Domestic Retail
2. Other retail	Domestic Retail mortgage
3. Corporates	Domestic Large regulated and unreg. fin. institutions (uncollateralized)
4. Financial institutions	Domestic Large regulated and unreg. Fin.institutions (reverse repos)
5. Sovereign	Domestic Corporate - L - Real Estate Activities
	Domestic Corporate - M - Professional, scientific and technical activities
	Domestic Corporate - C - Manufacturing
	Domestic Corporate - G - Wholesale and retail trade
	Domestic Corporate - F - Construction
	Domestic Corporate - A - Agriculture, forestry and fishing
	Domestic Corporate - Other
	Retail Baltics
	Retail Denmark
	Retail Norway
	Retail Finland
	Retail (rest of world)
	Retail mortgage Baltics
	Retail mortgage Denmark
	Retail mortgage Norway
	Retail mortgage Finland
	Retail mortgage (rest of world)
	Corporate Baltics
	Corporate Denmark
	Corporate Norway
	Corporate Finland
	Corporate (rest of world)
	Financial Institution Baltics
	Financial Institution Denmark
	Financial Institution Norway
	Financial Institution Finland
	Financial Institution (rest of world)
	Domestic Sovereign exposures, HTM
	Foreign Sovereign exposures, HTM
	Corporate bond, HTM
	Financial Institution bond, HTM
	Remaining other debt securities

Source: Finansinspektionen, IMF Staff.

Table 6. Sweden: IMF Top-down Approach



Source: IMF Staff.

F. Balance Sheet Growth Projections

19. Projections of banks' balance sheet items were useful in projecting income statement items and credit risk RWAs.

- ***In the stress scenario it was assumed that each asset class grows at the zero rate.*** This was because forecasting exposures in the stress scenario would likely bring about negative growth rates of exposures which in turn would increase capital ratios. By setting the growth rate of assets to zero recapitalization of banks via deleveraging was avoided. However, loan and total assets changed during the stress testing horizon reflecting the change in the exchange rate. Moreover, the securities portfolio also reflected mark to market changes due to changes in interest rates.

- ***In the baseline the loan growth was modeled using a panel regression model.*** GDP growth, unemployment rate, and interest rates were used as exogenous variables. The growth rate of the balance sheet was assumed to be equal to the growth rate of the loan portfolio as the largest asset category.

G. Loan Losses and Net Income Projections

20. The projection of income statement items was based on the IMF's projections of the balance sheet for each bank over the stress horizon and the main macro and financial variables in two different scenarios. In particular:

- **Provisions for loan losses.** To assess **the credit risk**, total provisions for loans losses were projected as total credit losses. Total provisions were projected using a panel regression model of total credit losses and macro and financial variables (GDP growth rate, unemployment rate, interest rates and house price growth rate) from the scenarios as exogenous variables.[9] To capture cross-border spillovers, the GDP was defined as a weighted average of GDPs of countries where banks have exposure to.[10] In the sensitivity analysis, we used a model similar to the model used by the authorities to check for the robustness of credit loss projections. Projected credit losses were used to project point in time PDs that were used in updating trough the cycle PDs and calculating credit RWAs. Provisions for own sovereign and corporate bonds held to maturity were also take into account by calculating haircuts on those positions due to changes in risk free rate and credit spreads.

- **Interest income/interest expense.** Maturity gap analysis was conducted to assess the **interest rate risk** in the banking and trading book. Maturity gaps (by time-to-repricing) were calculated in each period by assuming that all interest earning assets and liabilities in each bracket grow at projected loan growth rate i.e. the bank does not change its maturity profile over the stress testing period. Cash flow effects from an increase in lending and funding costs were also considered. The EBA guidelines were followed to calculate lending rates and funding costs as a function of change in sovereign spread[11] with pass-through parameters as defined in the EBA stress testing methodology note. Since the analysis considered aggregate interest sensitive assets and interest sensitive liabilities the calculated pass-through parameters were defined as a weighted average of EBA parameters where weights reflected the structure of assets and liabilities of each bank. The flow effects on net interest income from changes in interest rates on derivatives' portfolio were not considered due to data constraints and the fact that banks report

[9] An important caveat of this approach is that it assumes that the business model of banks and quality of clients has remained constant in the last 20 years.

[10] The bank's weight for a particular country corresponded to the share of its exposure to this country in its total exposure.

[11] The change in sovereign spread was backed out using the EBA constraint on new liabilities and the dynamics of the covered bond yields.

income on derivatives differently.[12] This likely overestimated the net interest income for banks that report net interest income on derivatives.

- **Non-interest income excluding trading income.** This item was projected using a panel regression models with equity prices, GDP growth and interest rates as exogenous variables. The assumption was that non-trading, non-interest income depends on the dynamics of the economy. Moreover, an increase in interest rates might lower the demand for credit pushing the banks to raise their non-lending prices. Finally, the equity prices were used as proxy for asset management income.

- **Trading income and realized losses on AFS/HTM securities.** To assess **the market risk,** realized losses in the trading and AFS fixed income securities due to interest rates and credit spread risks was assessed through a duration approach. Losses on equity and other positions, including derivatives, were modeled as a function of equity prices, interest rates and real GDP dynamics.

- **Non-interest expenses.** This item was projected using a panel regression model and the growth rate of total asset as the only independent variable. The assumption was that non-interest expenses depend on the size of the business which is ultimately related to the size of the balance sheet.

- **Taxes.** Taxes was set at the effective tax rate in 2015 for the whole stress testing horizon in case of positive net income and zero otherwise.

- **Extraordinary items and minority interest.** These items were set to zero.

- **Accumulated other comprehensive income.** Unrealized losses on AFS securities and foreign currency translation were projected as part of AOCI.[13] Losses on AFS securities were calculated using the duration approach and the foreign currency gains and losses were calculated based on the net open position and the dynamics of the exchange rate.

H. Capital Action Assumptions

21. The following rule for determining dividend payments was assumed (Table 7).

- Dividends were payable out of the current year's profit using the Basel III capital conservation rule. Dividends were assumed to be paid out of current period net income after taxes by banks that were in compliance with supervisory capital requirements. A maximum allowed dividend payout was assumed to be equal to the dividend payout ratio (dividends over net income after taxes) in 2015. If a bank fell below the supervisory threshold before dividend distribution, it was considered capital constrained and followed a schedule of dividend payouts per Table 7. If a

[12] Interest income and interest expense from financial instruments held for trading (including derivatives) can be reported either separately from other gains and losses as "interest income" and "interest expense" or as part of gains or losses from these categories of instruments.

[13] Other AOCI items, including actuarial gain and losses on defined contribution pension plans, were set at zero and unrealized gains and losses on qualifying cash flow hedges. Were held constant

bank fell below the supervisory threshold because of dividend distribution, it was assumed that the bank's dividend payout would be limited to a level that ensures the supervisory threshold is not breached. This rule applied only if a bank earned a positive net income. If net income was negative it was assumed that there is no dividend payout. If a bank was above the threshold, it paid a maximum allowed proportion of dividend.

- It was also assumed that banks do not issue new shares or make repurchases during the stress test horizon.

Table 7. Sweden: Dividends Distribution Schedule \1

Capital thresholds: 2016-2020	Assumed dividend payout
12.5-13.125	0% x Net income (t)
13.125-13.75	20% x EDPR x Net income (t)
13.75-14.375	40% x EDPR x Net income (t)
14.375-15.0	60% x EDPR x Net income (t)
>15	Effective div. payout rate in 2015 (EDPR)

\1 This is just an example where the supervisory threshold is 15 percent. In the exercise specific buffers were also considered.
Source: IMF Staff.

I. Single Factor Tests and Sensitivity Checks for Banks

22. Four single factor shocks were performed by the banks. All these tests used one-time shock scenarios which were somewhat more severe than the environment in the first year of the stress scenario:

- *Interest rate shock in the banking book* to isolate the impact of re-pricing of assets, liabilities and off-balance sheet positions (Table 8);
- *Market risk shock in the trading book, available for sale (AFS) securities and credit valuation adjustment (CVA)* to isolate the impact of market risk shocks (interest rates, spreads, exchange rate, equity, commodities) on the trading book, AFS securities and on CVA on the over-the-counter (OTC) derivatives (Table 9);
- *Failure of 10 largest counterparties.* For each bank, losses were calculated based on the assumed instantaneous and unexpected default of this bank's largest counterparties with two assumptions on LGD (equal to 100 percent and banks' best estimate); and
- *A shutdown of FX swaps market* to identify the effects on the capital requirements due to change in net open positions and higher risk weighted assets due to highly unlikely materialization of counterparty credit risk and the default of largest counterparties in the FX swap market.

Table 8. Sweden: Interest Rate Shock in the Banking Book (IRRBB)

Tenor	Scenario Shocks (bps)			
	SWE, DEN	USD	Rest of EU	Russia
Overnight	+100	+100	+125	+300
3 month	+100	+100	+125	+300
1 year	+150	+150	+180	+350
2 years	+200	+200	+250	+400
5 year	+250	+250	+300	+500
10 year and longer	+350	+350	+350	+550

Source: IMF Staff.

23. A range of sensitivity analysis was performed by the FSAP team. These included: (i) using a credit loss model similar to what the authorities used in their stress test; (ii) allowing bank to deleverage in the stress scenario, (iii) changing projected corporate PDs to reflect debt at risk measure from the corporate interest coverage ratio simulation and the debt capacity measure from the authorities' stress test of households, (iv) "Low for long" to capture the impact of a prolonged period of negative rates; (v) using EBA interest rate shocks; (vi) using market based measures of solvency.

Table 9. Sweden: Market Risk Shock in the Trading Book, AFS securities and CVA

Market Risk Factor		*Price Shock*						
Equities' price change (%)	Nikkei 225	-30%						
	S&P500	-30%						
	OMX Stockholm 30 Index	-40%						
	MSCI Asia Ex-Japan	-40%						
	STOXX50	-50%						
Commodities' price change (%)	Energy	-40%						
	Base Metals	-40%						
	Precious Metals	-25%						
	Grains and others	-30%						
		SWE:	US:	EU/UK:	JPY:	Baltic states:	Nordic countries:	Russia
Interest Rates change (bps)	Overnight:	200	200	200	100	400	200	400
	3 month:	200	200	200	100	400	200	400
	5 year:	300	400	500	200	600	300	600
	10 year:	400	500	600	300	800	400	800
	5-year swap spreads:	200	300	400	150	400	200	400
	10-year swap spreads:	300	400	500	250	600	300	600
		SWE:	US:	EU/UK:	JPY:	Baltic states:	Nordic countries:	Russia
Credit Spreads change (bps)	Covered bonds	+500	-	+500	-	+500	+600	-
	Senior Financials	+250	+280	+360	+150	+450	+300	+450
	Subordinated Financials	+335	+610	+900	+250	+700	+500	+700
	Non-Financial IG	+250	+150	+200	+100	+450	+300	+450
	Non-Financial HY	+800	+500	+1000	+350	+1200	+1000	+1200
	Nordic countries:	+300						
	Baltic states	+800						
	Russia	+600						
	Portugal	+600						
	Spain	+400						
	Italy	+400						
	Other Europe	+150						
FX change (%)	USD/SEK	+40% (USD appreciates)						
	EUR/SEK	+20%						
	GBP/SEK	+30%						
	NOK/SEK	+20%						

Source: IMF Staff.

J. Results

24. The solvency stress test suggests banks would be resilient to severe economic distress. One bank would fall below the supervisory hurdle rate and no bank would breach the regulatory threshold over the stress testing horizon. This highlights the importance of capital buffers the banks have already built. Recapitalization needed to bring the bank to the supervisory hurdle rate peaked in 2018 at 100 percent of its 2015 net income—which corresponds to 2 percent of 2018 nominal GDP. The system-wide CET 1 ratio fell by 2.5 percentage points in 2016 (Panel 2) relative to the base year (or 2.5 percentage points relative to the baseline scenario in 2016) and by additional 1.5 percentage points in 2017-2018. The system-wide "all-in" leverage ratio fell by 0.3 percent point in the downturn period (from 4.1 percent in 2015 to 3.8 percent in 2018) due to both lower capital and

higher exposures (as a result of depreciation of SEK) and no banks fell below the internationally agreed minimum of 3 percent.

25. Capital ratios in the years of downturn (2016-2018) were driven by lower net interest income, higher provisions for credit losses and increases in risk weighted assets (Panel 2). Compared to the base period (2015), the system wide CET1 fell sharply in the first three years both due to negative profits and higher RWAs. Net income fell significantly from SEK 76 billion to SEK 34 billion net loss in 2016. This was mostly due to the impact of the sharp increase in funding costs that depressed net interest income and provisions for credit losses which increased seven times by 2018 due to a severe contraction of the real economy. Provisions subtracted 1.1 percentage points from CET1 ratio in 2015 and additional 3.4 percentage points in the 2017-2018 period. Net income was still negative in 2017 after recovering to positive numbers in 2018 onwards. Trading income, which was mostly affected by losses on fixed income investments due to higher yields, played a modest role in dynamics of CET1 ratios. It subtracted 1 percentage points from the system-wide CET1 capital ratio and additional 0.3 percentage points in the 2017-2018 period. Higher RWAs had similar effect subtracting 1.3 percentage points from the system-wide CET1 ratio in 2016-2018 largely as a result of higher PDs and depreciation of SEK.

26. Positive changes in CET1 ratios in the recovery period were mainly the results of positive profits driven by higher interest income and lower provision for credit losses. Net interest income increased significantly in the recovery period as the funding shock dissipated. Moreover, the provisions for credit losses dropped due to the pickup in real activity.

27. CET1 ratios were projected to be broadly stable in the baseline (Panel 3). The system-wide CET1 ratio increased marginally in 2016 comparing to the base period. However, it fell by 0.7 percentage points over the 2017-2018 since the negative impact of higher RWAs due to the expansion of balance sheets was larger than the positive impact of large profits. While the system-wide leverage ratio was projected to increase in 2016, the steady decline after 2016 was due to higher expansion of balance sheet in comparison to growth rate of profits.

28. The supervisory initiative that will increase corporate risk weights could have a significant impact on capital ratios. Higher corporate risk weights would reduce the system wide CET1 ratio. This would push three additional banks below the supervisory threshold in the stress scenario (raising recapitalization need to 3 percent of GDP) and one bank in the baseline scenario[14]. But even with higher corporate risk weights no bank would breach the regulatory threshold.

29. Single factor shock analysis suggests that while losses due to individual materialization of severe interest, market and concentration shocks would be manageable, increase in RWAs due to shutdown of FX swaps markets would entail higher capital needs. In particular:

[14] The authorities argued that they would expect the banks to increase their capital ratios in anticipation of the risk weight increase, thereby effectively avoiding a recapitalization need due to a failure to meet the supervisory capital requirements.

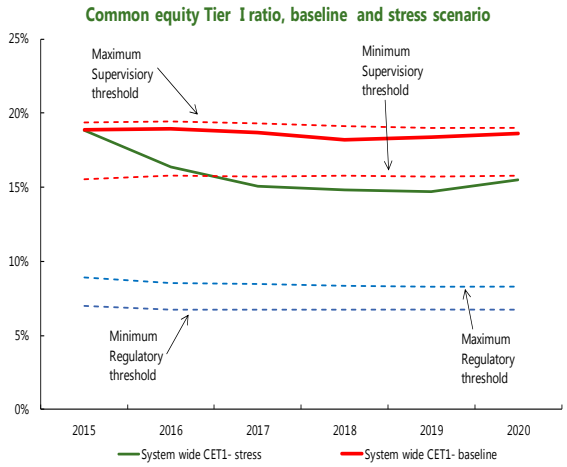
- *Interest rate shock in the banking book:* an aggregate loss from materialization of the interest rate risk (as described in Table 8) would correspond to around 3.5 percent of 2015 aggregate CET1 capital. Around half of the losses would be due to shock in Sweden, and 1/3 of the losses from shocks in Nordic countries.

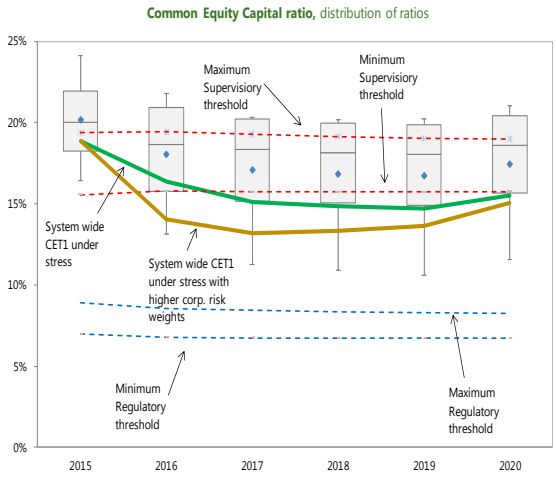
- *Market risk shock in the trading book, AFS securities and CVA*: the aggregate loss rate (loss over mark-to-market value of portfolio) on trading book and AFS securities was equal to 6.3 percent mostly driven by credit spreads and amounted to 6 percent of CET1 capital. While CVA on the OTC derivatives would more than double, the impact on the capital position would be small as the total increase in the price of counterparty credit risk would be less than 1 percent of total CET1 capital.

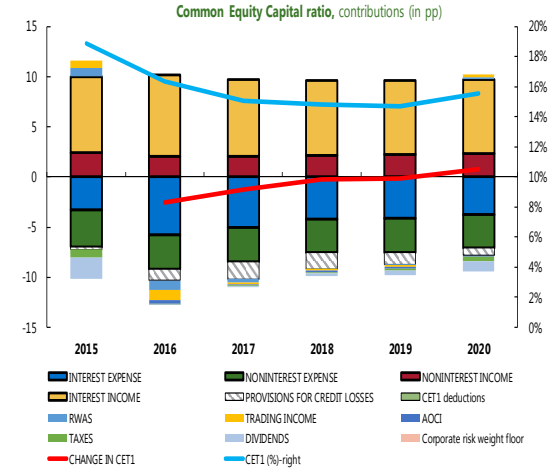
- *Failure of 10 largest counterparties:* Two banks would be affected significantly by the unlikely event of a simultaneous failure of their 10 largest counterparties. For other banks the losses (calculated using banks' estimated of LGDs) as a share of banks' CET1 ranged from 8-13 percent. As part of EBA stress test, banks simulated the impact of the failure of two largest counterparty in derivatives and the losses ranged from around 1 to 3 percent of CET1.

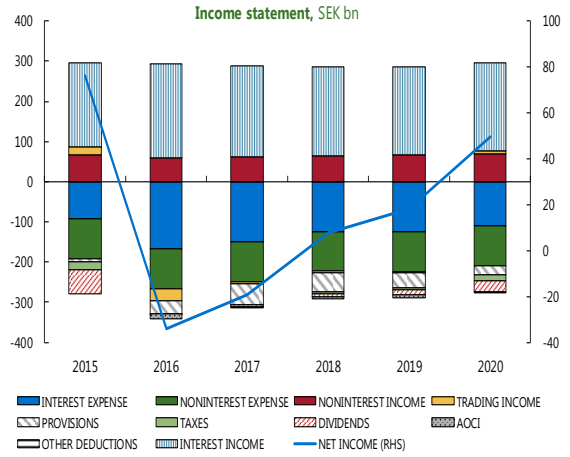
- *A shutdown of FX swaps market*: This highly unlikely shock would increase the net open position of the banks substantially thereby increasing RWAs and capital needs by almost 20 percent and lower 2015 CET1 ratio by 2.3 percentage points.

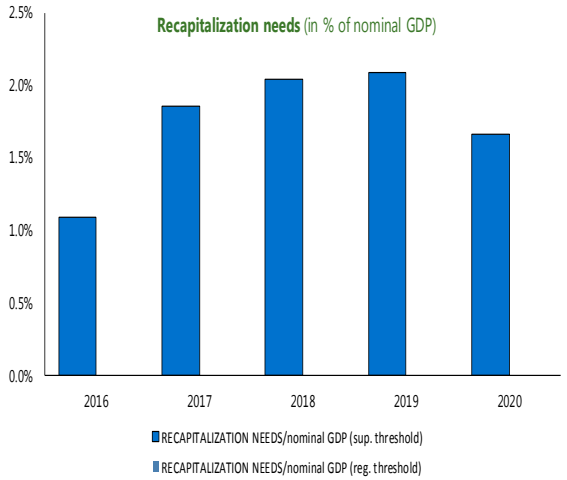
Figure 3. Sweden: Stress Testing Results: Stress Scenario, IMF Top-down \1

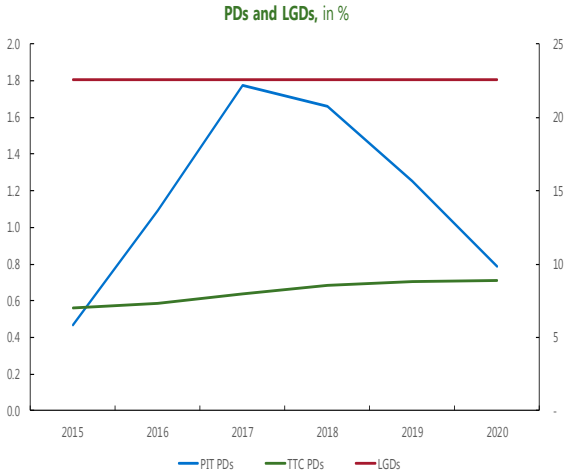












Source: IMF Staff calculations.

\1 The two hurdle rates differ across the four banks. In the charts this is represented as the highest and lowest of each hurdle rate (see Table 4)

Figure 4. Sweden: Stress Testing Results: Baseline Scenario, IMF Top-down \1

Source: IMF Staff calculations..

\1 The two hurdle rates differ across the four banks. In the charts this is represented as the highest and lowest of each hurdle rate (see Table 4)

30. Sensitivity analyses were performed with respect to the interest rate shock, loan growth rate assumption in the stress scenario and market based (Figure 1). The results show that:

- *Credit loss model (similar to the authorities' credit loss model):* To address a credit loss modeling risk, the model similar to what the authorities used in their stress test[15] was used to assess the

[15] The differences in the loss estimates using the two models illustrate the model risk ingrained in this type of analysis for Sweden. While both models of credit losses pertain to panel regression estimated since 1989, the differences are related to specification of the dependent variable (credit-losses in the IMF model versus credit- losses over exposures in the authorities' model) and the structure of independent variables (the authorities' model includes more independent variables). It is important to emphasize that there is no statistical or economic reason for using or not using one versus the other model. The differences in the results of the two models therefore illustrate the

robustness of FSAP team's credit loss projection. In this case, credit losses would double (comparing to the credit losses in the stress scenario) and the system wide CET1 capital ratio would fall by 8.7 percentage points over the period between 2016 and 2018. All banks would fall below the supervisory threshold and one bank would breach the regulatory threshold. Recapitalization needed to bring the banks back to supervisory thresholds would peak in 2018 at 7 percent.

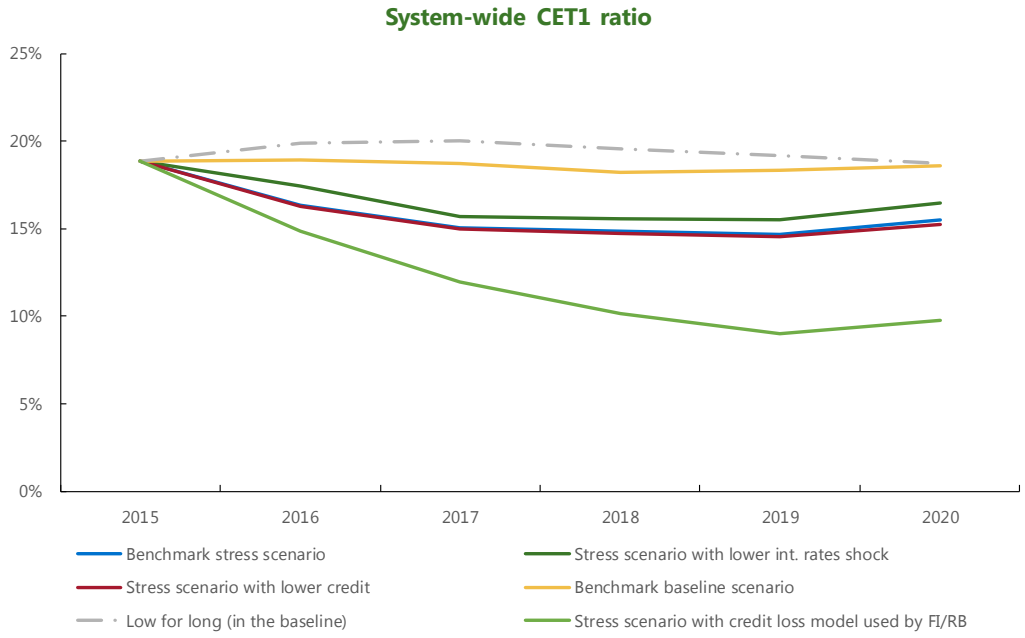
- *Less severe interest rate shock (as in the EBA stress scenario):* When using the scenario that mirrors the EBA adverse scenario the results of the IMF stress test were less severe and came closer to the EBA stress testing results (see next section). This was because net interest income and realized and unrealized trading income were not pressured by the larger increase in the yields used in the IMF stress scenario. Under this scenario, the cumulative drop in the system-wide CET1 ratio was 3.3 percentage points over the first three years (instead of 4 percentage points in the benchmark stress scenario) whereas the drop in the BU exercise under the similar stress scenario amounted to 2.3 percentage points (see next section). The difference was mostly explained by the more conservative projection of credit losses and depreciation of SEK in the IMF top-down framework.

- *Loan dynamics:* By modeling loans and total assets in the stress scenario i.e. allowing the size of the balance sheet to shrink during stress thereby allowing bank to recapitalize by deleveraging, CET1 ratios would be slightly higher (by 0.1 percentage points) than in the benchmark stress scenario. The reason for the small effect is because loans are not projected to fall substantially in the stress scenario due to sluggish adjustment of credit growth rate, lower interest rates and the lag effect from negative GDP growth and lower unemployment rate.

- *Low for long in the baseline:* Under the assumption that interest rates stay at the low levels in the baseline, the system wide ratio, contrary to expectations, would be higher than in the baseline--the system-wide CET1 ratio would be higher by 0.7 percentage point over the stress testing horizon. This is because lower interest rates would contribute to lower credit losses; higher trading income; and lower funding costs. This calculation, however, crucially depends on the method to estimate pass-through from risk free rates to lending and funding rates (which is in this case was the EBA methodology).

possible range of projected credit losses and the extent of model risk. However, it should be emphasized that both models are based on historical data and as such do not adjust for changes in the banks´ portfolio which might lead to over-prediction of credit losses.

Figure 5. Sweden: Sensitivity Analyses



Source: IMF Staff calculations.

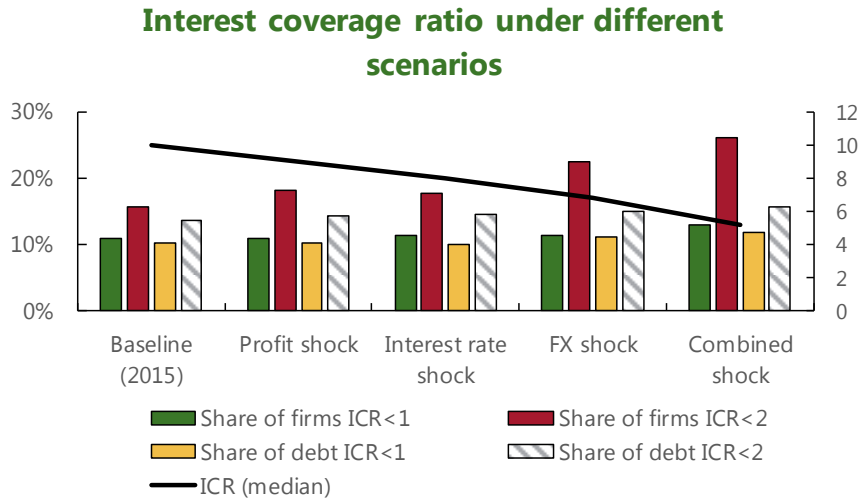
31. As part of the sensitivity analysis, the increases in probabilities of default in the top down stress test were assessed against the results of the granular stress tests of households and non-financial corporate sector.

- *Households' stress test:* The FI stress test suggests that direct credit risk is low for residential mortgages. And that there is no need to further increase PDs for mortgage exposures in the IMF stress test. FI assess the new mortgage borrower's payment capacity under different stressed scenarios, some more severe than the IMF stress scenario in the first year. The calculation is based on the FI's household survey data, and the methodology mostly follows the same structure as the commercial banks' discretionary income calculations (see Finansinspektionen, 2016: "The Swedish Mortgage Market.") It considers four negative scenarios: (i) interest rate increase by no more than 5 percentage points, (ii) 10 percent of the borrowers become unemployed, (iii) higher interest rate combined with a 20 percent decline in house prices, and (iv) higher unemployment combined with a 20 percent decline in house prices. In general, the exercise suggests that the Swedish mortgage borrowers' payment ability is enough to withstand these shocks. While this exercise is very useful in monitoring the health of the household sector, the authorities are encouraged to combine different one-off shocks (higher interest rates, unemployment and lower house prices) and try to map the results of the test into the probabilities of default on mortgage exposures.

- *Non-financial corporate stress test:* A stress test of the corporate sector based on interest rate coverage ratio was performed to assess the resilience of the non-financial corporations. As in the households' test, the results suggest that the increase in corporate PDs in the IMF stress test is much more than the PDs implied by the corporate stress test. Under the combined scenario of interest rate increase (300 basis points), depreciation of SEK (15 percent) and profit drop (10

percent) the share of firms with debt at risk would go up from 16 percent in the baseline (2015) to 26 percent (Figure 2) i.e. by 70 percent. In comparison, PDs on corporate exposure in the IMF top down test increase by 300 percent in 2016.[16,17]

Figure 6. Sweden: Corporate Sector Stress Test Based on the ICR



Source: IMF Staff calculations.

32. Moreover, FSAP team's market-price based analysis was used to complement the solvency stress testing results by taking into account the information about risk that is embodied in market prices. This exercise allowed consideration of correlations between institutions and higher frequency and more timely assessments. Using equity prices and balance sheet information in a contingent claims analysis (CCA) framework a historical time series of bank one-year expected default frequencies (EDFs), market capital to asset ratios (MCARs), and expected losses (ELs) were calculated[18]. Satellite econometric models using quarterly macro data 1999Q1–

[16] These results were calculated under the more conservative interest coverage ratio threshold set to be equal to 2 and an assumption that no firm hedges its external debt against FX risk.

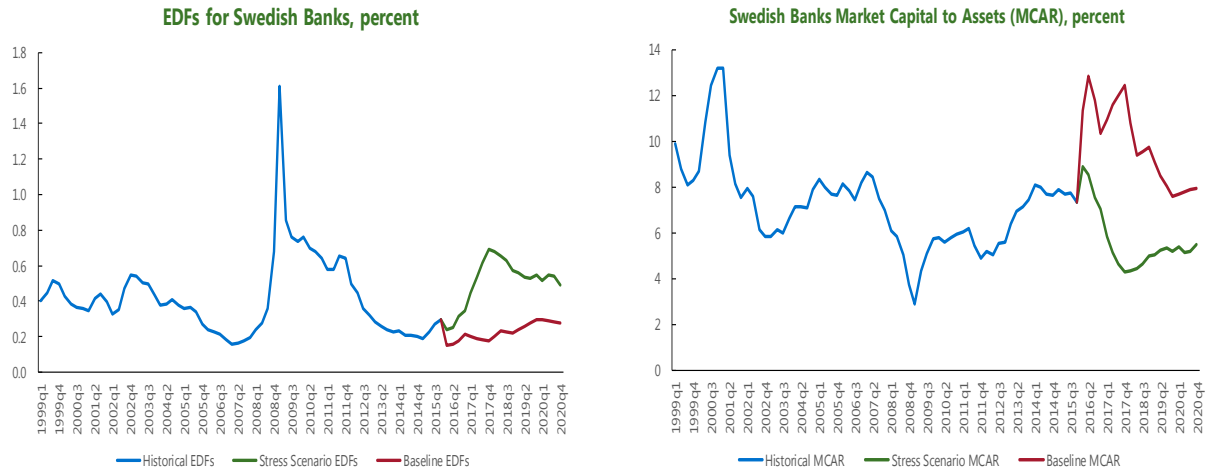
[17] The difference in the two exercises is due to different methodologies used in the IMF solvency approach and the corporate sector stress test. While the former analyses the solvency risk of all banks' corporate exposures, the later includes a small subsample of all banks' exposures and analyzes default risk based on assumptions (e.g. on the ICR).

[18] One-year expected default frequencies (EDF) were obtained from Moody's CreditEdge data for Swedish banks. The data was used to calculate of expected losses and the relationship of EDF to market capital to asset ratio for each bank. Please see Gray, Dale, Robert Merton, and Zvi Bodie, 2008, "A New Framework for Measuring and Managing Macrofinancial Risk and Financial Stability," Harvard Business School Working Paper No. 09/15 (Cambridge, MA: Harvard Business School).

2015Q4 were estimated[19] and used to project EDFs and MCARs for the baseline and stress scenarios over the 2016-2020 horizon period.

33. The results of the market-based exercise are broadly consistent with the IMF TD stress tests. The one-year EDF projections under the stress scenario increase 0.3 percent to an average of 0.7 percent (Panel 6). These stressed EDF levels are quite low—the range of peak EDF levels was between 0.5 and 0.95 percent—this means that all banks have peak default probabilities of 0.95 percent or lower which equates to investment grade or near investment grade ratings. Since bank EDFs are tightly linked to the bank market cap to asset ratios, market capital to asset ratios were projected for the 2016–2020 period. In the stress scenario, these MCARs decline on average about from eight to near four percentage points by 2017–18 period but then recover slowly afterwards as shown in Figure 2. These stress scenario MCARs reach levels seen in 2012 but do not reach levels seen during the 2009 crisis.

Figure 7. Sweden: CCA Stress Test Results



Source: Moody's CreditEdge and IMF staff estimates (individual bank MCARs and EDFs are weighted by bank asset size).

BOTTOM UP (EBA) AND THE AUTHORITIES' SOLVENCY STRESS TESTS OF BANKS

[19] The econometric satellite model used quarterly EDF and macro data from 1999q1-2015q4. A panel version of the model with a total sample size of 272 bank-quarter observations was estimated and used to project EDF and expected losses. Macro variables included growth in GDP, inflation, exchange rate depreciation, stock market returns, real house price inflation, short term and long-term interest rates.

34. This section presents the results of the solvency stress tests conducted by the authorities and the banks for the EBA stress testing exercise and discusses the differences vis-à-vis the FSAP team's analysis. The EBA stress testing framework is publicly available and details of the solvency stress test can be found in European Banking Authority, 2016, "2016 EU-Wide Stress Test, Methodological Note". The general framework for the authorities' top-down approach is also publicly available and can be found in the Riksbank's 2013 Financial Stability report and Finansinspektionen, "Stability in the financial system", December 2015.

35. The differences between the IMF approach, the authorities' approach, and the EBA approach had significant impacts on the results (Table 10). While there was a difference between the stress scenario used by the IMF and the banks, the IMF also ran a stress test using a scenario similar to EBA stress scenario in order to reconcile the results (see sensitivity analysis of the IMF top down test). Moreover, while the bottom up exercise used a three-year stress horizon, the IMF and the authorities' tests focused on stress testing horizon that spanned over five years. The level of the granularity and availability of the data and subsequently the methodology used by their respective approaches was different. The banks used much more granular data than the IMF or the authorities. Also, the authorities' approach was focused on modeling credit losses only. While the authorities did not assess the effects of shocks in the scenarios on other income statement items directly (e.g. the effect of interest rate shock on net interest income), these effects were indirectly taken into account when projecting credit losses. In other words, the projection of credit losses in the authorities' stress test is higher than it would otherwise be if they modeled all the items of the income statements. Moreover, losses on derivatives were not fully assessed in the IMF stress test because of the difference in reporting of derivatives' income and since granular data on derivatives were not available to the IMF. Finally, the IMF approach also assessed the effects of higher corporate risk weights.

A. Bottom Up Stress Test

36. Banks projected their capital ratios to increase under the baseline scenario (Panel 4). The system-wide CET1 ratio was projected to increase by 2.2 percent points in the period from 2016 to 2018, driven by positive net income and lower dividends.

37. The results of the bottom up (EBA) stress test suggest that banks are resilient to shocks of the stress scenario. Over the three years of the stress testing horizon, the system-wide CET1 would fall by 2.3 percentage points and one bank fell below the supervisory threshold. The most important factors behind the dynamics of the system-wide CET1 ratio included higher RWAs (partly due to higher probabilities of default and loss given defaults), higher provisions for credit losses and lower net interest income as a result of higher yields that affected trading income and interest expense.

38. The credit losses in the bottom up stress test were mainly driven by losses on corporate exposures (Panel 7). Two thirds of total projected credit losses in the stress scenario came from the corporate exposures. Moreover, two third of losses came from non-Sweden exposures, mostly from exposures in Finland, Norway and other countries (U.K., Russia).

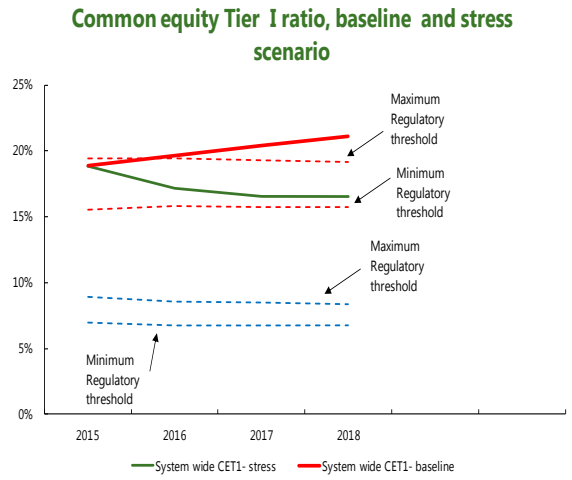
39. The differences in the system wide CET1 ratios in the bottom up test and IMF TD exercise were significant. In comparison to the cumulative drop of 2.3 percentage point in the bottom up exercise, the system wide CET1 ratio fell by 4 percent points in the IMF top down test over the first three years. As mentioned before, the differences were explained by additional elements considered in the IMF framework: (i) larger funding costs that made net interest income smaller, (ii) depreciation of SEK that affected the RWAs; and (iii) more conservative projection of credit losses under the IMF framework.

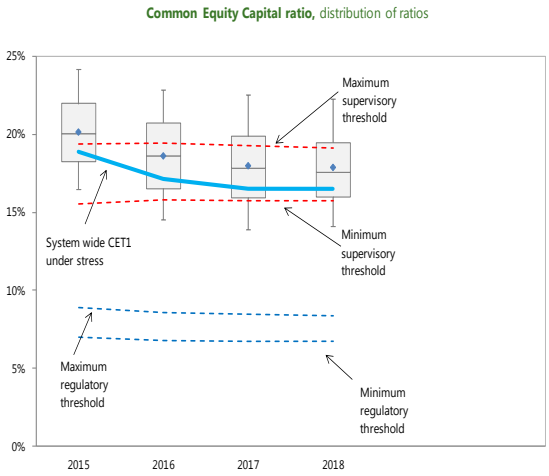
Table 10. Sweden: Differences Between Solvency Stress Testing Approaches

	IMF top down approach	Bottom up/EBA	Top down by the authorities
Scenarios	• Baseline: IMF WEO • Stress: EBA + more conservative interest rate shocks + depreciation of SEK	• Baseline: EBA • Stress: EBA	• Baseline: IMF WEO • Stress: EBA + more conservative interest rate shocks + depreciation of
Length of scenarios	5 years	3 years	5 years
Capital hurdle rates	Basel III minimum requirement+buffers	No hurdle rate (IMF hurdle rates imposed)	No hurdle rate (IMF hurdle rates imposed)
Methodology	Balance sheet approach • Net interest income: maturity gap and EBA guidance on lending and funding rates • Trading income and AOCI: modeling and duration approach • Provisions: credit losses model	2016 EBA methodology	Framework based on the credit losses model
Risk weighted assets	Credit risk RWAs: IRB formula; Market and Operational RWAs from BU test; Corporate risk weight floor	Bank's own calculations consistent with EBA guidance	Assumption: RWAs increase by 7.5 percent each year in the first three years and 0 afterwards
Projected loans and total assets	Held fixed in the stress scenario; modeled in the baseline	Held fixed in the stress and the baseline scenario	Held fixed in the stress and the baseline scenario
Data used	Supervisory data	Granular supervisory data	Publicly available data
Important Income statement items not considered	Net interest income on derivatives	NA	Assumption: pre-provision profits lower by 20 percent comparing to 2015
Dividend distribution	Dividend distribution rule as a function of capital ratio	EBA guidance on dividend distribution	If after tax net profit is positive, a dividend of 75% was assumed
One-time factor shocks	IRRBB, Counterparty shock, FX swaps' market shutdown, Market risk shock in the trading, AFS book and CVA	NA	NA

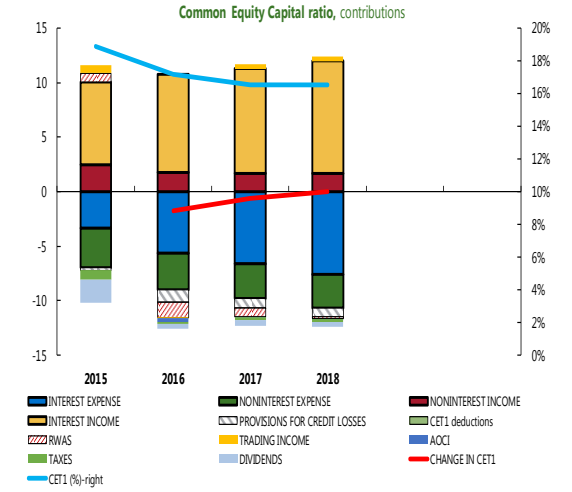
Source: EBA, IMF Staff, Finansinspektionen, Riksbank.

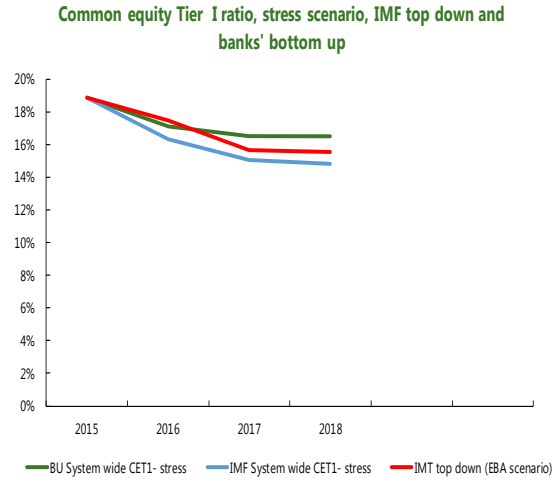
Figure 8. Sweden: Stress Testing Results: Stress Scenario, Bottom-up

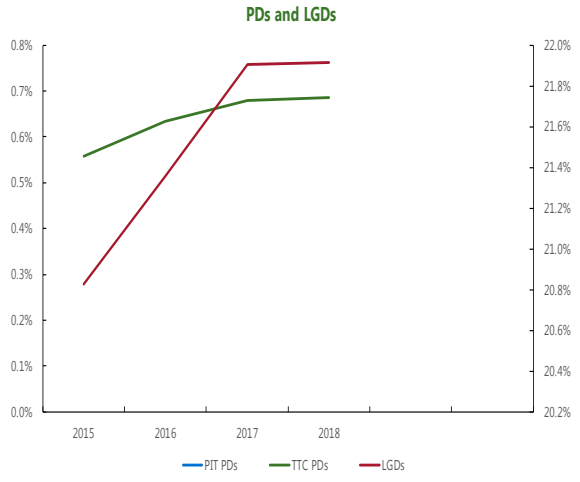




Source: EBA, IMF Staff calculations







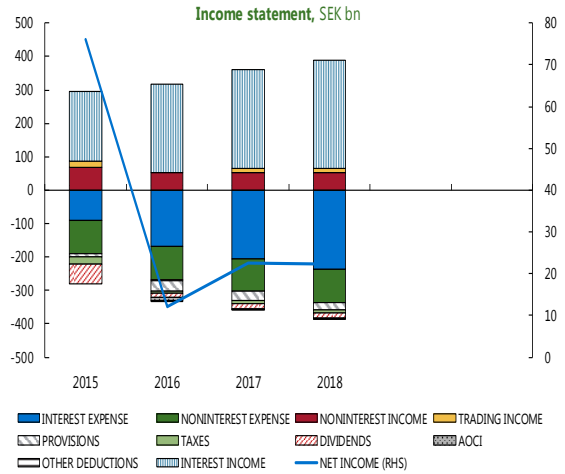
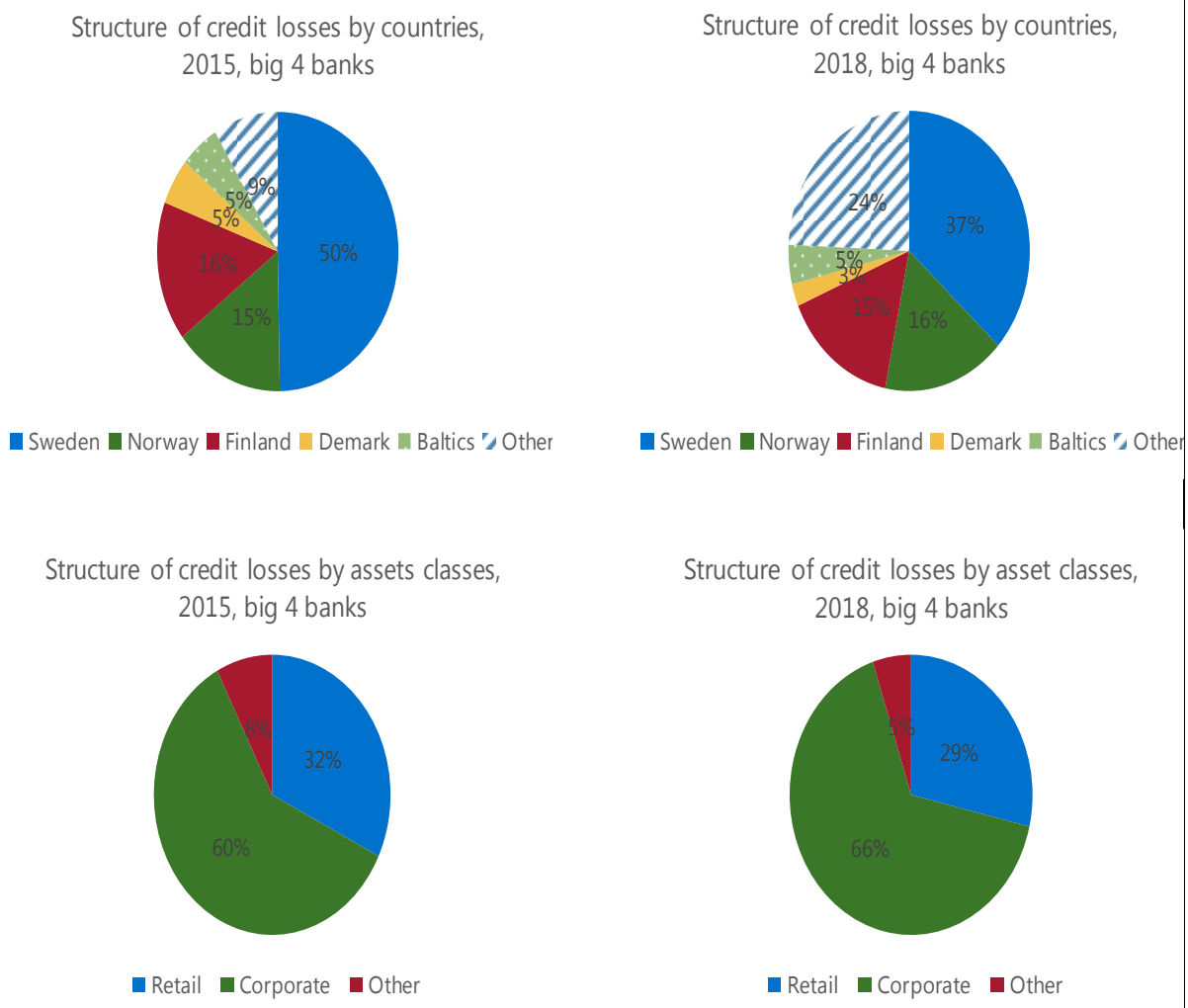


Figure 9. Sweden: Credit Losses in the Bottom-up Stress Test



Source: EBA, IMF Staff calculations.

B. The Authorities Stress Test

40. The authorities projected banks' capital ratios to be stable under the baseline scenario (Panel 9). The negative effect on capital coming from dividend pay-outs and higher RWAs due to expansion of balance sheets matched the positive effect of net income.

41. The results of the authorities' top down stress test suggest that banks are resilient to shocks of the stress scenario. Over the three years of the stress testing horizon, the system-wide CET1 would fall by 4.9 percentage points and all banks fell below the supervisory threshold but no bank would fall below the regulatory threshold. Higher provisions for credit losses which increased 18 times in 2016 was the most important factor behind the dynamics of the system-wide CET1 ratio.

42. Due to large differences in methodologies, it was very difficult to compare the results of the authorities' top down exercise to the results of the IMF or EBA approach. In comparison to the cumulative drop of 4 percentage points in the IMF top down exercise, the system wide CET1 ratio fell by 4.9 percent points in the authorities' top down test over the first three years. The

differences were mainly due to the different methodologies used to estimate the effects of the stress scenario on income statements of the banks. The authorities modeled credit losses only and applied the haircut on pre-provision net income. As a consequence, the effects of interest shocks on net interest income, the main determinant of net income in the IMF exercise, were not assessed in a consistent way. However, they were indirectly picked up in the projection of credit losses. In addition to different modeling approaches to credit losses, this was one of the main reasons for the large difference between the projection of credit losses under the IMF TD approach and the authorities' TD approach-- the estimates of the cumulative credit losses (2016-2018) in the authorities' top down exercise were three times larger than in the IMF stress test, or five times larger than in the EBA exercise.

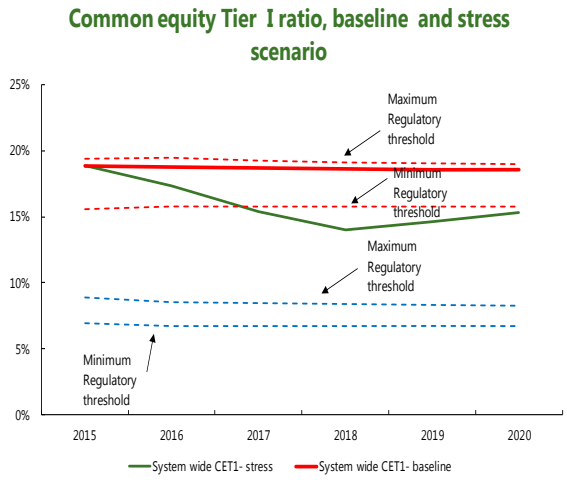
C. Recommendations

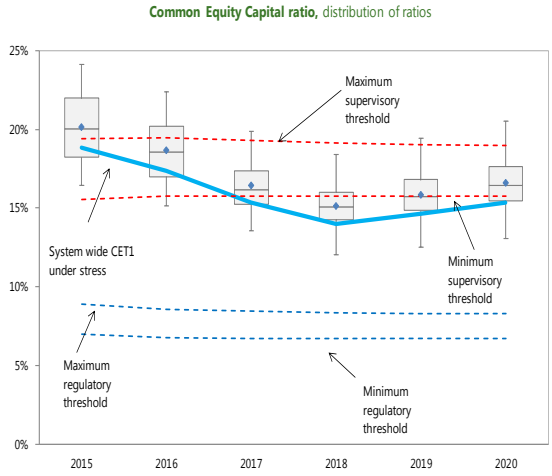
43. The solvency exercise has suggested there are some shortcomings in terms of data gaps and the authorities' stress testing framework that need to be addressed to strengthen the monitoring of solvency risks. In particular:

- FI and Riksbank should improve their scenario-based solvency stress test. The authorities' stress testing framework is based on too many ad hoc assumptions (on pre-provision income and RWAs in particular). However, there is merit to start using modeling approaches that would replace these assumptions and allow projections of all the main elements of balance sheets and income statements of banks that would be consistent with scenarios. A key benefit of such a framework would also be the enhanced ability to validate results of the EBA/bottom-up tests. More frequent monitoring of solvency risks could be done by using market-based solvency and shortfall measures.

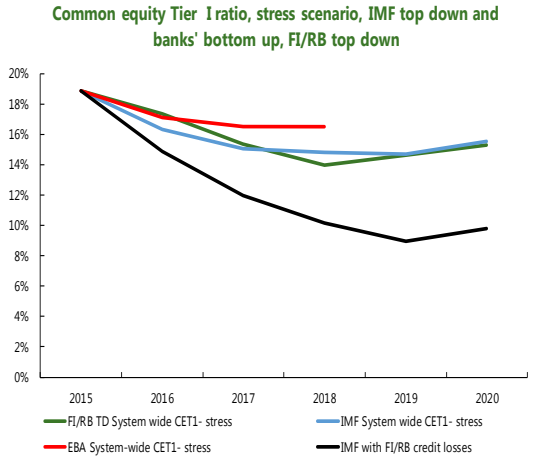
- As a prerequisite for the scenario-based stress testing framework, data gaps should be closed. FI should start collecting longer time series (possibly going back to the 1990s crisis) of balance sheet and income statement data adjusted for mergers and acquisitions and regulatory changes. FI should start collecting more granular data on trading and net interest income, including on derivatives income in a way that would ensure comparability across banks, with a breakdown between centrally-cleared and over-the-counter transactions, to better understand and monitor market risks.

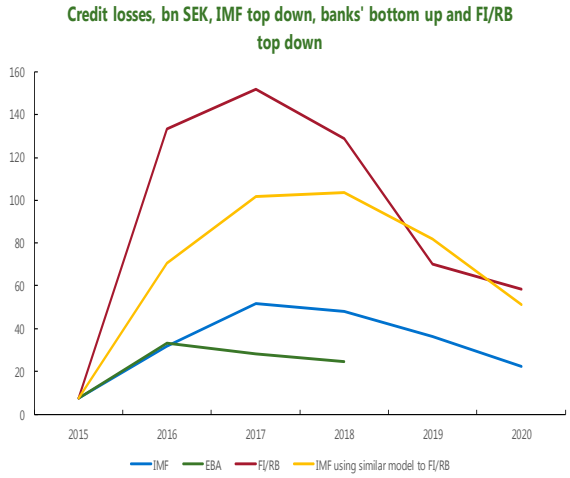
Figure 10. Sweden: Stress Testing Results: Stress Scenario, Authorities' Top-down

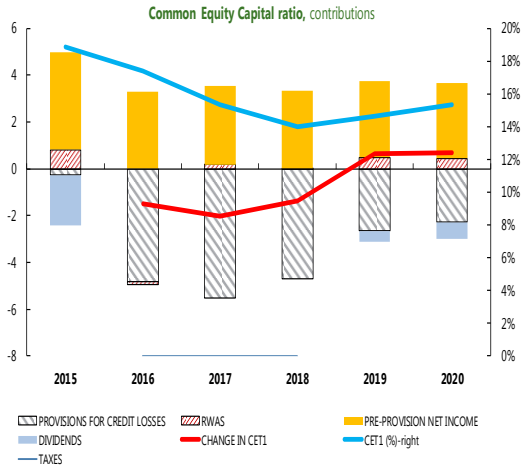


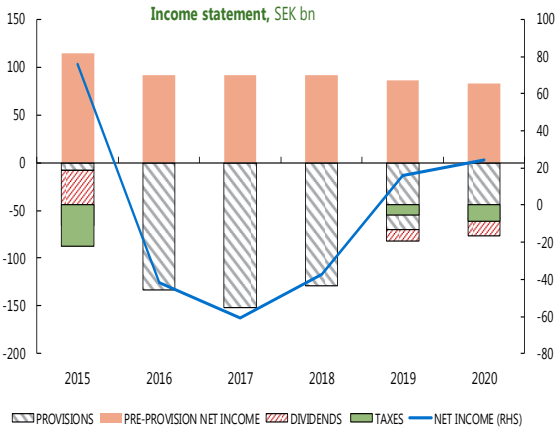


Source: IMF Staff, Finansinspektionen, Riksbank









LIQUIDITY STRESS TESTS FOR BANKS

44. This section explains the top-down liquidity stress tests that were applied on a bank-by-bank basis in the 2016 Sweden FSAP. The FSAP team performed a liquidity stress test to assess the resilience of the banking sector to sudden, sizable withdrawals of funding. While some elements of the liquidity risk were incorporated in the solvency exercise (e.g. the funding risk), the liquidity risk analysis was completed separately from the solvency stress testing.

A. Assumptions

45. The first set of tests covered the Swedish LCR and the proxy NSFR by different currencies. The tests were done as stand-alone tests. The thresholds were set at 100 percent for both metrics. While the IMF used the supervisory, consolidated data for the LCR, the NSFR numbers were mapped from NSFR templates banks report to COREP into Basel III NSFR categories.

46. For the LCR and NSFR, the tests considered two scenarios.

- *LCR (Table 11):* A baseline scenario was calibrated to reflect adjustment factors consistent with the Swedish LCR regulation.[20] The objective of the stress scenario was to apply larger run-off rates on wholesale funding and larger haircuts on liquid assets to examine sensitivity of different elements of the LCR to changes in the LCR parameters.[21] Off-balance sheet items not reported in the LCR (e.g. guarantees to non-financial customers) due to narrow definition of the LCR outflows with respect to off-balance sheet items were also taken into account when assessing outflows, as part of a separate baseline scenario.[22] While these facilities are not part of Swedish LCR regulation they might be an important source of liquidity pressures during periods of stress.

- *NSFR (Table 12):* A baseline scenario mirrored the Basel III NSFR parameters. The parameters of the stress scenario were adjusted by 10 percentage points comparing to the baseline.

47. The second test pertained to an implied cash flow analysis by different currencies. This test, similarly to the LCR, aims to capture the risk that a bank fails to generate sufficient funding to satisfy payment obligations due to scheduled and unscheduled net cash outflows and/or restricted ability to access funding markets. In comparison to the LCR, the cash flow test took into account different maturities of assets and funding sources by performing the test for different time horizons. The test was also more flexible with definition of liquid assets, net inflows and outflows, haircuts and run-off and roll-off rates.

48. The implied cash flow test simulated an outflow of funding over a period of 1 day to more than 10 years. The structure and granularity of asset, liabilities (for the purposes of defining outflows and inflows) and counterbalancing capacity items and maturity buckets was based on a

[20] The Swedish LCR regulations are based on the LCR originally proposed by the Basel Committee in 2010, which is more conservative than the revised proposal from 2013.

[21] The stress scenario parameters were broadly consistent with the Lehman type liquidity squeeze, as documented by Schmieder and others (2011).

[22] Banks report those items to FINREP.

maturity ladder provided by the authorities. The IMF liquidity stress test results were assessed using the ratio of net cash outflows to counterbalancing capacity.

49. The following assumptions were made in the cash flow exercise.

- The open maturity outflows were included in the net cash outflows.
- When a bank uses a counterbalancing capacity to meet net outflows, a proportion of inflows is assumed to disappear. The proportion corresponded to the share of the asset sold to meet the net outflow.
- The calibration of outflows and inflows broadly followed the calibration of the Swedish LCR. The calibration of parameters beyond 30 days broadly followed the NSFR calibration.
- Inflows and outflows related to derivatives were not considered.

50. As for the cash flow stress test, the calibration of parameters was informed by the LCR (for shorter maturities) and NSFR (for longer maturities) parameters. In general, the objective of the calibration was to assess the liquidity profile of the bank in a scenario characterized by outflows of at least 20 percent of funds within three months and additional 5–10 percent within next three months (Appendix 2). The calibration of run-off rates on outflows across different funding sources and different maturities in USD and EUR was more stringent to reflect the fact that foreign sources of funding are more volatile. The run off rates on wholesale funding in foreign currency were higher by 10 percentage points and on deposits in foreign currency by 5 percentage points.

Table 11. Sweden: LCR Calibration

	Baseline	Adverse
	Weight	
HQLA		
Level 1 Assets		
Coins and bank notes	0%	0%
Qualifying marketable securities form sovereigns, central banks, PSEs, and multilat. Dev banks		2%
Qualifying central bank reserves		0%
Domestic sovereign or central bank debt for nonzero risk-weighted entities (**regarded as level 2A in the Swedish LCR framework**)	15%	25%
Level 2A Assets		
Qualifying marketable securities form sovereigns, central banks, PSEs, and multilat. development banks (with 20% risk weighting)	15%	25%
Qualifying corporate debt securities rated AA- or higher		
Qualifying covered bonds rated AA- or better		
OUTFLOWS	Weight	
Retail Deposits		
Demand deposits (Stable deposits)	5%	8%
Demand deposits (Less stable retail deposits)	10%	15%
Term deposits, residual maturity > 30d	0%	0%
Unsecured Wholesale Funding		
Demand and term deposits, residual maturity < 30d, small, medium, and large business (Stable deposits)	5%	10%
Operational deposits generated by clearing, custody, and cah mgt activities	25%	50%
Cooperative banks in an institutional network	75%	100%
Other legal entity customers	100%	100%
Secured Funding		
Secured funding with a central bank, or backed by Level 1 assets	0%	2%
Secured funding backed by Level 2A assets	25%	50%
Secured funding backed by non-Level 1 or non-Level 2A asset, with domestic sovereign, multilat dev banks, or domestic PSEs as a counterparty	100%	100%
Undrawn but committed credit and liquidity facilities		
Undrawn loan commitments (household)	5%	10%
Undrawn credit facilities (non financial corporates)	10%	20%
Undrawn liq. facilities (household and non financial corporates), **done separately**	50%	50%
Other undrawn credit or liquidity facilities	100%	100%
Additional Requirements		
Valuation changes on Level 1 posted collateral	0%	0%
Valuation changes on Level 2a posted collateral	15%	30%
Valuation changes on Level 2b posted collateral	20%	40%
Net derivate cash outflows	100%	100%
Increased liquidity needs related credit valuation	100%	100%
Additional contractual loan commitments	100%	100%
Any other contractual cash outflows (not listed above)	100%	100%
Inflows	Weight	
Level 1 assets	0%	0%
Level 2a assets	5%	5%
All other assets (Complement of roll-off rate may varie between 0 and 50 %)	5%	5%
Credit or liquidity facilities	0%	0%
Operational deposits held at other financial institutions	25%	25%
Net derivative cash inflows	100%	100%
Other (contractual) cash inflows	100%	100%

Source: IMF Staff.

Table 12. Sweden: Proxy NSFR Calibration

	Baseline	Adverse
ASF Factor 100%		
(a) Total regulatory capital	100%	100%
(b) Other capital instruments with effective maturity of one year or more	100%	100%
(c) Liabilities with effective residual maturity of one year or more	100%	100%
ASF Factor 95%		
Stable non-maturity (demand) deposits and term deposits with residual maturity of less than one year provided by retail and SME customers	95%	92%
ASF Factor 90%		
Less stable non-maturity (demand) deposits and term deposits with residual maturity of less than one year provided by retail and SME customers	90%	85%
ASF Factor 50%		
(a) Funding (secured or unsecured) with residual maturity of less than one year provided by non-financial corporate clients	50%	40%
(b) Operational deposits	50%	40%
(c) Funding with residual maturity of less than one year from sovereigns, public sector entities (PSEs), and multilateral and national development banks	50%	40%
(d) Other funding (secured or unsecured) with residual maturity of not less than six months and less than one year not included in the above categories, including funding provided by central banks and financial institutions	50%	40%
ASF Factor 0%		
(a) All other liabilities and equity categories not included in the above categories, including liabilities without stated maturity	0%	0%
(b) Derivatives payable net of derivatives receivable, if payables are greater than receivables	0%	0%
	Baseline	**Adverse**
RSF Factor 0%		
(a) Coins and banknotes	0%	0%
(b) All central bank reserves (including required and excess reserves)	0%	0%
(c) Unencumbered loans to banks subject to prudential supervision with residual maturity of less than six months	0%	0%
RSF Factor 5%		
Unencumbered Level 1 assets - excluding coins, banknotes and central bank reserves (above)	5%	10%
RSF Factor 15%		
Unencumbered Level 2A assets	15%	25%
RSF Factor 50%		
(a) Unencumbered Level 2B assets	50%	60%
(b) HQLA encumbered for a period of six months or more and less than one year	50%	60%
(c) Loans to banks subject to prudential supervision with residual maturity six months or more and less than one year	50%	60%
(d) Deposits held at other financial institutions for operational purposes	50%	60%
(e) All other assets not included in the above categories, including loans to non-bank financial institutions, loans to non-financial corporate clients, loans to retail and small business customers, and loans to sovereigns, central banks and PSEs	50%	60%
RSF Factor 65%		
(a) Unencumbered residential mortgages with a residual maturity of one year or more and with a risk weight of less than or equal to 35%	65%	75%
(b) Other unencumbered loans not included in the above categories, excluding loans to financial institutions, with a residual maturity of one year or more and with a risk weight of less than or equal to 35% under the *Standardized Approach*	65%	75%
RSF Factor 85%		
(a) Other unencumbered performing loans with risk weights greater than 35% under the *Standardized Approach* and residual maturity of one year or more, excluding loans to financial institutions	85%	95%
(b) Unencumbered securities that are not in default and do not qualify as HQLA including exchange-traded equities	85%	95%
(c) Physical traded commodities, including gold	85%	95%
RSF Factor 100%		
(a) All assets encumbered for a period of one year or more	100%	100%
(b) Derivatives receivable net of derivatives payable, if receivables are greater than payables	100%	100%
(c) All other assets not included in the above categories, including non-performing loans, loans to financial institutions with residual maturity of one year or more, non-exchange-traded equities, fixed assets, pension assets, intangibles, deferred tax assets, retained interest, insurance assets, subsidiary interests, and defaulted securities	100%	100%
Off-Balance Sheet Categories		
RSF Factor 5%		
Irrevocable and conditionally revocable credit and liquidity facilities to any client	5%	10%
RSF Factor at the discretion of national supervisors, based on their national circumstances		
(a) Unconditionally revocable credit and liquidity facilities	5%	5%
(b) Trade finance-related obligations (including guarantees and letters of credit)	5%	5%
(c) Guarantees and letters of credit unrelated to trade finance obligations	5%	5%
(d) Non-contractual obligations such as: potential requests for debt repurchases of the bank's own debt or that of related conduits, securities investment vehicles and other such financing facilities; structured products where customers anticipate ready marketability; and managed funds that are marketed with the objective of maintaining a stable value	5%	5%

Source: IMF Staff.

B. Results

51. While all banks could withstand short-term liquidity shocks consistent with parameters of the Swedish LCR regulation, some banks would face short-term liquidity pressures if faced with more severe shocks due to reliance on unsecured wholesale funding (Panel 10).

- Under the baseline, the LCR test indicates that banks would be able to endure market and funding shocks as characterized by withdrawal of funds and haircuts on liquid assets of the Swedish LCR (which are more conservative than Basel III LCR parameters). The aggregate LCR (in all currencies) is above 100 percent for all banks which suggests that most banks would be able to meet outflows by a combination of sales of liquid assets (mainly government securities and covered bonds) and inflows on reverse repo and securities borrowing transactions. While the LCR in SEK for three banks is below 100 percent, the liquidity shortfall in SEK is more than compensated by large buffers in convertible currencies (USD, EUR).

- Under the scenario where the off-balance sheet item not included in the Swedish LCR taken into account the aggregate LCR of one bank falls below 100 percent.

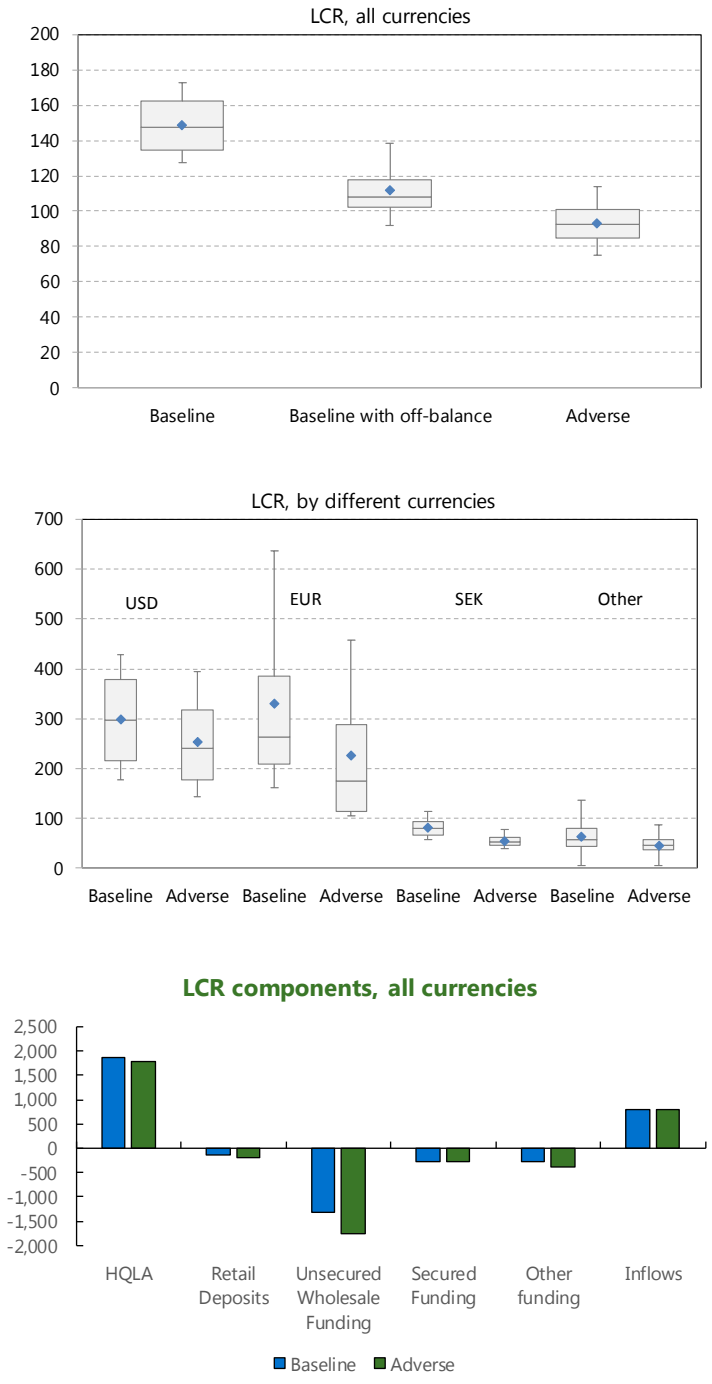
- Reliance on unsecured wholesale funding, in particular operational deposits, poses more risks for all banks in the stress scenario that is characterized by more severe disruptions in the unsecured wholesale markets. In this scenario, three banks would fall below 100 percent.

52. Similarly, medium term liquidity problems could arise in a severe stress scenario. While the test based on the proxy NSFR suggests that most banks would fall below the threshold of 100 percent (Panel 11), the Basel III NSFR numbers for all banks are almost 100 percent. The authorities noted that all the banks are prioritizing the NSFR and have a strategy to become NSFR-compliant well ahead of the expected EU NSFR requirement of January 1, 2018. However, if faced with larger shocks, as characterized by parameters in the stress scenario, all banks will not be able to maintain a stable funding profile in relation to the composition of their assets and off-balance sheet activities. The authorities acknowledged that the main source of funding risk for the banks is associated with the stability of their wholesale funding relative to assets and they encourage the banks to further improve their NSFR ratios.

53. Moreover, the cash flow analysis shows that two banks would have medium term funding problems if faced with severe and long lasting liquidity and market shocks. The analysis confirms the findings of the LCR test that suggests that some banks would face short term liquidity problems in SEK. The analysis also shows that some banks would face medium-term liquidity pressures (1 month–12 months) if they are hit by large funding shocks that lasts for a long time. This is mostly due to large outflows with respect to short term paper issued in foreign currency over the period between one month and 12 months and the test's assumption that the bonds holders do not roll-over this particular bonds once it matures. This is potentially inconsistent with the findings of the Basel III NSFR (in the baseline) that suggests that banks could withstand large liquidity shocks over a period of one year. While this inconsistency could be due to different nature of the two tests and different sizes of shocks applied in the two tests the authorities are encouraged

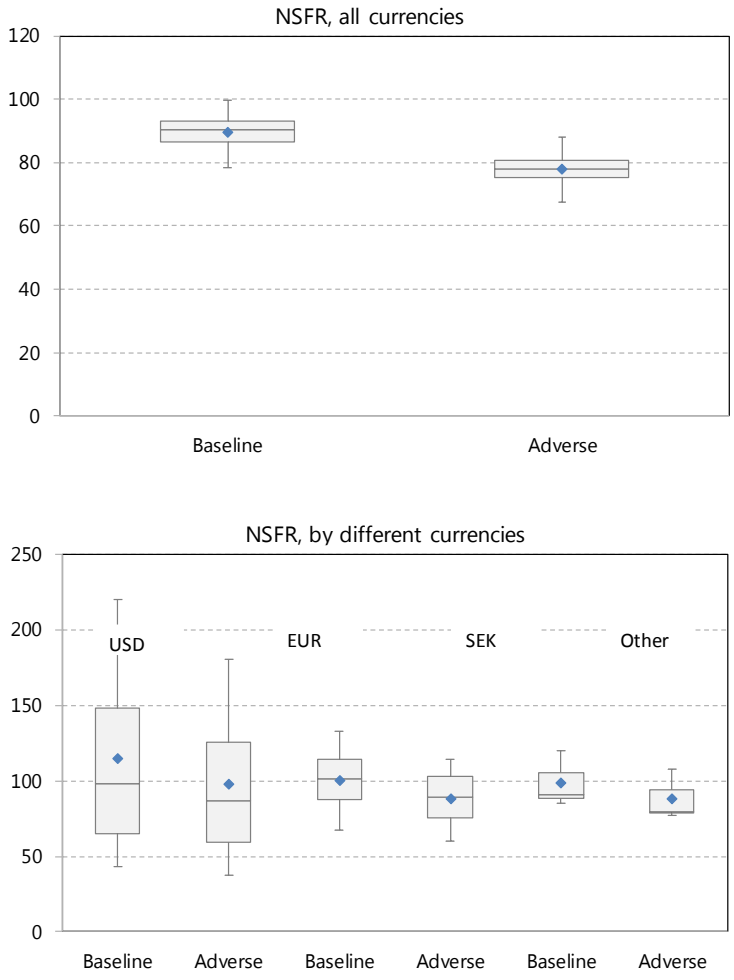
to further explore the reasons behind the differences. Other banks seem resilient to the shocks applied mostly due large buffers of liquid assets that are also a source of large inflows-- around 20-25 percent of total inflows mature within 3 months, mostly related to exposures to central banks.

Figure 11. Sweden: The LCR Test



Source: Finansinspektionen and IMF Staff calculations.

Figure 12. Sweden: The Proxy NSFR Test



Source: Finansinspektionen and IMF Staff calculations.

C. Recommendations

54. While the authorities' stress testing framework is comprehensive, the exercise has suggested that there is room for improvement which will enhance the authorities' ability to identify and monitor emerging liquidity risks. In particular:

- *NSFR.* In addition to the NSFR liquidity measure that is based on COREP NSFR templates and only approximates the NSFR, the authorities are encouraged to start collecting granular data on available and required stable funding based on Basel III NSFR for all significant currencies to calculate and monitor the Basel III NSFR.

- *Maturity ladder exercise.* The authorities' maturity ladder exercise should be improved significantly by including features of the 2016 FSAP cash flow stress test.

NETWORK ANALYSIS FOR BANKS

55. The FSAP's network analysis was based on the work by Espinosa-Vega and Solé (2010) conducted by the Riksbank to address confidentiality concerns. The test consisted of simulating credit and funding shocks within a network of four largest banks and then tracking the contagion effects in terms of capital losses and path of bank failures. The default of a bank in the exercise was defined using the regulatory hurdle rate. The supervisory hurdle rate was also used in the sensitivity analysis. For the credit shock, it was assumed that the domino effects will be triggered if each of the four banks defaulted (one at a time) on their respective credit commitments. For the funding shock, it was assumed that the default of bank also leads to a liquidity squeeze for those banks funded by the defaulting bank[23]. In this case, the credit shock was compounded by a funding shock and the associated fire sale losses. The dataset included unsecured lending (mainly deposits and overnight loans), securities (mainly covered bonds reported on a net basis i.e. after risk-mitigating instruments), and derivatives reported at the end of 2015. The dataset did include cross-holdings of repo agreements and equities. Parameters for LGD, and the share of funding previously granted by the defaulted banks that non-defaulted banks are unable to replace and the fire-sale discount were set to 25 percent. In the sensitivity analysis the parameters were doubled.

56. The results suggest that losses due to contagion are modest and that banks hold enough capital to sustain credit and funding shocks to a single counterparty bank.

- The baseline simulations (parameters set at 25 percent) where regulatory hurdle rate was used to define a default did not trigger contagion chains among the four banks. This is likely due to the fact that banks are well capitalized (comparing to the regulatory threshold) and hold large capital buffers. The same results were delivered by simulation that uses the supervisory hurdle rate to define a default.

- While not large enough to trigger a second round of contagion, the capital losses born by each bank were modest and ranged between 1 percent of bank's CET1 capital to 9.5 percent. This was likely a consequence of large collateralization of interbank exposures (covered bonds in particular).

57. Extreme shocks were needed to bring about large losses. In the sensitivity analysis the parameters that measure LGD, the severity of an institution's funding squeeze vis-à-vis the defaulting bank and the haircuts due to the fire sales associated with the funding squeeze were doubled, from 25 percent to 50 percent.

- Even in this scenario the second-round defaults were not triggered. However, losses increased to 3.5–22 percent of CET1 capital.

[23] It was assumed that the funding-shortfall induced loss absorbed by bank's capital.

- Second round defaults were triggered with the same parameters but with stark and a likely unrealistic assumption that the supervisory hurdle rate defines a default. Losses amounted up to half of CET1 capital.

Figure 13. Sweden: Network Analysis with Credit and Funding Shocks

Baseline simulation (parameters=25; threshold set at supervisory and regulatory threshold)

Default of bank	Loss borne by bank (of initial CET1 capital)			
	Bank 1	Bank 2	Bank 3	Bank 4
Bank 1		-4.0%	-2.1%	-3.3%
Bank 2	-4.2%		-1.1%	-1.3%
Bank 3	-7.4%	-3.5%		-3.2%
Bank 4	-9.5%	-3.3%	-3.5%	

Adverse simulation (parameters=50; threshold set at regulatory threshold)

Default of bank	Loss borne by bank (of initial CET1 capital)			
	Bank 1	Bank 2	Bank 3	Bank 4
Bank 1		-9.5%	-7.5%	-8.3%
Bank 2	-10.2%		-4.0%	-3.4%
Bank 3	-15.0%	-7.1%		-6.8%
Bank 4	-21.9%	-7.6%	-10.0%	

Adverse simulation (parameters=50; threshold set at supervisory threshold)

Default of bank	Loss borne by bank (of initial CET1 capital)			
	Bank 1	Bank 2	Bank 3	Bank 4
Bank 1		-24.2%	-21.5%	-18.5%
Bank 2	-10.2%		-4.0%	-3.4%
Bank 3	-47.1%	-24.2%		-18.5%
Bank 4	-47.1%	-24.2%	-21.5%	

Source: Riksbank.

58. The caveats of the contagion analysis likely underestimated the contagion risks. In particular:

- Not all interbank transactions were included in the analysis. Repo instruments and equity were not part of the exercise.
- The analysis was unable to assess the potential impact of contagion feedbacks arising from other segments of the financial sector in Sweden or abroad (e.g., the default of an insurance company in Sweden or if banks are exposed to a common funding source of funding such as covered bonds held by foreign investors).
- Liquidity pressures stemming from replacing covered bonds issued by defaulted bank by mortgages were not captured by the exercise. The liquidity profile of a bank that takes over illiquid mortgages of a defaulted bank as collateral in liquid covered bonds issued by the defaulted bank might change substantially given the large share of covered bonds in liquid assets. These liquidity risks and its link to solvency were not included in the exercise.

59. The authorities are encouraged to address the caveats of the contagion exercise to strengthen the monitoring of spillover risks. The authorities should start collecting all interbank exposures and exposures between different financial institutions, including collateralized and uncollateralized and on and off balance sheet items, including all types of derivatives. This would improve the contagion exercise and allow the authorities to understand better the linkages within a particular sector and between different financial sectors. Moreover, the contagion exercise should consider richer market dynamics in the simulations (e.g., by taking into account counterparty risk in FX swaps or changing liquidity profile of banks, and its consequences for solvency, that take on mortgages for covered bonds of a defaulted bank). To further strengthen the spillover analysis, including by capturing cross border spillover risks and interconnectedness risks between different domestic financial institutions, the authorities could use market-price based network analysis that extract interconnectedness risks from market prices[24].

SOLVENCY STRESS TESTS OF INSURANCE COMPANIES

60. This section explains the IMF stress test of insurance undertakings. The section covers: (i) the scope of the test; (ii) the scenario specification for the BU and TD stress tests as well as the range of additional one-factor sensitivity analyses; (iii) the modelling assumptions; and (iv) the results of the exercises.

[24] Please see Luis Brandão-Marques, Benjamin Huston, and Marco Piñon, 2016: Nordic linkages, IMF Working Paper, forthcoming, who describe and quantify financial linkages within the Nordic region and with the rest of the world, using market data.

A. Scope of the Test

61. Solvency II[25] was implemented in 2016 and forms the basis for the insurance stress test. Also the reference date for the ST exercises was set to January 1, 2016 so that it coincides with the implementation date of the new regulatory regime. For the pre-stress valuation of assets and liabilities before stress, the opening balance sheet under Solvency II should be used. Insurance undertakings under the Solvency I transitional, shall apply the valuation methods as determined by national regulations.

62. Seven insurance companies participated in the ST, accounting for a representative sample of the market. In the Swedish life sector, which is characterized by high concentration, a coverage of 78 percent is reached by including four large undertakings. The non-life sector is more heterogeneous: While a market coverage of 53 percent can be reached by including three undertakings, a considerably larger number would have to be included to lift the coverage ratio above the IMF's target of 70 percent. To limit the burden on participating undertakings, the exercise did therefore not include small insurers, many of which are active only on a regional basis.

63. The stress test was run at the highest level of consolidation which includes all world-wide insurance activities, however especially life business is predominantly written in Sweden. With large parts of life business being performed as occupational pensions insurance, a Sweden-specific product, 99 percent of technical provisions are domestic exposures. In the smaller non-life sector, 36 percent of the technical provisions are related to business within Sweden.

B. Scenario Specification

64. The FSAP stress test includes two scenarios, of which one is taken from the EIOPA exercise ("scenario 1") and the other one is designed fairly in line with the IMF's stress scenario also used for the banking sector stress test ("scenario 2").

65. From the EIOPA ST, the "double-hit" scenario was utilized for the FSAP exercise.[26] As the EIOPA Stress Test is performed on a solo basis and only for those undertakings offering interest guaranteed products, the scope of the IMF stress test needs to be slightly widened to provide a more complete assessment of the stability of the Swedish insurance sector. The scenario should therefore be calculated by the participating undertakings on a consolidated level. As regards the technical details of this scenario, refer to the Technical Specifications as published by EIOPA.

66. The macrofinancial scenario specified by the IMF for the banking sector stress test was in some aspects slightly adjusted and amended for the purpose of the insurance stress test.

[25] Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance

[26] For details on the scenario, refer to the technical specifications published by EIOPA: https://eiopa.europa.eu/Publications/Surveys/EIOPA-BoS-16-109%20ST2016%20Technical%20Specifications%20%2820160601%29.pdf

While it includes a projection of macro and market variables for the next five years, for the insurance stress test all shocks were assumed to occur at the beginning of the first year (instantaneous shock).

67. To cover the most relevant risk factors for an insurer's balance sheet, specifically the market risk shocks have been defined granularly. The scenario includes shocks to the risk-free interest rate, equity and property prices, credit spreads of corporate and sovereign bonds as well as a shock to the external value of the Swedish krona.

68. In addition to the market and credit risks derived from the macrofinancial scenario, a mass lapse event was added. It should be assumed that 20 percent of insurance policies for which discontinuance would result in an increase of technical provisions without the risk margin are discontinued.

69. Insurance undertakings were also requested to provide the sensitivity of their basic own funds to a range of additional risk factors. The outcome of these shocks is not added to the results of the macrofinancial scenario:

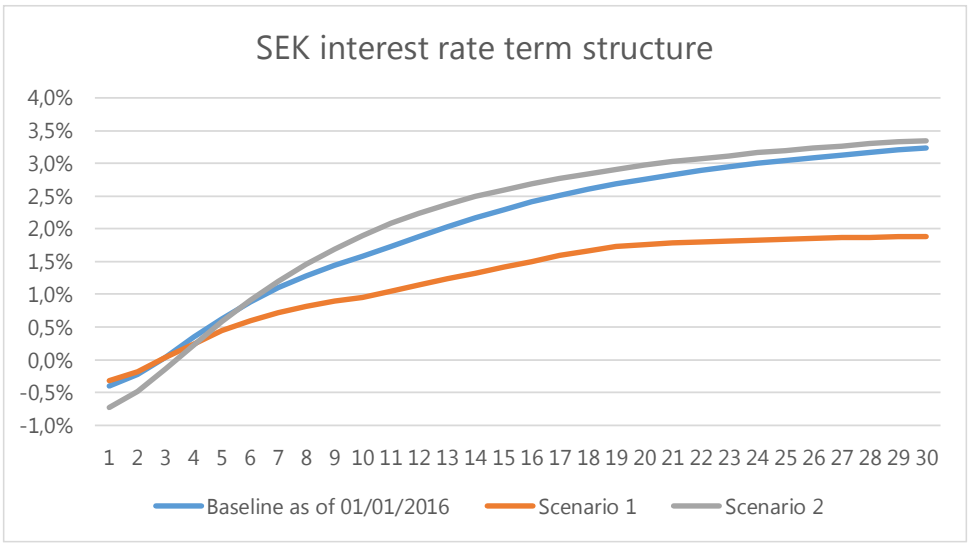
- Both life and non-life companies performed a stand-alone sensitivity analysis assuming that the credit spreads of Swedish covered bonds increase by 500 basis points.
- Life insurers calculated the sensitivities for longevity (modeled as a permanent 20 percent decrease in mortality rates, applied to all policies) and mortality shocks (modeled as a permanent 15 percent increase in mortality rates, applied to all policies) as well as a pandemic event with higher morbidity rates (modeled as a temporary 35 percent increase in disability-morbidity rates for the next 12 months).
- Property&casualty (P&C) insurers provided an estimate of the impact of two catastrophic events: The first event to be modeled is a repetition of winter storm Gudrun (also known as Erwin) which hit the Nordic region in January 2005, assuming the repetition of the storm, but the impact measured based on exposures (both domestic and foreign, if applicable) at the reference date. The second event, more relevant for non-Swedish exposures, is a repetition of hurricane Andrew which hit the United States in August 1992; again, this event was modeled based on the exposures of the reference date. In addition, for each catastrophic event, insurance undertakings provided the reinsurance recoveries from the participant's five largest reinsurers (on a group basis).

Table 13. Sweden: Specification of Market and Credit Risk Shocks for the Insurance Stress Test

		EIOPA Double-hit scenario ("Scenario 1")	IMF Adverse scenario ("Scenario 2")
Risk-free (swap) rate	SEK, 1 year	-60bp	-33bp
	SEK, 10 years	-63bp	+32bp
	EUR, 1 year	-60bp	-33bp
	EUR, 10 years	-61bp	+32bp
	USD, 1 year	-61bp	-33bp
	USD, 10 years	-63bp	+32bp
Stock prices	Sweden	-28.4%	-25.4%
	Other countries	-33.4% [1]	-25.4%
	Strategic participations	N/A	-10.0%
Property prices	Sweden, residential	-4.6%	-31.5%
	Sweden, commercial	-4.2%	-31.5%
	Other countries, residential	-6.7% [1]	-25.0%
	Other countries, commercial	-6.0% [1]	-25.0%
Covered bond spreads	Sweden	+20bp [2]	+78bp [3]
Corporate bond spreads	AAA	+24/16/20bp [4]	+50bp
	AA	+120/116/72bp [4]	+80bp
	A	+135/198/115bp [4]	+120bp
	BBB	+214/372/162bp [4]	+180bp
	BB	+260/432/207bp [4]	+300bp
	B or lower	+323/484/230bp [4]	+300bp
	Unrated	+350/516/247bp [4]	+200bp
Sovereign bond spreads	Sweden	+141bp [5]	+136bp
	AAA	e.g. +152bp for DE [5]	+50bp
	AA	e.g. +172bp for FR [5]	+80bp
	A	e.g. +196bp for LV [5]	+120bp
	BBB	e.g. +226bp for IT [5]	+180bp
	BB		+300bp
	B or lower		+300bp
Haircut on largest banking counterparty	Equity	N/A	-100.0%
	Subordinated bonds	N/A	-100.0%
	Uncollateralized derivative exposure	N/A	-100.0%
	Unsecured bonds	N/A	-50.0%
	Secured bonds	N/A	-15.0%
	Deposits	N/A	-15.0%
	Collateralized derivative exposure	N/A	-15.0%
Exchange rates	External value of SEK	N/A	-13.9%

Notes:
\1: EU average, no shock applied to non-EU/EEA assets
\2: for AAA-rated covered bonds, not country-specific
\3: non-Swedish covered bonds are stressed with the stress for corporate bonds
\4: for non-financials, financials and covered bonds, respectively
\5: for 10-year maturities, no shock applied for non-EU/EEA assets

Figure 14. Sweden: Interest Rate Shock



Source: EIOPA, Fund staff calculations.

Notes: The term structure for the Swedish krona, as determined under Solvency II, is based on observed market rates up to a maturity of 10 years (the so-called last-liquid point). After 10 years, the term structure converges towards an ultimate forward rate set at 4.2 percent. The term structure does not include the volatility adjustment.

C. Capital Standards and Modelling Assumptions

70. The main output of the stress test calculations is the effect on available own funds, eligible for the coverage of the solvency capital requirement (SCR). As the stresses might also affect the capital requirement, participating undertakings are encouraged to recalculate the SCR and group floor on SCR after stress (on an optional basis).

71. Companies performed the calculations of their capital requirements based on the Solvency II Standard Formula. No full or partial internal models have yet been approved by the supervisory authority for the participating firms.

72. Insurance companies have a broad range of risk-mitigating mechanisms in place which need to be modeled appropriately. The mitigating effects of profit sharing and deferred taxes were reported separately, and so were the measures of the long-term guarantee package (LTG) which can be applied as determined by the Solvency II Directive and subject to the approval of supervisory authority. Management actions could only be included in the calculations as far as these are non-discretionary rules already in place at the reference date.

73. Undertakings were further requested to provide a three-year projection of business development under scenario 2 (the IMF's macrofinancial scenario). Key figures to be projected included gross written premiums, gross claims, lapse rates, investment returns, net earnings, gross technical provisions, own funds, and the SCR. Projections had to be made in line with the macrofinancial scenario (e.g. with regard to the development of the Swedish GDP and consumer prices) while the market value of investments was assumed to stay constant after the occurrence of

shocks at the reference date which marks the beginning of the first year of the projection horizon (instantaneous shock).

74. To benchmark the results of the BU stress test, an additional top-down stress test was run by the mission team, based on input data received from Finansinspektionen and the companies. Data required from the insurance undertakings included:

- A granular breakdown of investment assets, specifically on the geographical breakdown of sovereign bond holdings, the rating distribution of the corporate bond portfolio, as well as durations and coupon rates of fixed-income investments.
- Cash-flow projections for the upcoming 60 years in line with the Solvency II contract boundaries.

75. For the TD stress test, scenarios will be applied to the cash flow projections to recalculate the technical provisions after an interest rate shock, and to investment assets; a liquidity drain will result from a mass lapse event (life insurers) and from a catastrophic event (P&C insurers). Over the projection horizon, the asset allocation is kept stable (rebalancing at annual intervals). Dividends are assumed to be paid out of net income in line with historic payout ratios as long as SCR coverage is given. No capital increases will be modelled in the top-down stress test.

D. Results

76. The Swedish life insurance companies, on aggregate, are sufficiently capitalized to withstand severe shocks on financial markets. Although aggregated coverage of the SCR declines from 196 percent to 132 and 135 percent in the BU and TD scenario 2, respectively, the majority of companies would still be able to meet the solvency capital requirements. Contrary to other European countries, the use of long-term guaranteed measures is not widespread in Sweden and the impact is therefore not distorting the pre-stress capital in any direction: The matching adjustment is not applicable to the business of life insurers, and the transitionals for the discount rate have no noteworthy effect as Sweden had introduced a widely market-consistent valuation already before the Solvency II implementation.

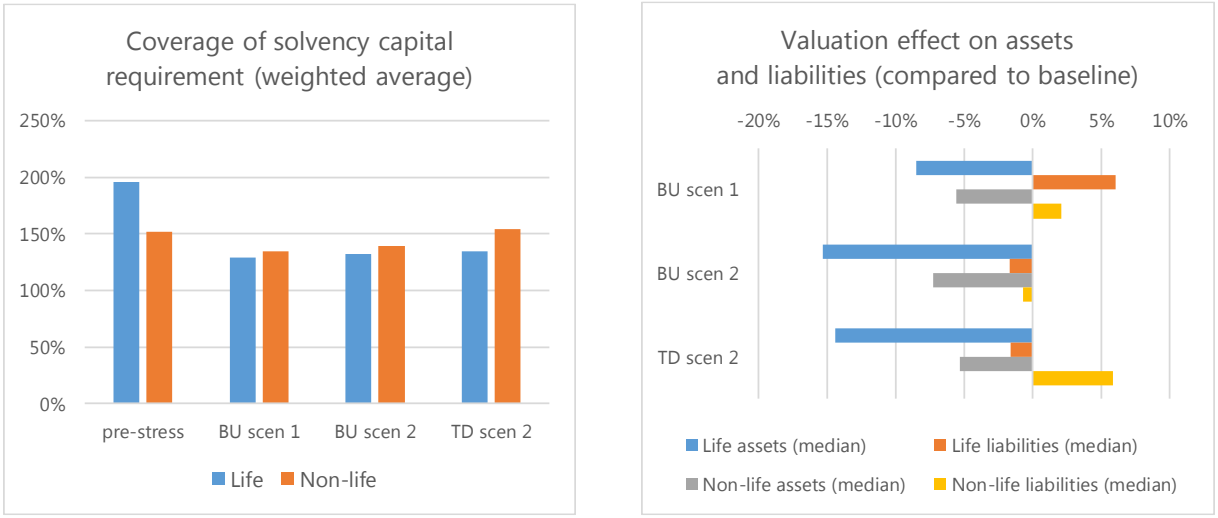
77. In the non-life sector, the immediate impact of the stress is not as pronounced as in the life sector. Compared to the life insurers, non-life companies have a lower SCR coverage before stress (152 percent for the sector as a whole), while after stress solvency ratios are at similar levels as in the life sector, amounting to 140 and 154 percent in the BU and TD scenario 2, respectively. This reflects their lower sensitivity towards market risk shocks and even a beneficial impact of the SEK depreciation.

78. The capital needs of companies not meeting their solvency capital requirement is small. The two companies whose SCR ratios fall slightly below 100 percent in both BU scenarios would need to raise on aggregate SEK 17.7 bn and 4.0 bn in scenario 1 and 2, respectively. This amounts to less than 1 percent of the Swedish GDP. Insurance companies who participated in the ST suggested that instead of raising additional capital the SCR ratio can rather easily be adapted by changing the asset allocation in the investment portfolio, mainly by switching from equity into

sovereign bonds. Such a re-allocation would lower the SCR as there is no capital charge to be held for EU/EEA or OECD sovereign bonds under Solvency II.

79. Effects of the stresses are observed on both the asset and the liability side of the balance sheet, but most prominently among investment assets. Especially under scenario 2, the aggregated market value of assets of the life insurance companies declines by about 15 percent while the liabilities remain broadly unchanged. Again, the asset-side effect is much smaller for the non-life sector where the decline ranges between 5 and 8 percent.

Figure 15. Sweden: Overview of Insurance ST Results

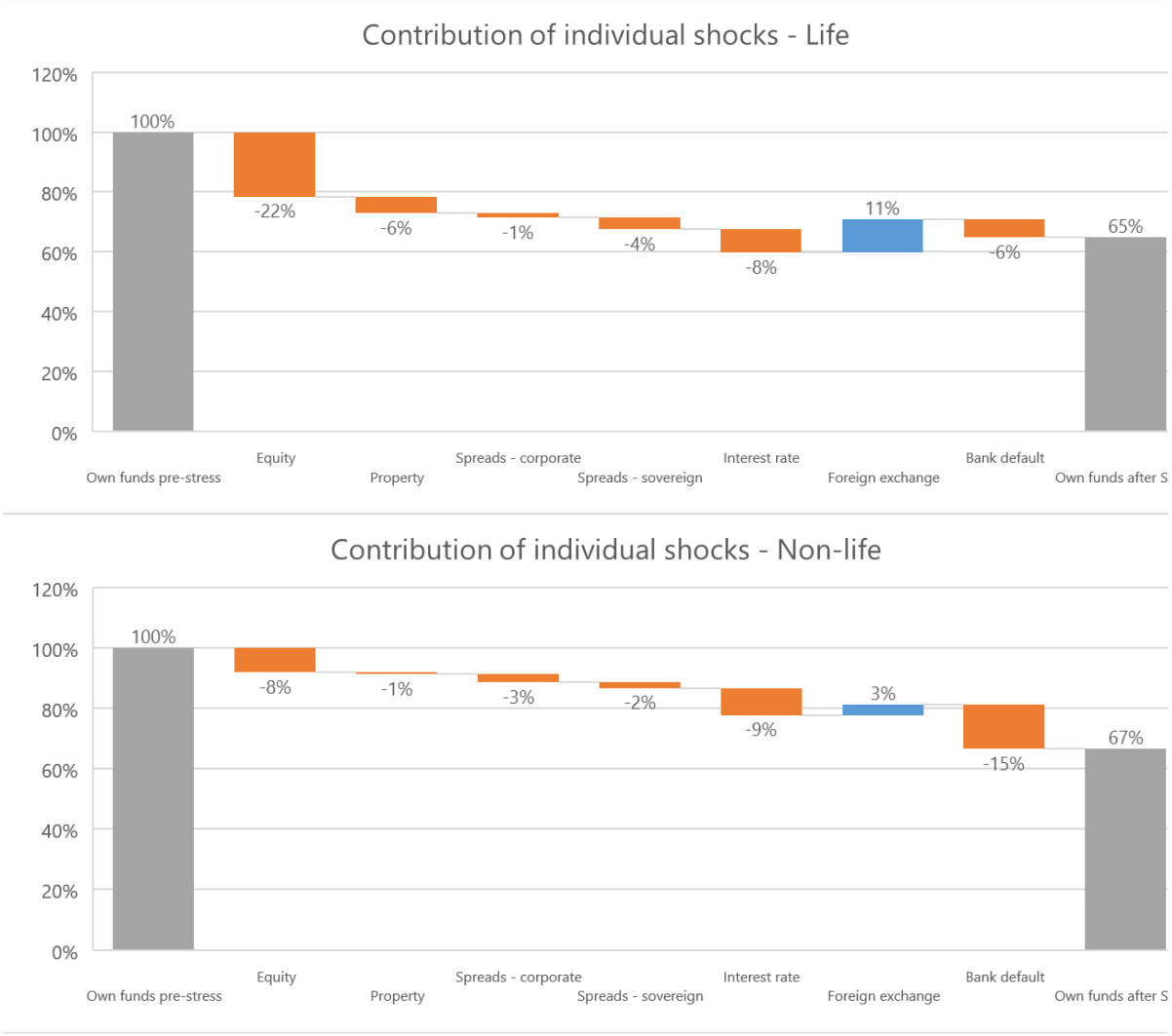


Source: Fund staff calculations based on company submissions.

80. In Scenario 2, available own funds decline by 35 percent for the life sector as a whole with the biggest single impact coming from the equity shock. The assumed 25.4 percent drop in the price of Swedish stocks brings down the available own funds of life insurers by 22 percent on aggregate. The combined effect of the interest rate change on assets and liabilities accounts for an 8 percent decline in own funds, followed by the default of the largest banking counterparty and the decline in property prices being the third- and fourth-most important risk factors. Swedish insurers tend to benefit from a depreciation of the krona, holding more assets than liabilities in a foreign currency. This should however not be interpreted as active currency speculation but is merely an effect stemming from the rather limited domestic investment universe.

81. In the non-life sector, the overall decline in own funds amounts to 33 percent, and the relative contribution of individual risk factors differs slightly from the life sector: Lower (relative) investments in equity, property and sovereign funds make non-life companies on aggregate less vulnerable while larger and riskier corporate bond portfolios than seen in the life sector add vulnerabilities. Importantly, the default of the largest banking counterparty has a substantially more prominent effect in the sample of non-life firms.

Figure 16. Sweden: Composition of the Effect on Own Funds in Scenario 2 (top-down)

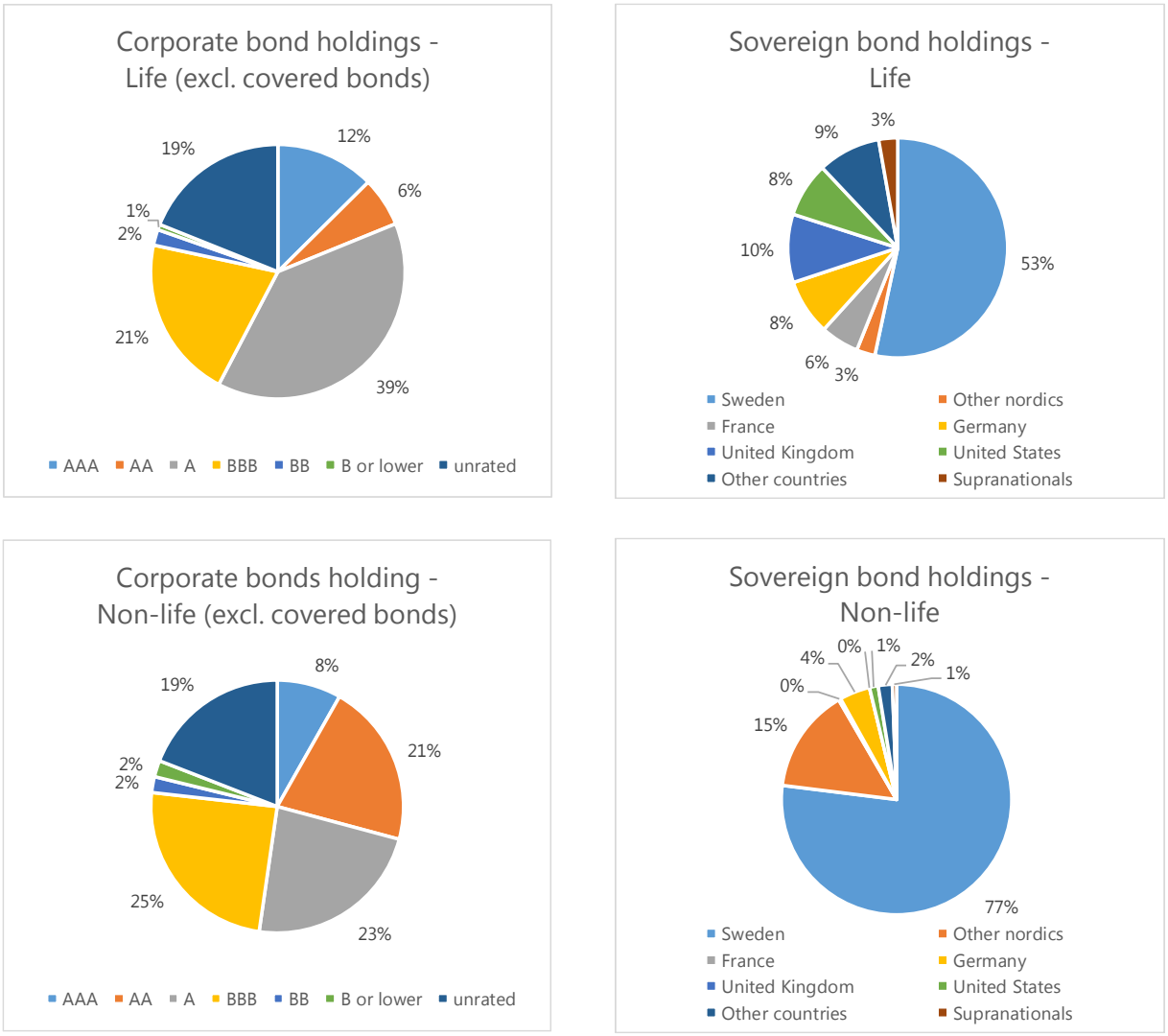


Source: Fund staff calculations based on company submissions.

82. The fixed-income portfolio of Swedish life insurers is large but rather conservative. Excluding covered bonds, the corporate bond portfolio consists to around 58 percent of bonds with a rating between AAA and A; only 3 percent have a rating below investment grade. Similarly, sovereign bond holdings are predominantly comprised of exposures to highly-rated countries. While Swedish government bonds account for 53 percent of the holdings, France, Germany, the United Kingdom and the United States each account for close to 10 percent. Durations of these holdings vary greatly but tend to be substantially longer than those of corporate bonds, for most sovereign bonds between four and ten years.

83. Swedish non-life insurers invest into riskier fixed-income assets than life companies, but also their risk profile can be assessed as adequate. Investment grade assets account for more than three quarters of the corporate bond portfolio (excluding covered bonds) and only 4 percent of bonds are rated BB or lower. The geographical breakdown of the sovereign bond portfolio reflects the breakdown of countries where business is underwritten, with 77 percent of sovereign bond holdings being Swedish and another 15 percent being issued by other Nordic countries.

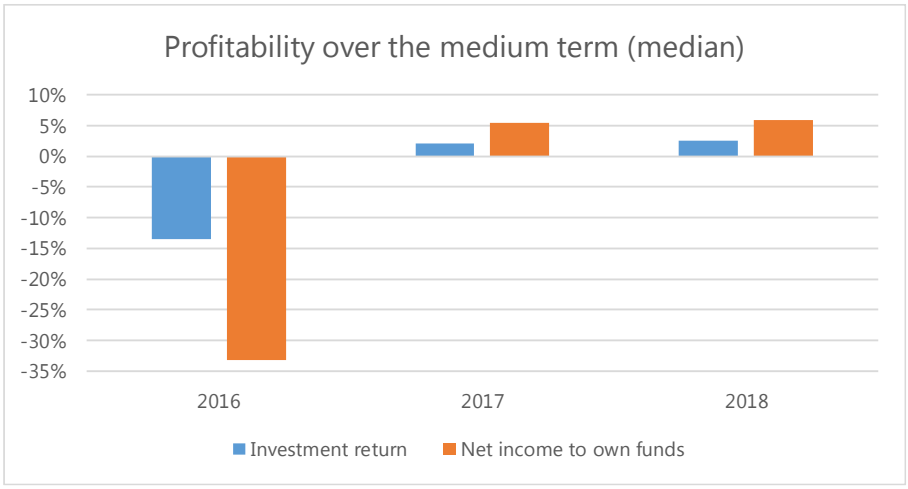
Figure 17. Sweden: Breakdown of the Bond Portfolio



Source: Fund staff calculations based on company submissions.

84. After the materialization of the stress scenario, both life and non-life insurers are expected to recover rather quickly and to restore profitability. Stress scenario 2 translates into an investment return of -14 percent for the median company and similarly the ratio of net income to own funds would be very negative with -33 percent. However, although assuming no recovery of financial markets after the instantaneous stress event, insurers expect investment returns between 2 and 3 percent in 2017 and 2018, and net income is projected to be around 6 percent of own funds in each of both years.

Figure 18. Sweden: Medium-term Projections



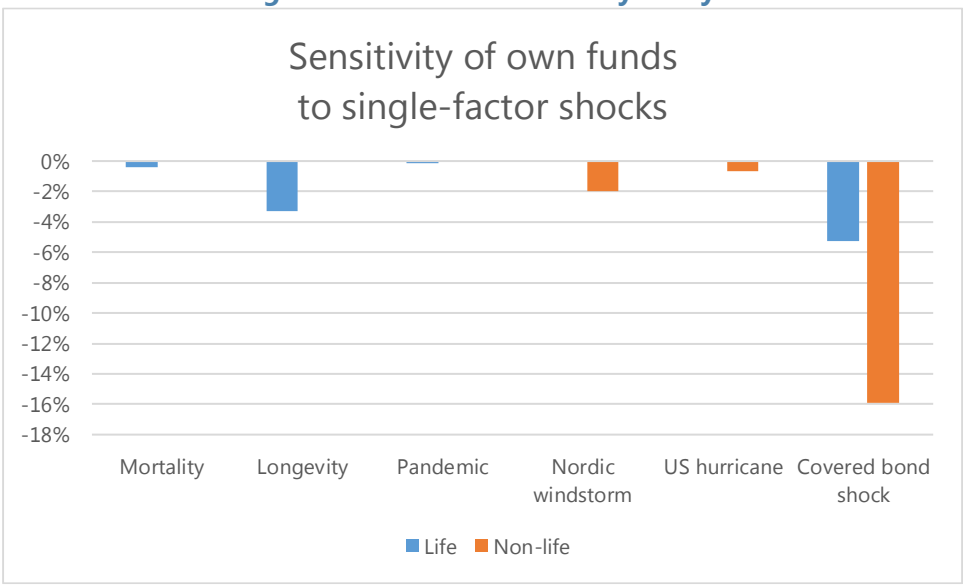
Source: Fund staff calculations based on company submissions.

85. On the underwriting side, both life and non-life companies are resilient to severe shocks if they occur in isolation. Among life insurers, the sensitivity to a longevity shock, i.e. a permanent 20 percent decrease in mortality rates, would result in a decline of own funds by a mere 3 percent. A permanent 15 percent increase in mortality rates or a severe pandemic (defined as a 35 percent temporary increase in disability and morbidity rates) would affect own funds even less.

86. Non-life companies would see a limited impact of a Nordic windstorm similar to the 2005 Gudrun event in which case the median company would suffer a 2 percent loss in own funds. Catastrophic events outside the Nordic region would have only a marginal effect on the Swedish non-life sector as a whole, as only a very small number of companies has a sizable exposure. In general, exposure to catastrophic events is well managed via diversified reinsurance contracts, however it is noted that the sector is less exposed to low-frequency, high-impact risks but more to high-frequency, low-impact risks, mainly windstorms and floods following cloudbursts—such risks are to a larger extent kept on the primary insurers' own books.

87. A very severe (and so far unseen) deterioration in the market for Swedish covered bonds would reveal the concentration risk Swedish insurers are facing in their investment portfolios. Assuming a credit spread increase of 500 bp, results vary greatly across companies, but for the median life company own funds could decline by 5 percent and for the median non-life firm own funds could drop by 16 percent.

Figure 19. Sweden: Sensitivity Analyses



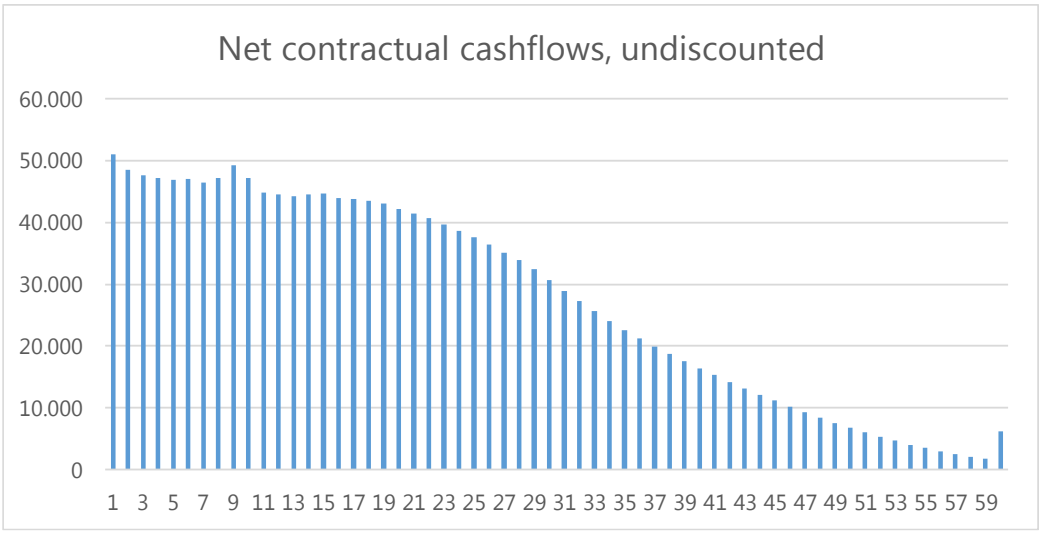
Source: Fund staff calculations based on company submissions.

E. Low-for-long

88. For most European life insurers, including those in Sweden, the prolonged low interest rate environment presents a severe challenge. Life insurance liabilities have very long durations which under a market-consistent valuation regime makes them highly sensitive to changes in interest rates which are used to discount future expected claims paid out to policyholders. An exact match of assets and liabilities is usually not possible in the absence of very long-dated investment assets. In fact, the duration gap between assets and liabilities is among the highest in the EU, according to EIOPA.

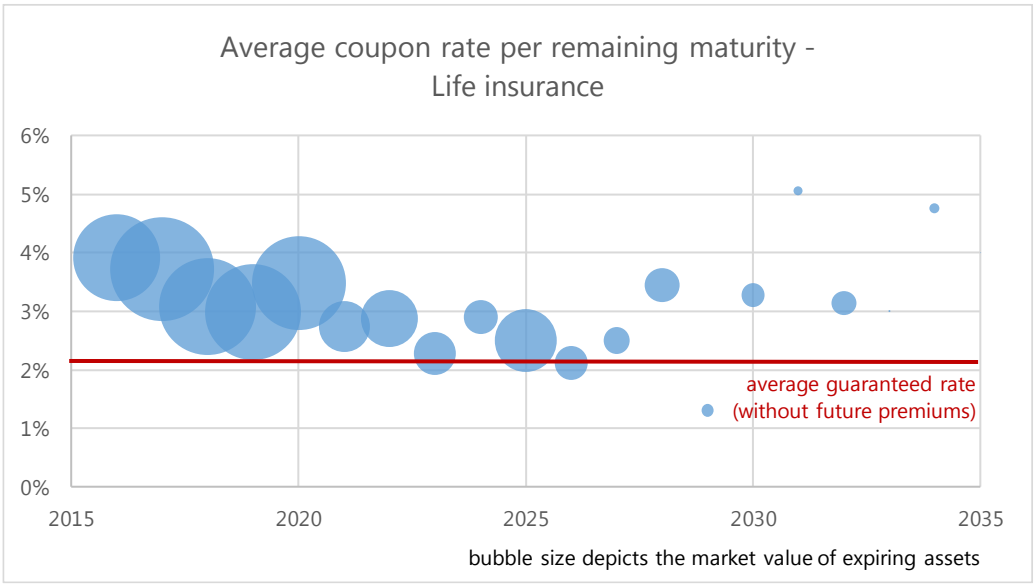
89. Large parts of the fixed-income portfolio with relatively high coupon rates are going to expire in the upcoming years. For the aggregate of life insurance companies included in the stress test exercise, 73 percent of all investments with a fixed coupon have a remaining maturity of five year or less—these assets pay a coupon of between 3.4 percent on average. For the next 5-year cohort of maturities, i.e. between five and ten years, the average coupon rate amounts to 2.7 percent. While such coupon rate is still considerably above the average guaranteed interest rate of 2.1 percent, the current yield environment will make it difficult to find assets with sufficiently high yields without taking on undue credit risk.

Figure 20. Sweden: Net contractual Cash Flows in Life Insurance (SEK mln)



Source: Fund staff calculations based on company submissions

Figure 21. Sweden: Reinvestment Risks



Source: own calculations based on company submissions.

90. Swedish life insurers have been active in recent years to adapt their product portfolio which on aggregate led to a decline in guaranteed interest rates, either by reducing guarantees offered in new business or increasing sales of unit-linked policies.

91. On the asset side, the financially stronger companies, in particular mutuals, have been taking on more risks, for example moving out of sovereign bonds into corporate bonds and equity. However, going forward, insurers might see further pressures to increase the yield on their investments, either by extending durations of the bond portfolio, accepting more credit risk or by investing into other less traditional asset classes, like e.g. infrastructure. Increasing the investments in shares further could increase the sensitivity to equity prices even further.

92. It is recommended that FI strengthens its stress testing framework and ensures that reporting data is complete and accurate:

- Scenarios used for regular macroprudential stress tests should complement both the Solvency II Standard Formula and the companies' Own Risk and Solvency Assessment and incorporate a multi-period perspective. Should FI consider that the Standard Formula does not adequately capture the risk profile of a company, e.g. due to high concentration to the domestic banking sector, the need for a Pillar 2 capital add-on should be assessed.

- FI should ensure that reporting data is of sufficient quality to perform stress tests and other analytical work. Further, not having the full set of Solvency II reporting data available for large life insurance companies complicates analytical work and should be mitigated by expanding, in a risk-based way, the current use of voluntary reporting.

LIQUIDITY STRESS TEST OF INVESTMENT FUNDS (IMF'S TOP DOWN)

93. The investment funds have grown significantly during the last five years. Total net assets have increased by 70 percent since the end of 2011, driven mostly by increases in equity funds and balanced funds. Funds' assets are invested mostly into domestic (36 percent of total assets), and foreign equity markets (36 percent), followed by domestic mortgage bonds (8 percent).

94. The size of investment funds exacerbates the risks of transmission of redemption shocks from the fund industry into the rest of the economy. Open-ended investment funds are exposed to redemption risk. Therefore, asset liquidation of investments funds in the event of severe redemptions can represent a sizable shock for financial and non-financial sector if it would result in fire-sale discounts. While the liquidity risks for investment funds are alleviated by the existence of the Premium Pension Authority (PPM),[27] which represent 25 percent of total assets, the redemption risk is still relevant since units redeemed and reinvested in other investment funds would probably not be invested in the same assets sold by the funds faced with outflows.

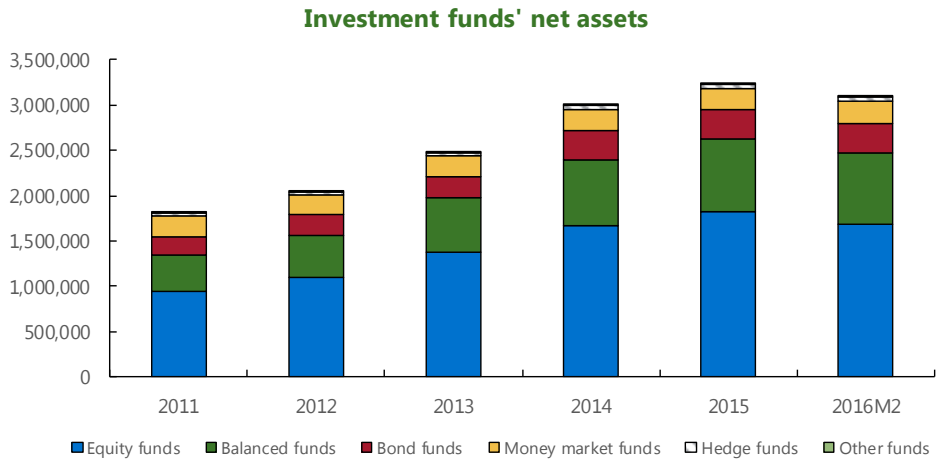
95. The liquidity stress test was run to assess the risks in the investment funds' industry and markets' capacity to absorb assets sold by funds in the event of severe redemptions. The test was geared to ensuring that asset management funds have enough liquid assets to meet severe

[27] The redeemed pension money by savers from one fund has to be invested in another investment funds (need to be discussed if this is right).

redemptions in an orderly manner. The shock was defined as a one time, tail event redemption shock. Net flow rates were defined on the quarterly basis.[28] The first percentile of net flow rate distribution of all funds of the same style over the period 2005Q1–2015Q4 was taken as the stress redemption shock. The approach taken in this exercise was to assess whether a standard metric of available trading liquidity, quarterly market turnover in specific assets markets, is sufficient to absorb redemption demand in a tail risk scenario.

96. The coverage of the stress tests included investment funds which account for about 95% of the asset management industry. The test covered Swedish UCITS (Undertaking for Collective Investment in Transferrable Securities) funds and Swedish special funds (a type of alternative investment fund in Sweden that requires authorization). Since the industry is diverse, and risks within one segment may not necessarily be present in others, the exercise entailed stress testing the largest funds by different segments (e.g. equity investment funds, bond funds, etc.). The calculations were based on granular data on investment funds provided by the FI. The cut-off date of the data was fourth quarter 2015.

Figure 22. Sweden: Investment Funds' Assets



Source: Fondbolagens Förening.

- **Once an investment fund is hit by a redemption shock, it has to sell its assets to meet redemptions.** The following two sets of assumptions on redemption induced assets sold were made:[29]

- *Approach 1 ("pro rata"):* Pro-rata selling of assets was assumed i.e. assets will be sold to meet the redemptions by making sure that the structure of assets is intact. This assumption is a natural one to adopt for the case of index funds which would be expected to sell assets to meet

[28] Ideally, the analysis should be based on a higher frequency data. However, only quarterly data are collected by FI. Using the quarterly data might underestimate the results as it is likely that the higher frequency data are more volatile.

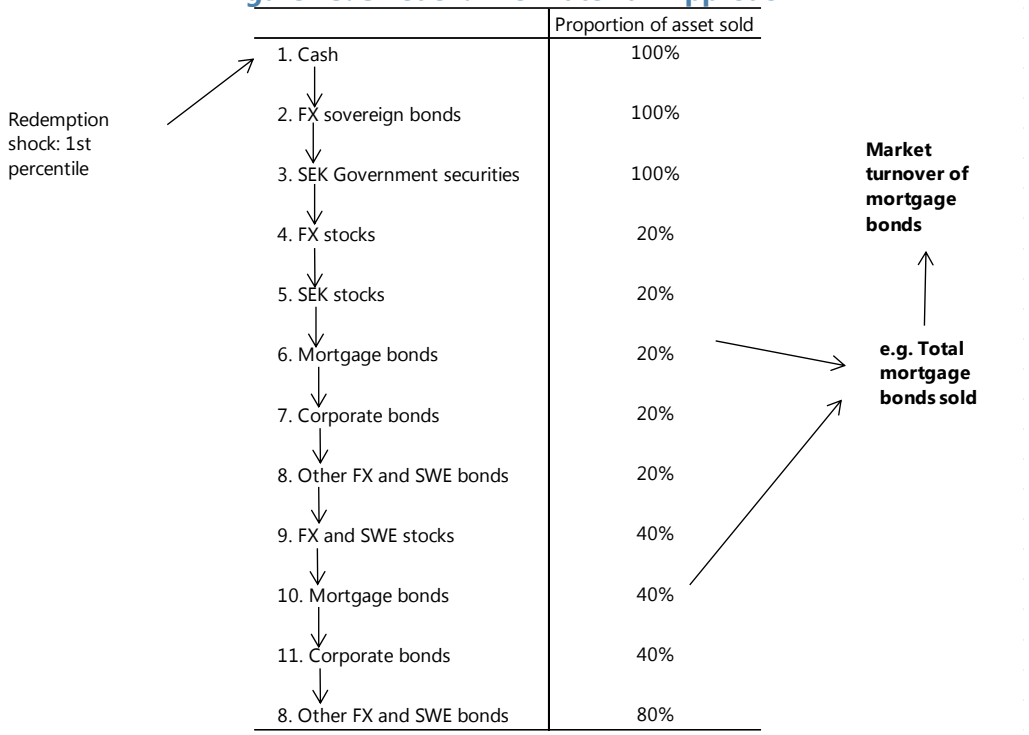
[29] The 2015 US FSAP stress testing note used the same assumptions.

redemption demand in a way that seeks to keep portfolio weights unchanged to continue minimizing tracking error relative to their benchmark.

- *Approach 2 ("waterfall"):* Investment funds were assumed to rank-order assets held by their liquidity characteristics, as captured by the LCR haircut hierarchy, selling assets to meet redemptions in descending order of liquidity (Figure X). The assumed ranking of assets sold was based on economic reasoning and expert insights. Nonetheless, it might not apply for funds of different styles. Ideally, the ranking should take into account their mandate and their strategy, which was resolved by the first approach.

- Under both approaches, realized assets sales due to the tail event shocks were added up across all funds included in the exercise and for each asset market.

Figure 23. Sweden: The Waterfall Approach



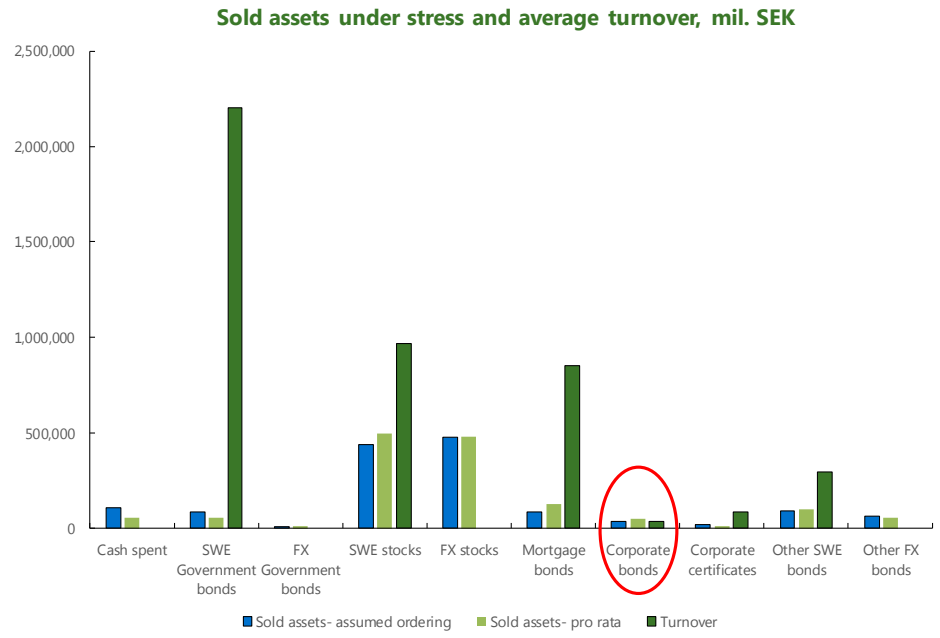
Source: IMF Staff.

97. Assets sold by investment funds hit by the shock were compared to data on market turnover which was used as an indicator of general market demand for a given asset class. If market turnover was smaller than assets sold by investment funds this indicated potential liquidity pressure on investment funds that invest in the assets sold in that particular market. This might also give rise to fire-sale risks on that particular market and might imply that investors in the funds exposed to those markets have to take a haircut on their investment.

98. The results of the analysis suggest that corporate bonds markets may face stress when faced with tail event redemption shocks. The analysis illustrates the danger that funds that invest

in corporate might sell these assets at a fire-sale discount to meet redemptions. Under the pro rata assumption, the volume of corporate bonds sold under severe stress by investment funds could be 50 percent higher than the average turnover of the corporate bonds. The materialization of fire sale risks stemming from investment funds trying to meet redemptions in other markets is very small. Under the tail event shock, all other types of bonds that might be sold to meet the redemptions are smaller than average market turnover under both approaches. This is primarily due to the fact that investment funds are not large investors in bonds other than corporate bonds-- the structure of investment funds' assets structure is predominated by investments in equity (Figure 10). Moreover, the turnover of domestic stock market is much larger than equity that would be sold by investments funds faced with severe redemption shocks.

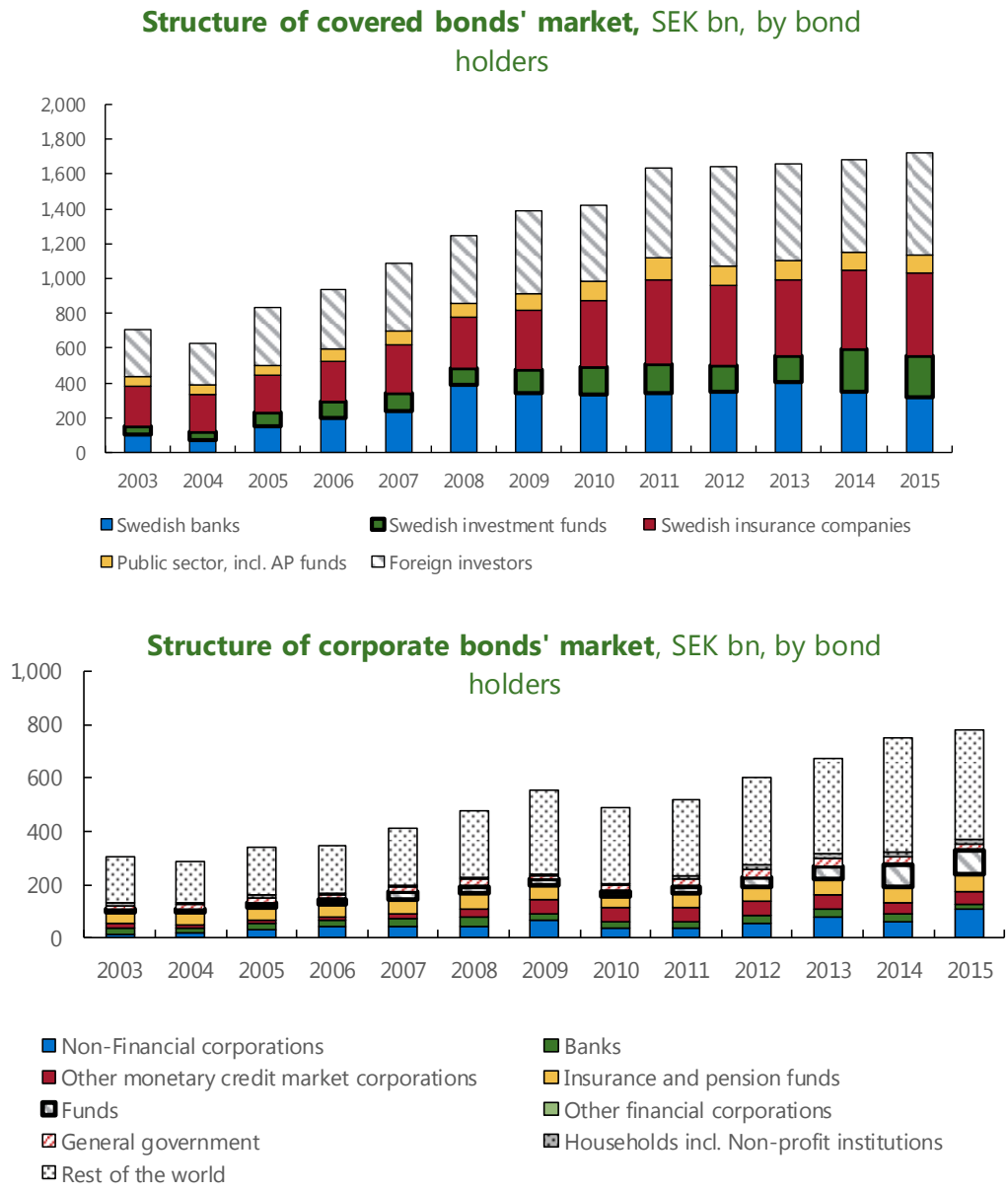
Figure 24. Sweden: Results of the Stress Test



Source: Finansinspektionen and IMF Staff calculations.
Note: "Sold assets- pro-rata" represent asset sold by investment funds hit by a tail event redemption shock that have to sell their assets pro-rata i.e., by making sure that the structure of assets is intact (approach 1). "Sold assets- assumed ordering" represent asset sold by investment funds hit by a tail event redemption shock that have to sell their assets in descending order of liquidity (approach 2). Source: IMF Staff calculations.

99. A caveat is that the results do not take into account that materialization of liquidity risks in other sectors that hold same assets which would put additional pressures on market capacity to absorb assets sold by all sectors. For example, foreign investors, including investment funds domiciled abroad, hold 28 percent of Swedish covered bonds, twice as much as investment funds domiciled in Sweden. In the stress environment they might sell the covered bonds as well. Therefore, this exercise likely overestimated the markets' capacity to absorb assets sold during times of stress.

Figure 25. Sweden: Structure of Covered Bonds and Corporate Bonds' Markets



Source: Riksbank and IMF Staff calculations.

100. The authorities are encouraged to develop their monitoring tools to continuously assess susceptibility of markets to extreme mutual fund redemptions. The exercise suggests that liquidity shocks to investment funds might be important for funding of non-financial corporations and the cost of funding. Moreover, as investment funds continue to grow and possibly start change their structure of investments, it is important that the authorities start conducting liquidity risk analyses as part of their overall approach to mutual fund industry oversight.

Appendix I. Risk Assessment Matrix[1]

Source of Risks	Likelihood [2]	Impact
1. Sharp rise in risk premia with flight to safety leads to more volatile global financial conditions.		
Sharp asset price adjustment and decompression of credit spreads as investors reassess underlying risk and respond to unanticipated changes in growth prospects, Fed policy rate path, and increases in U.S. term premia, with poor market liquidity amplifying the effect on volatility. **For Sweden**: Apart from the global adjustment, there is a reassessment of Swedish-specific risk, i.e. a reassessment of household risk which would translate into a reassessment of covered bonds risks. This scenario could also be triggered by a fall in housing prices. The scenario could further affect stock prices (with stocks accounting for a large share of insurance investments).	Medium	Renewed stress in global wholesale funding markets would led to liquidity strains for Swedish banks that rely on foreign exchange wholesale funding More specifically, concerns about covered bonds would impose higher refinancing risks for banks. In the face of higher volatility, banks would be constrained in their ability to post additional collateral to maintain the bonds' cover ratios High loss rates due to real estate collateral devaluation would put pressure on loan generation and banks' and MC's profitability. Mark-downs of covered bonds would hurt the solvency of banks, life insurance companies and pension funds. A drop in stock prices would affect insurers given that stocks are a big share of their investments Adverse impact could be partially mitigated by safe-haven flows.
Extension to Nordic countries The scenario above would also affect Nordic countries in which Swedish banks (such as Nordea and Handelsbanken) have extensive exposures. This regional scenario could be motivated by a surge in global volatility or by specific conditions in Nordic countries which in general are confronting weak growth prospects, rising house prices and high	Medium	Similar effects as above are extended to Swedish banks' exposures in the other Nordic countries: 70 percent of Nordea's lending and 22 percent of Handelsbanken's lending goes to Nordic economies. Moreover, higher bank funding costs translate into higher lending rates and curtailed lending, leading to a decline in house prices in

[1] The matrix shows events that could materially alter the baseline (the scenario most likely to materialize in the IMF staff's view). It reflects staff's views on the source of risks and overall level of concern at the time of discussions with the authorities.

[2] The relative likelihood of risks (in case the baseline does not materialize) is the staff's subjective assessment of the risks around the baseline ("low" indicates a probability below 10 percent, "medium" between 10 and 30 percent, and "high" between 30 and 50 percent).

household debt, as a result of the search for yield. Mortgage loans are funded with covered bonds.		the region. Nordea is the second bank in Denmark (after Danske Bank)

Source of Risks	Likelihood [2]	Impact
2. Structurally weak growth in key advanced and emerging economies, including the Euro Area and China.		
Euro Area/Japan. Weak demand and persistently low inflation from a failure to fully address crisis legacies and undertake structural reforms, leading to low medium-term growth and accumulation of financial imbalances. **Sweden, Nordic, and Baltic countries**: Lower growth in AE and in particular Euro Area would affect exports of Sweden and other Nordic and Baltic countries. This scenario is likely to be combined with low interest rates.	**Medium /High**	Weaker GDP growth and higher unemployment would increase NPL and lead to higher loan loss impairment, weighing on banks' profitability. Life insurance companies and pension funds would face difficulties in attracting long term savings in an environment of low interest rates; servicing contracts with guaranteed interest rates would weigh on profitability
3. Economic fallout from political fragmentation in Europe, including uncertainty associated with post-Brexit arrangements, renewed surge in migration flows, and rising populism and nationalism in large economies.		
The UK is an important trading partner (Sweden exports over 2 percent of its GDP to the UK). More generally, Sweden is a small open economy highly dependent on unrestricted movement of labor, goods and services.	**Medium**	Uncertainty during post-Brexit negotiations could weigh on confidence and investment. Renewed large scale refugee inflows would increase spending and support activity but would further strain capacity to receive and integrate migrants, raising unemployment and undermining social cohesion. Higher barriers to trade would dampen exports and investment and weaken the growth outlook. Weaker GDP growth and higher unemployment in Europe would increase NPL and lead to higher loan losses in banks with cross-border exposures.
4. Significant house price decline in Sweden.		
High house prices largely reflect demographic, balance sheet, and interest rate factors driving up demand faster than supply. Price levels remain high despite the recent moderation, but the slow reduction in supply shortfalls mitigates downside risks.	**Medium**	Large impact on consumption and employment lowers growth. Loan quality impacted, primarily of firms serving domestic market. Lending could be curtailed if doubts about the quality of covered bonds rise, elevating bank funding costs.

Appendix II. Parameters of the Cash Flow Exercise

1	OUTFLOWS	Open maturity	Overnight	Greater than overnight up to 2 days	Greater than 2 days up to 3 days	Greater than 3 days up to 4 days	Greater than 4 days up to 5 days	Greater than 5 days up to 6 days	Greater than 6 days up to 7 days	Greater than 7 days up to 2 weeks	Greater than 2 weeks up to 3 weeks	Greater than 3 weeks up to 4 weeks	Greater than 4 weeks up to 5 weeks	Greater than 5 weeks up to 2 months	Greater than 2 months up to 3 months	Greater than 3 months up to 6 months	Greater than 6 months up to 9 months	Greater than 9 months up to 12 months	Greater than 12 months up to 2 years	Greater than 2 years up to 3 years	Greater than 3 years up to 5 years	Greater than 5 years up to 10 years	Greater than 10 years
		Contractual Flow Maturity																					
1.1	**Liabilities resulting from securities issued**																						
1.1.1	unsecured bonds due	100	100	100	100	100	100	100	100	100	100	100	80	70	60	60	40	30	20	0	0	0	0
1.1.2	hybrid bonds due	100	100	100	100	100	100	100	100	100	100	100	80	70	60	60	40	30	20	0	0	0	0
1.1.3	bonds eligible for the treatment set out in Article 129(4) or (5) of CRR due	50	50	50	50	50	50	50	50	50	50	50	40	40	30	30	30	20	10	0	0	0	0
1.1.4	bonds as defined in Article 52(4) of Directive 2009/65/EC other than those reported to in item 1.1.3	100	100	100	100	100	100	100	100	100	100	100	80	70	60	60	40	30	20	0	0	0	0
1.1.5	securitisations due	100	100	100	100	100	100	100	100	100	100	100	80	70	60	60	40	30	20	0	0	0	0
1.1.6	short-term paper due	100	100	100	100	100	100	100	100	100	100	100	80	70	60	60	40	30	20	0	0	0	0
1.1.7	of which to intragroup entities																						
1.1.8	of which debt securities issued for retail only																						
1.2	**Liabilities from secured lending and capital market driven transactions as defined in Article 192 of CRR, collateralised by:**																						
1.2.1	Central Bank eligible assets																						
1.2.1.1	securities with a 0% risk weight	15	15	15	15	15	15	15	15	15	15	15	5	5	0	0	0	0	0	0	0	0	0
1.2.1.2	securities with a 20% risk weight	65	65	65	65	65	65	65	65	65	65	65	55	55	50	50	45	45	20	0	0	0	0
1.2.1.3	bonds eligible for the treatment set out in Article 129(4) or (5) of CRR																						
1.2.1.3.1	credit quality step 1	25	25	25	25	25	25	25	25	25	25	25	15	15	10	10	5	5	0	0	0	0	0
1.2.1.3.2	credit quality step 2	45	45	45	45	45	45	45	45	45	45	45	35	35	30	30	25	25	15	0	0	0	0
1.2.1.3.3	credit quality step 3	65	65	65	65	65	65	65	65	65	65	65	55	55	50	50	45	45	20	0	0	0	0
1.2.1.4	bonds as defined in Article 52(4) of Directive 2009/65/EC other than those reported to in item 1.2.1.3																						
1.2.1.4.1	credit quality step 1	45	45	45	45	45	45	45	45	45	45	45	35	35	30	30	25	25	15	0	0	0	0
1.2.1.4.2	credit quality step 2	65	65	65	65	65	65	65	65	65	65	65	55	55	50	50	45	45	30	0	0	0	0
1.2.1.4.3	credit quality step 3	85	85	85	85	85	85	85	85	85	85	85	75	75	70	70	65	65	40	0	0	0	0
1.2.1.5	non financial corporate bonds																						
1.2.1.5.1	credit quality step 1	45	45	45	45	45	45	45	45	45	45	45	35	35	30	30	25	25	15	0	0	0	0
1.2.1.5.2	credit quality step 2	65	65	65	65	65	65	65	65	65	65	65	55	55	50	50	45	45	30	0	0	0	0
1.2.1.5.3	credit quality step 3	85	85	85	85	85	85	85	85	85	85	85	75	75	70	70	65	65	40	0	0	0	0
1.2.1.6	residential mortgage backed securities of credit quality step 1	100	100	100	100	100	100	100	100	100	100	100	80	70	60	60	40	30	20	0	0	0	0
1.2.1.7	other assets	100	100	100	100	100	100	100	100	100	100	100	80	70	60	60	40	30	20	0	0	0	0
1.2.1.8	of which central bank open market operations																						
1.2.2	non-central bank eligible but tradable assets																						
1.2.2.1	equities listed on a recognised exchange, not self issued or issued by financial institutions	100	100	100	100	100	100	100	100	100	100	100	80	70	60	60	40	30	20	0	0	0	0
1.2.2.2	gold	100	100	100	100	100	100	100	100	100	100	100	80	70	60	60	40	30	20	0	0	0	0
1.2.2.3	other assets	100	100	100	100	100	100	100	100	100	100	100	80	70	60	60	40	30	20	0	0	0	0
1.2.3	of which to intragroup entities																						
1.3	**Liabilities not reported in 1.2, resulting from deposits by customers that are not financial customers**																						
1.3.1	by retail customers	15	15	15	15	15	15	15	15	7	7	7	5	5	5	5	2	2	0	0	0	0	0
1.3.2	by non-financial corporate customers	40	40	40	40	40	40	40	40	30	30	30	30	30	25	25	20	15	10	5	0	0	0
1.3.2.1	of which are intragroup entities																						
1.3.3	by are central banks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.3.4	by other entities	30	30	30	30	30	30	30	30	30	30	30	20	20	20	20	10	10	5	5	0	0	0
1.3.4.1	of which are intragroup entities																						
1.3.4.2	of which are public sector entities																						
1.4	**Liabilities not reported in 1.2, resulting from deposits by customers that are financial customers**																						
1.4.1	by credit institutions	100	100	100	100	100	100	100	100	100	100	100	75	75	75	75	50	50	20	0	0	0	0
1.4.1.1	of which are intragroup entities	50	50	50	50	50	50	50	50	50	50	50	25	25	25	25	0	0	0	0	0	0	0
1.4.2	by financial customers other than credit institutions	100	100	100	100	100	100	100	100	100	100	100	75	75	75	75	50	50	20	0	0	0	0
1.4.2.1	of which are intragroup entities	50	50	50	50	50	50	50	50	50	50	50	25	25	25	25	0	0	0	0	0	0	0
1.4.3	of which are members of an institutional network																						
1.4.3.1	of which are intragroup entities																						
1.6	**Amount payable from the contracts listed in Annex II of CRR other than those reported in item 1.5**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
1.7	**Other cash-outflows**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
1.7.1	of which to intragroup entities	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
1.8	**Of which: Interest flows due**																						
1.8.1	of which to intragroup entities																						

2	INFLOWS; roll-off indicate the fraction of the amount maturing that is converted into a cash inflow (and not rolled over)	Open maturity	Overnight	Greater than overnight up to 2 days	Greater than 2 days up to 3 days	Greater than 3 days up to 4 days	Greater than 4 days up to 5 days	Greater than 5 days up to 6 days	Greater than 6 days up to 7 days	Greater than 7 days up to 2 weeks	Greater than 2 weeks up to 3 weeks	Greater than 3 weeks up to 4 weeks	Greater than 4 weeks up to 5 weeks	Greater than 5 weeks up to 2 months	Greater than 2 months up to 3 months	Greater than 3 months up to 6 months	Greater than 6 months up to 9 months	Greater than 9 months up to 12 months	Greater than 12 months up to 2 years	Greater than 2 years up to 3 years	Greater than 3 years up to 5 years	Greater than 5 years up to 10 years	Greater than 10 years
2.1	**Monies due from secured lending and capital market driven transactions as defined in Article 192 of CRR, collateralised by:**																						
2.1.1	Central Bank eligible assets																						
2.1.1.1	securities with a 0% risk weight		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.1.2	securities with a 20% risk weight		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.1.3	bonds eligible for the treatment set out in Article 129(4) or (5) of CRR																						
2.1.1.3.1	credit quality step 1		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.1.3.2	credit quality step 2		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.1.3.3	credit quality step 3		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.1.4	bonds as defined in Article 52(4) of Directive 2009/65/EC other than those reported to in item 2.1.1.3																						
2.1.1.4.1	credit quality step 1		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.1.4.2	credit quality step 2		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.1.4.3	credit quality step 3		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.1.5	non financial corporate bonds																						
2.1.1.5.1	credit quality step 1		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.1.5.2	credit quality step 2		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.1.5.3	credit quality step 3		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.1.6	residential mortgage backed securities of credit quality step 1		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.1.7	other assets		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.1.8	of which central bank open market operations																						
2.1.2	Non-central bank eligible but tradable assets																						
2.1.2.1	equities listed on a recognised exchange, not self issued or issued by financial institutions		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.2.2	gold		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.2.3	other assets		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.1.3	of which from intragroup entities																						
2.2	**Monies due not reported in 2.1 from customers that are not financial customers**																						
2.2.1	from retail customers		50	50	50	50	50	50	50	50	50	50	30	30	30	30	10	10	10	10	10	10	10
2.2.2	from non-financial corporate customers		50	50	50	50	50	50	50	50	50	50	30	30	30	30	10	10	10	10	10	10	10
2.2.2.1	of which are intragroup entities																						
2.2.3	from central banks		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.2.4	from other entities		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.2.4.1	of which are intragroup entities																						
2.2.4.2	of which are public sectior entities																						
2.3	**Monies due not reported in 2.1 from financial customers**																						
2.3.1	from credit institutions		100	100	100	100	100	100	100	90	90	70	70	70	70	70	70	70	70	70	70	70	70
2.3.1.1	of which are intragroup entities		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
2.3.2	from financial customers other than credit institutions		100	100	100	100	100	100	100	90	90	70	70	70	70	70	70	70	70	70	70	70	70
2.3.2.1	of which are intragroup entities		50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
2.3.3	of which are members of an institutional network																						
2.5	**Amount receivable expected from the contracts listed in Annex II of CRR other than those reported in item 2.4**		**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
2.6	**Paper in own portfolio maturing**		**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
2.7	**Other cash inflows**		**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
2.7.1	of which from intragroup entities		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2.8	**Of which: Interest flows received**																						
2.8.1	of which from intragroup entities																						
2.9	**Total inflows**																						
2.10	**Net funding gap**																						
2.11	**Cumulated net funding gap**																						

3	COUNTERBALANCING CAPACITY; haircuts in the initial stock column	Factors (1-haricut)
3.1	**Cash**	100
3.2	**Exposures to central banks**	100
3.3	**Unencumbered Central Bank eligible collateral**	
3.3.1	securities with a 0% risk weight	100
3.3.1.1	representing claims on sovereigns	
3.3.1.2	guaranteed by sovereigns	
3.3.1.3	representing claims on or guaranteed by central banks	
3.3.1.4	representing claims on or guaranteed by public sector entities, regions with fiscal autonomy to raise and collect taxes and local authorities	
3.3.1.5	representing claims on or guaranteed by the Bank for International Settlements, the International Monetary Fund, the European Union or multilateral development banks	
3.3.1.6	representing claims on or guaranteed by the European Financial Stability Facility and the European Stability Mechanism	
3.3.2	securities with a 20% risk weight	85
3.3.2.1	representing claims on sovereigns	
3.3.2.2	guaranteed by sovereigns	
3.3.2.3	representing claims on or guaranteed by central banks	
3.3.2.4	representing claims on or guaranteed by public sector entities, regions with fiscal autonomy to raise and collect taxes and local authorities	
3.3.2.5	representing claims on or guaranteed by multilateral development banks	
3.3.3	bonds eligible for the treatment set out in Article 129(4) or (5) of CRR	
3.3.3.1	credit quality step 1	85
3.3.3.2	credit quality step 2	75
3.3.3.3	credit quality step 3	65
3.3.4	bonds as defined in Article 52(4) of Directive 2009/65/EC other than those referred to in item 3.3.3	
3.3.4.1	credit quality step 1	85
3.3.4.2	credit quality step 2	65
3.3.4.3	credit quality step 3	45
3.3.5	non financial corporate bonds	
3.3.5.1	credit quality step 1	85
3.3.5.2	credit quality step 2	70
3.3.5.3	credit quality step 3	55
3.3.6	residential mortgage backed securities of credit quality step 1	85
3.3.7	other central bank eligible assets (including credit claims)	80
3.4	**Other unencumbered non central bank eligible, tradeable assets**	
3.4.1	equities listed on a recognised exchange, not self issued or issued by financial institutions	50
3.4.2	gold	90
3.5	**Undrawn committed credit lines granted to the reporting institution**	
3.5.1	by members of the institutional network	50
3.5.2	by intragroup entities	50
3.5.3	by other entities	0

Domain		Assumptions		
		Bottom-Up by Financial Institutions	Top-Down by Authorities	Top-down by FSAP Team
BANKING SECTOR: SOLVENCY RISK				
1. Institutional Perimeter	Institutions included	• 4 largest bank holding companies		
	Market share	• 75 percent of total banking sector's assets		
	Data and baseline date	• Banks' own data • Consolidated banking group • Baseline date: 2015 Q4	• Publicly available data • Consolidated banking group • Baseline date: 2015 Q4	• Supervisory data • Consolidated banking group • Baseline date: 2015 Q4
2. Channels of Risk Propagation	Methodology	• Banks' internal models constrained by EBA guidelines	• A simple top-down approach by Riksbank and FI focused on modeling loan losses	• Balance sheet-based approach
	Satellite Models for Macro-Financial linkages	• Macro-financial linkages: Banks were required to calculate, under the EBA scenarios and the EBA methodology, potential losses, pre-provision net revenue, provision for loan losses and capital levels as a function of macro and financial variables from the scenarios. • Net interest income: Banks' own methodology to project net interest income based on the repricing of their portfolio; net interest income could not increase under the baseline or the stress scenario; the margins were constrained: (i) the margin paid on liabilities could not	• Macro-financial linkages: The focus was on projecting provisions for loan losses as a function of macro and financial variables from the scenario • Provisions for loan losses: projected using a model that fits historical credit losses, bank by bank, to macro variables, and conditional on the stress scenario it gave a projection of the aggregate credit loss level for each of the four banks. The second model estimated the relative risk for different exposures which was used to distribute the losses estimated in	• Macro-financial linkages: Income statement items and balance sheet items (loans and funding in particular) modeled and forecasted as functions of macro variables from scenarios as explanatory variables. Growth rate of balance sheets in the stress scenario was set to zero (but adjusted to exchange rate changes and mark to market losses) • Net interest income: maturity gap analysis due to a general increase in interest rates that affected all banks' banking and trading books was used; all interest earning assets and

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
		increase less than the highest amount between a proportion of the increase in the sovereign spread and that of an idiosyncratic component; (ii) the increase of the margin on repriced assets was capped by a proportion of the increase in sovereign spreads • Operational risk losses: Losses from new conduct risk events and other operational risk losses were subject to a floor • Non-interest income, expenses: Banks' own estimates, but subject to constraints for specific P&L items; Administrative expenses and other operating expenses could not fall below the 2015 value • Provisions for loan losses: calculated as expected losses using point in time projected PD, LGDs and exposures • A static balance sheet assumption; the exposure for the computation of the leverage ratio remained constant	the first model across different asset classes and countries. • Pre-provision net revenue: projected by applying a 20 percent haircut	liabilities in each bracket were assumed grow at projected loan growth rate. Margins calculated using the EBA methodology • Non-interest income excluding trading: projected as a function of GDP growth, interest rates using a panel regression model. • Trading income: losses in the value of trading and AFS fixed income securities due to interest rate and credit spread risks assessed through a duration approach. In the case of all securities HTM (including those issued by sovereigns), no losses were computed from changes in general interest rates. Losses on equity positions were modeled as a function of Stock exchange index, interest rates and real GDP dynamics. • Non-interest expense: projected as a function of total assets in a panel regression model.

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
				• Provisions for loan losses: projected as total credit losses using a panel regression model • AOCI: projected unrealized losses on AFS securities using the duration approach.
	Stress test horizon	• 2015q4–2018q4	• 2015q4–2020q4	
3. Tail shocks	Scenario analysis	• **Baseline:** EBA baseline scenario • **Stress:** EBA stress scenario reflecting Sweden-specific risks as well as spillovers from a recession in the Nordic and Baltic region. The Sweden-specific stress scenario was driven by a confluence of shocks to produce a deep recession. Recovery was slowed by domestic balance sheet adjustments, so the overall GDP profile is somewhat "L-shaped". • In the stress scenario unemployment rate rose by a 6 percentage point rise over a four period. The cumulative growth rate of real GDP was equal to 7 percent over the first three years (GDP growth rates were negative	• **Baseline:** WEO baseline scenario as of April 2016 and EBA baseline • **Stress:** EBA stress scenario with more severe interest rate and exchange rate shocks.	

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
		for three years), equity prices fell by 25 percent in the first year, house prices declined by 35 percent over the first three years. • The Sweden-specific macro scenarios were supplemented with a set of scenarios for the Nordic and Baltic region.		
	Sensitivity analysis/one time add-on shock	N.A.	• N.A.	• Interest rate risk in the banking book: steepening of the yield curve depending on currency (e.g. 100 bps widening in the short end of the curve; 350 bps widening in the long end of the curve for Sweden) • Market risk shocks on Trading, AFS securities and CVA: Equity index shocks: stock market decline (OMX by 40 percent, S&P 500 by 30 percent, Stoxx 50 by 50 percent, MSCI Asia (ex Japan) by 40 percent, Nikkei 225 by 30 percent); Currency valuation shocks: 40 percent depreciation of the SEK against the U.S. dollar, 20 percent depreciation against the euro, 30 percent depreciation against GBP;

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
				(iii) commodity price decline (energy, base metals, precious metals and grains by 40, 40, 25 and 30 percent respectively); (iv) interest rates (depending on the currency and maturity) and credit spreads (depending on exposure) increase • Counterparty default shock (top 10 exposures) • Shutdown of foreign exchange swaps market: impact on net open position and capital, CCR RWAs and credit risk RWAs • Low interest rates for a long time • Constant loan supply versus dynamic forecast of credit • Less severe interest rate shock in the baseline • Corporate sector stress test
4. Risks and Buffers	• Risks/factors assessed • (How each element is derived, assumptions)	• Credit risk (granular sectoral exposures) including securitizations: Banks' internal models based on stressed point-in-time PD and LGD parameters and grade migration; Prescribed loss parameters for sovereign exposures	• Credit risk (granular sectoral and geographical exposures). • Tax rate: After-tax net income (or loss) was calculated by applying a consistent tax rate to pre-tax net income (or loss).	• Credit risk (households, corporates, sovereign, financial institutions exposures): estimated according to Basel III framework, under IRB approach • Market risk: mark-to-market valuation of securities in

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
		• Market risk, CCR and CVA: Full revaluation of the trading and AfS/FVO portfolio; Default of the two most vulnerable of the 10 largest stressed CCR exposures • Operational risk, including conduct risk: banks' own projections for the advanced measurement approach (AMA), basic approach and standard approach • Taxes: a common simplified tax rate of 30%		trading book and AFS/FVO using the duration approach • Taxes: set at the pooled average tax rate over the last 20 years
	Behavioral adjustments	• Dividend, fees and commission remained constant in the baseline; minimum of the ratio to total assets of 2015 and the average of the 2 years with the smallest value that occurred 2011-2015 in the stress scenario; For dividends paid: Pay-out ratio was based on publicly declared dividend policies. If no policy was available, the pay-out ratio in the baseline was the maximum of 30% and the median of the pay-out ratios in profitable years 2011-2015; in the adverse, the same amount of dividends was	• The static balance sheet assumption • If after tax net profit was positive, a dividend ratio of 75 per cent was assumed	• Static and dynamic balance (for the baseline) sheet assumptions were analyzed; for the dynamic case the balance sheet growth and funding growth were modeled and forecasted using a panel regression with fixed effects and macro variables as exogenous variables • Dividend payout schedule followed capital conservation rule; banks could distribute maximum dividend amount equal to dividend payout ratio (dividends over net income) in

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
		assumed (0 accept for loss-making banks) • The static balance sheet assumption		the base-year if they were not capital constrained; dividends were paid out only if bank records profits. • Asset disposals and acquisitions over time not considered; the portfolio composition remained unchanged over time, with maturing exposures replaced with similar ones.
5. Regulatory and Market-Based Standards and Parameters	Calibration of risk parameters	• Banks used their models rather than resort to benchmarks to determine stressed PD and LGD parameters • Banks employed a rating transition matrix-based approach, considering the effects of PD/LGD grade migration on the level of default and impairments projected in the stress test horizon for the given scenarios.	• For corporate exposures (and retail SME) PD was modelled using EDFs for all country exposures, except for the Baltic countries. PDs for household exposures were based on the level of indebtedness and the level of unemployment. The model estimates for PD were also subject to expert judgment. LGDs were mostly based on expert judgment.	• Projected losses distributed across different asset classes and countries • Projected point in time PDs for each asset class (and country) calculated as projected loan losses for each asset class/(LGD x projected exposures by asset class) • Downturn LGDs provided by banks- stayed constant at 2015Q4 level • Point in time PDs and downturn LGDs used for both credit losses and stressed RWA calculations

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
	Regulatory/Accounting and Market-Based Standards	• Capital standards: Basel III capital • Capital metrics: Tier 1 common capital ratio, common equity tier 1 ratio, Tier 1 capital ratio, total capital ratio and the leverage ratio; all ratios reported on a transitional and a fully loaded basis • Hurdle rates: NA; hurdle rates used from the IMF top down approach	• Capital standards: Basel III capital • Capital metrics: Tier 1 common capital ratio, common equity tier 1 ratio, Tier 1 capital ratio, total capital ratio and the leverage ratio; all ratios reported on a transitional and a fully loaded basis • Hurdle rates: NA; hurdle rates used from the IMF top down approach	• Capital standards: Basel III CET1 capital, leverage ratio • Capital metrics: Common equity tier 1 ratio, Basel III leverage ratio • Hurdle rate: regulatory hurdle rate (Basel III regulatory minimum, other Pillar 2 own-fund requirements associated with pension risk, concentration risk and interest rate risk in the banking book, microprudential mortgage floors) and local supervisory requirements that took into account the buffers (systemic risk surcharge, the countercyclical capital buffer, and macroprudential mortgage floors) • 100 percent of AOCI phase out from CET1 capital from 2016 onwards • 100 percent phase in factor on deductions from CET1
		• Risk-weighted assets- credit risk: CRR requirements based on stressed PD and LGD parameters; a prescribed increase in REA for securitization exposures, as well	• Risk-weighted assets: risk weights went up by 7.5 percent per year for the first three years and 0 afterwards	• Risk-weighted assets- credit risk: using Basel II, IRB formula that translated downturn LGDs, changes in through the cycle PD (that are adjusted for

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
		as prescribed shocks to credit risk losses for sovereign exposures; RWAs floored by 2015 value • Risk-weighted assets- market risk: based on a common set of stressed market parameters, calibrated from the macroeconomic scenario, as well from historical experience, and on haircuts for sovereign exposures; constant for STA approaches; VaR constant in the baseline and replaced by SVaR in the adverse; Stressed IRC and CVA capital requirements; Prescribed haircuts for AFS/FVO sovereign positions; RWAs for IRC and CVA floored by the increase for IRB REA; Prescribed simplified approach based on historical NTI volatility for HFT	• Market RWAs and Operational RWAs were not considered	projections of point-in-time PDs), changes in assets correlation, the maturity adjustment parameter and exposures (also adjusted for depreciation of SEK) into stressed RWAs. • RWAs for market and operational risk taken from the banks, reported for the BU test.
6. Reporting Format for Results	Output presentation	• Distribution of CET1 ratios/leverage ratios by bank in the baseline and stress scenario • Contribution to the change in system wide CET1 ratio in the baseline and stress scenario • Contribution of each component of the income statement to change in profits in the baseline and stress scenario • Evolution of sectoral losses (also by countries) • Evolution of PDs • Number of banks and share of total assets below hurdle rates • Capital shortfall under each scenario in nominal terms and relative to GDP. • Results of sensitivity analysis		

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
BANKING SECTOR: LIQUIDITY RISK				
1. Institutional Perimeter	Institutions included	• N.A.	• N.A.	• 4 largest banks
	Market share	• N.A.	• N.A.	• 75 percent
	Data and baseline date	• N.A.	• N.A.	• Supervisory data (COREP, FINREP) • Consolidated banking group as of 2015Q4
2. Channels of Risk Propagation	Methodology	• N.A.	• N.A.	• Swedish LCR ("old" Basel III version) by currency • Proxy NSFR by currency • Cash flow analysis using maturity ladder by currency
3. Tail shocks	Size of the shock	• N.A.	• N.A.	• Shocks reflected in adjustment factors (haircuts and run-off rates) applied to high-quality liquid assets/counterbalancing capacity and outflows; Factors were informed by the Basel III liquidity metrics (baseline scenario) and more severe episodes of market and funding risks (stress scenario)
4. Risks and Buffers	Risks	• N.A.	• N.A.	• Funding liquidity risk, rollover risk • Market liquidity shock
	Buffers	• N.A.	• N.A.	• Liquid assets/Counterbalancing capacity

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
5. Regulatory and Market-Based Standards and Parameters	Calibration of risk parameters	• N.A.	• N.A.	• Baseline scenario: haircuts and run-off rates calibrated based on the LCR/NSFR • Stress scenario: stressed LCR and NSFR
	Regulatory standards	• N.A.	• N.A.	• For LCR and NSFR threshold set to 100 • For maturity ladder based on survival horizon
6. Reporting Format for Results	Output presentation	• Distribution of LCRs and NSFRs by currency, by bank • Survival period of each bank in the baseline and stress scenario • Drivers of banks' liquidity position and high quality liquid assets/counterbalancing capacity, for each scenario		
BANKING SECTOR: SPILLOVER RISKS				
1. Institutional Perimeter	Institutions included	• N.A.	• 4 largest banks	
	Market share	• N.A.	• 75 percent of banks' assets	
	Data and baseline date	• N.A.	• 2015Q4	
2. Channels of Risk Propagation	Methodology	• N.A.	• Espinosa and Sole (2013) network analysis	
3. Tail shocks	Size of the shock	• N.A.	• Credit (default of each bank) and funding shocks	
4. Risks	Risks	• N.A.	• Contagion risk	
INSURANCE SECTOR: SOLVENCY RISKS				

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
1. Institutional Perimeter	Institutions included	• 4 life insurers • 3 non-life insurers	• N.A.	• 4 life insurers • 3 non-life insurers
	Market share	• Life: 78 percent (gross written premiums) • Non-life: 53 percent (gross written premiums)	• N.A.	• Life: 78 percent (gross written premiums) • Non-life: 53 percent (gross written premiums)
	Consolidation level	• Groups' worldwide consolidated business (if applicable)	• N.A.	• Groups' worldwide consolidated business (if applicable)
	Data	• Companies' own data	• N.A.	• Companies' own data, mainly based on regular supervisory reporting
	Baseline date	• 01/01/2016	• N.A.	• 01/01/2016
2. Channels of Risk Propagation	Methodology	• Companies' internal calculations	• N.A.	• Balance sheet-based approach • Companies' asset and liability cash flow projections (60 years) • Companies' data on fixed-income portfolio and guaranteed interest rates
	Stress test horizon	• Asset shocks assumed to occur instantaneously • Participants provided projections for a three-year horizon (2016-2018) assuming unchanged interest rates, risk premia and asset prices after the shock has occurred	• N.A.	• Asset shocks assumed to occur instantaneously • Long-term projection for asset-liability mismatches

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
3. Tail shocks	Scenarios	• EIOPA "double-hit" scenario: low risk-free interest rates and increase in risk premia • IMF stress scenario: broadly in line with macrofinancial scenario used in the banking ST	• N.A.	• IMF stress scenario: broadly in line with macrofinancial scenario used in the banking ST • Low-for-long interest rate scenario

	Sensitivity analysis	• 500 bps increase in Swedish covered bond spreads
		• Longevity shock: Permanent 20 percent decrease in mortality rates (life insurers only)
		• Mortality shock: Permanent 15 percent increase in mortality rates (life insurers only)
		• Pandemic event: Temporary 35 percent increase in disability/morbidity rates for the next 12 months
		• Catastrophic event (non-life insurers only):
		  • Windstorm: Repetition of windstorm Gudrun, hitting the Nordic countries in 2005
		  • US hurricane: Repetition of hurricane Andrew in 1992
			• N.A.	• None

4. Risks and Buffers	Risks/factors assessed	• EIOPA "double-hit" scenario • Interest rate shock: 1-year SEK risk-free rate: -60 bps; 10-year: -63 bps	• N.A.	• IMF stress scenario • Focus on the long-run impact of the low interest environment, especially on guaranteed business

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
		• Equity shock: -28.4 percent for Swedish stocks • Property shock: -4.6 percent for Swedish residential real estate; -4.2 percent for Swedish commercial property • Sovereign credit spread: +141 bps for 10-year Swedish government bonds • Corporate credit spread: Increase in credit spreads between 16 bps (for AAA financials) and 516 bps (for unrated financials) • IMF stress scenario • Interest rate shock: 1-year SEK risk-free rate: -33 bps; 10-year: +32 bps • Equity shock: -25.4 percent (domestic and global) • Property shock: -32.5 percent (domestic), -20 percent (global) • Sovereign credit spread: Increase in credit spreads of Swedish government bonds by 136 bps • Corporate credit spread: Increase in credit spreads		

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
		between 50 bps (for AAA) and 300 bps (for BB and lower) • Default of largest banking counterparty (100 percent write-off for equity and subordinated bonds, 50 percent write-off for unsecured bonds, 15 percent write-off for secured bonds) • Currency shock: 13.9 percent depreciation of SEK • Mass lapse event: Discontinuance of 20 percent of insurance policies for which discontinuance would result in an increase of technical provisions without the risk margin are discontinued		
	Risk aggregation	• All shocks of the scenarios were assumed to occur together and simultaneously, therefore summation of shock effects within each scenario, no diversification effect	• N.A.	• All shocks of the scenarios were assumed to occur together and simultaneously, therefore summation of shock effects within each scenario, no diversification effect
	Buffers	• Absorption effect of technical provisions (profit sharing) • Absorption effect of deferred taxes	• N.A.	• None

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
		• Absorption effect of "long-term guarantee measures" as part of the Solvency II framework		
	Behavioral adjustments	• Management actions limited to non-discretionary rules in place at the reference date	• N.A.	• None
5. Regulatory and Valuation Parameters	Regulatory regime	• Solvency II • Solvency I for occupational pension business pursued under Art. 308 of the Solvency II Directive	• N.A.	• Solvency II • Solvency I for occupational pension business pursued under Art. 308 of the Solvency II Directive
	Valuation	• National GAAP (market-consistent)	• N.A.	• National GAAP (market-consistent)
6. Reporting Format for Results	Output presentation	• Impact on solvency ratios • Impact on net income • Dispersion measures of solvency ratios and net income • Capital shortfall under each scenario in nominal terms and relative to GDP	• N.A.	• Impact on valuation of assets and liabilities • Impact on available own funds and solvency ratios • Capital shortfall under each scenario in nominal terms and relative to GDP
ASSET MANAGERS: LIQUIDITY RISKS				
1. Institutional Perimeter	Institutions included	• N.A.	• N.A.	• Largest investment funds divided into different styles
	Data and baseline date	• N.A.	• N.A.	• 2015Q4
2. Channels of Risk Propagation	Methodology	• N.A.	• N.A.	• Comparing redemptions with capacity of market for a particular asset class to be sold in an orderly manner

Domain		Assumptions		
		Bottom-Up by Financial Institutions	**Top-Down by Authorities**	**Top-down by FSAP Team**
				• Assuming a ranking of assets to be sold to meet redemptions • Pro rata approach • Redemptions applied to individual investment funds of the same style; redemptions calculated by style of investment fund as an average redemption rate across all investment funds of the same style; shock: 1st percentile of redemption rates' distribution
	Stress test horizon	• N.A.	• N.A.	• One quarter (shock characterized by a run on a fund represented by an assumed redemption rate)
3. Tail shocks	Sensitivity analysis	• N.A.	• N.A.	• N.A.
4.Risks and Buffers	Risks	• N.A.	• N.A.	• Liquidity risk (a run on investment fund)
	Buffers	• N.A.	• N.A.	• Liquid assets, assets sold • Capacity of a particular market to absorb sell-off of corresponding asset to meet redemptions (by comparing investment fund's portfolio of a particular security with market turnover of the same security)