INTERNATIONAL MONETARY FUND

NORWAY

FINANCIAL SECTOR ASSESSMENT PROGRAM

TECHNICAL NOTE—INSURANCE SECTOR STRESS TESTS

This Technical Note on Insurance Sector Stress Tests for Norway was prepared by a staff team of the International Monetary Fund. It is based on the information available at the time it was completed in August 2015.

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**International Monetary Fund
Washington, D.C.**

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August 17, 2015

TECHNICAL NOTE

INSURANCE SECTOR STRESS TESTS

Prepared By
**Monetary and Capital Markets
Department**

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APPENDICES

Glossary

BCU	Buffer capital utilization
BU	Bottom-up (stress test)
FSA	Finanstilsynet (the Financial Supervisory Authority of Norway)
FSAP	Financial Sector Assessment Program
GDP	Gross Domestic Product
GPFG	Government Pension Fund Global
LGD	Loss Given Default
MOF	Ministry of Finance
NOK	Norwegian kroner
ORSA	Own Risk and Solvency Assessment
STeM	Stress Test Matrix (for FSAP stress tests)
TD	Top-down (stress test)

EXECUTIVE SUMMARY AND RECOMMENDATIONS[1]

While the financial condition of insurance companies under Solvency I has generally been sound, insurers face major challenges going forward, thus placing an important premium on sound risk management and effective oversight by supervisors. First, a continued low-interest rate environment would adversely impact earnings and the claims-paying capacity of life insurers over the medium term, as some 83 percent of their liabilities carry guaranteed minimum rates of return. For example, at end-2013, the guaranteed return averaged 3.2 percent, above the return on 10-year government bonds, and the difference seems to have widened in 2014–15. This is particularly challenging given insurers' significant asset-liability maturity mismatch: the five largest life insurers' liability duration is about 16 years while asset duration is about 4 years. Second, life insurers' reliance on products bearing longevity risks makes them vulnerable to rising longevity. Third, pension providers are required to apply the new mortality tables, which will significantly increase technical reserves. In response, insurers have recently started to encourage existing policyholders with guaranteed products to switch their policies to "unit-linked" (nonguaranteed) products, thus shifting risks from insurers to policyholders. Furthermore, the expected implementation of Solvency II represents additional challenges for life insurers (as in many peer countries).

The mission conducted stress tests under Solvency II principles ("simplified approach") for the life and non-life insurance sectors. The insurance stress tests consisted of a combination of (1) top-down (TD) stress tests for asset-side risks and insurance liability risks, designed by the Financial Sector Assessment Program (FSAP) team and Finanstilsynet (the Financial Supervisory Authority of Norway—FSA), and (2) bottom-up (BU) stress tests for other liability risks. Three large life and non-life insurers, which cover 80 and 51 percent of assets in the life and non-life sectors, respectively, on a solo basis, were covered.

The stress tests (under Solvency II) confirm that life insurers are vulnerable to severe shocks. The stress tests pointed to the high sensitivity of life insurers to market risks such as equity prices, real estate prices, and credit spreads. The risks to insurers are particularly pronounced if interest rates fall further from the current levels. Insurers' solvency ratios would decline sharply under the shocks, although the rule for the transition to Solvency II would significantly reduce the immediate need for insurers to raise capital. The capital shortfall is about 1.0–2.1 percent of nominal GDP without the transition rule (and up to 1 percent of GDP under the transition rule), which would be manageable. While these results are similar to the results of the authorities' "Stresstest I" (under Solvency II), the authorities' "Stresstest II" (under Solvency I) and the companies' own stress tests (performed on a consolidated level) suggest much less vulnerability to shocks.

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[1] Prepared by Mr. Etibar Jafarov (MCM).

On the other hand, non-life insurers would remain solvent even under the most severe shock. This outcome reflects (1) the non-life insurers' current higher buffer capital; (2) significantly less maturity mismatches of their liabilities and assets: the five largest non-life insurers' liability duration is about 4 years compared with 2.5 years for asset duration; and (3) the lower regulatory impact from Solvency II. For the non-life insurers, the underwriting (non-life and health) shocks and market shocks would be the main contributors to the decline in solvency ratios.

At a conglomerate level, most financial institutions could weather the combined losses from their banking and insurance operations. Recapitalizing their insurance companies would be within the capacity of the corresponding conglomerates, owing to the small size of the capital required as compared to the level of aggregate capital in the group. However, this may be a challenge for conglomerates with larger shares of the insurance business in their overall operations.

Table 1. Summary of Recommendations		
Recommendations for Implementation	**Time**	**Agency**
Allocate more resources to assess the liability-side risks and validate models and assumptions used in the bottom-up stress tests by insurance companies.	NT	MOF, FSA
Apply macroprudential stress scenarios for insurance companies.	MT	FSA
Continue building a top-down stress test framework for the insurance sector.	MT	FSA
Prepare a recovery plan and achieve recapitalization of weakly capitalized insurance companies. Continue to restrict dividend payouts by the companies with weak capital adequacy and ask the weakly capitalized institutions to prepare a recovery plan.	MT, NT	FSA
Identify systemically important companies, ask for a resolution plan, and conduct their resolvability assessments.	MT	MOF, FSA
[1] "NT-near-term" is about 1 year; "MT-medium-term" is 1–3 years.		

BACKGROUND

1.   The insurance sector is relatively small. In terms of premium revenues relative to GDP, the life insurance and non-life insurance sectors are smaller than in many peer countries (Figure 1). This is in part because large shares of pension liabilities reside with the National Insurance Scheme Fund and the Norwegian Public Service Pension Fund.

Figure 1. The Size of the Insurance Sector

Premium revenue in insurance is relatively low compared to peer countries.

Total Gross Life Insurance Premiums
(In percent of GDP)
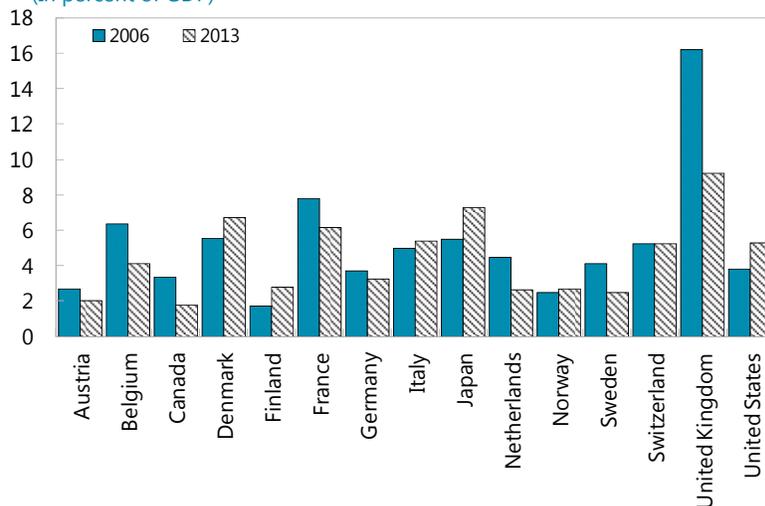
Total Gross Non-Life Insurance Premiums
(In percent of GDP)
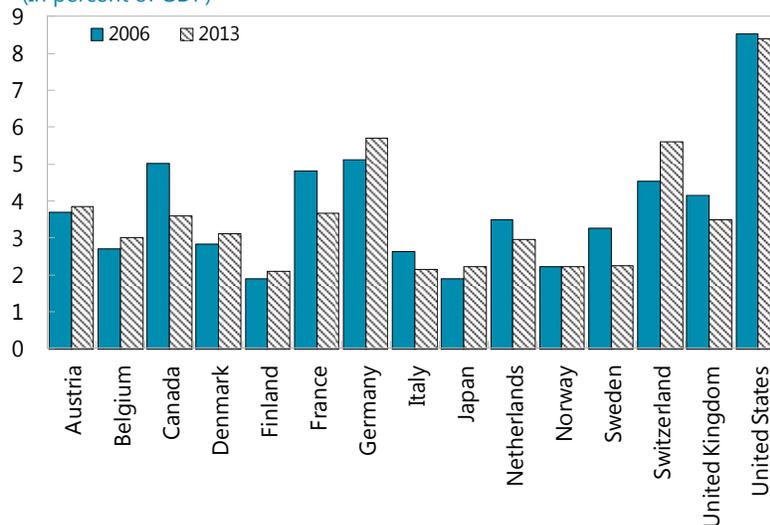
Sources: OECD; and IMF *World Economic Outlook* database.

2.   **The insurance sector is concentrated.** The Norwegian life insurance sector is one of the most concentrated in Europe: the three largest companies account for about 80 percent of gross written premiums (Figure 2). The degree of concentration is also high for the non-life insurance sector (although less so than in the life insurance sector), where, at 37 percent, the share of foreign-owned institutions is large.

Figure 2. Norway: Concentration in the Insurance Sector

The life insurance sector is one of the most concentrated in Europe.
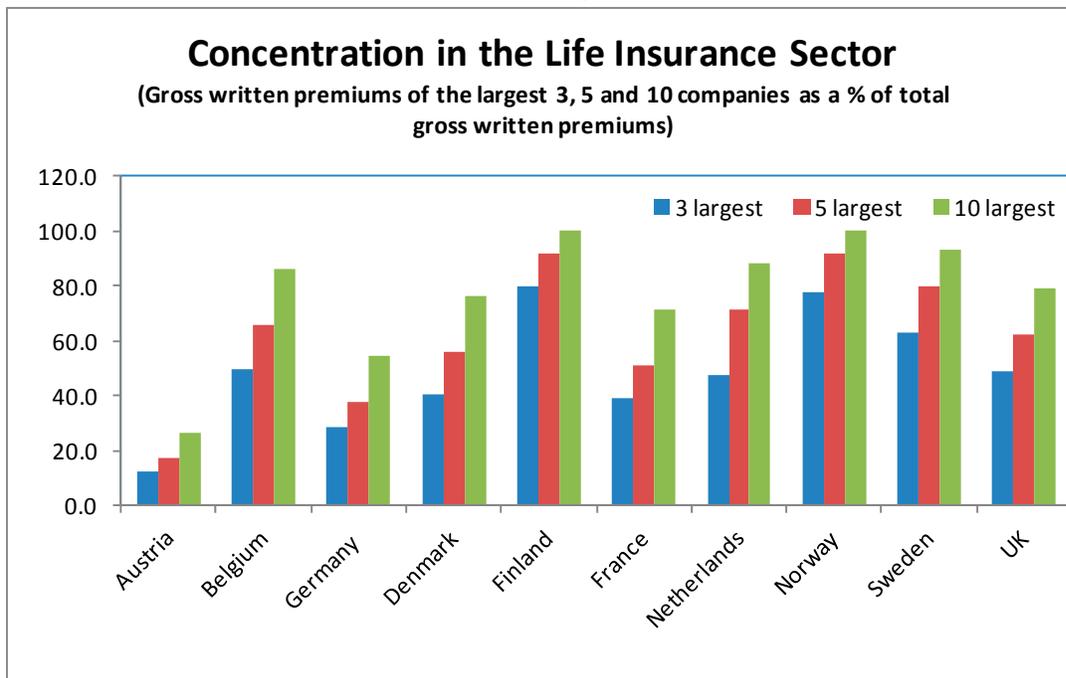
Concentration in the Life Insurance Sector
(Gross written premiums of the largest 3, 5 and 10 companies as a % of total gross written premiums)

The degree of concentration is also high for the non-life insurance sector.

Concentration in the Non-Life Insurance Sector
(Gross written premiums of the largest 3, 5 and 10 companies as a % of total gross written premiums)
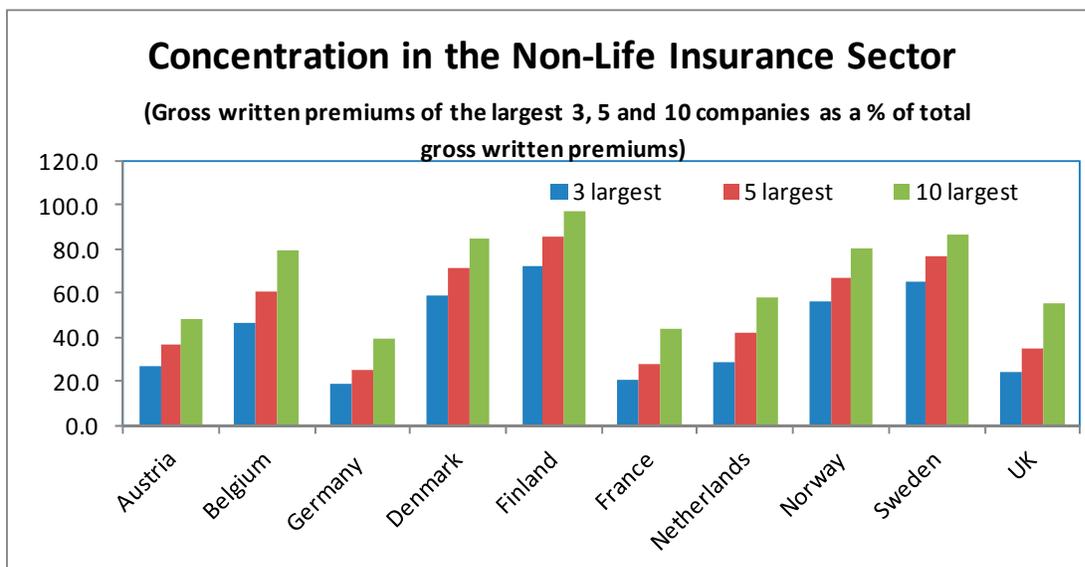
Sources: EIOPA; and IMF staff estimates.

3. **Many insurance companies are part of financial conglomerates.** At end-2013, the seven largest conglomerates accounted for 74 percent of total financial system assets (Table 2). Their core activities are in lending and life insurance, except for Gjensidige which operates mostly in the non-life insurance sector. The conglomerate structure allows earnings and risk diversification in normal times, but leaves room for contagion if institutions are hit by large shocks.

Table 2. Norway: Largest Financial Groups, December 2013 1/
(In percent of total assets)

	Credit institutions	Securities funds	Non-life insurance	Life insurance	Total conglomerates
DNB	40	17	1	27	35
SpareBank 1/Collaborating savings banks	15	5	7	3	12
Nordea	11	10	0	7	10
KLP	0.5	15	2	31	6
Storebrand	1	12	1	23	5
Eika-Gruppen	5	1	2	0	4
Gjensidige	0.5	0	27	1	1
Total financial conglomerates/alliances	*73*	*60*	*40*	*92*	*74*
Other institutions	27	40	60	8	26
Total market	*100*	*100*	*100*	*100*	*100*

Sources: Finanstilsynet and the Norwegian Mutual Fund Association.

1/ Credit institutions comprise banks, mortgage companies and finance companies. Eksportfinans and Kommunalbanken are not included in the figures The total for financial groups comprises aggregate total assets in the various segments and may diverge from the conglomerates/groups' own financial statements. The total market comprises Norwegian credit institutions' business abroad and foreign financial institutions' subsidiaries and branches in Norway. For SpareBank 1 Gruppen and Eika-Gruppen, the owner banks are included in the market shares.

4. **Prudent macroeconomic policies have reduced macroeconomic risks.** Real mainland GDP growth has averaged about 2½ percent during 2010–14 and, at 3½ percent, unemployment is low. High levels of oil production and exports, together with Norway's fiscal rule and oil fund (the Government Pension Fund Global—GPFG), have resulted in strong fiscal and external positions (see the Aide Memoire of the mission). The macroeconomic policy frameworks are sound, enhancing the economy's capacity to absorb shocks. The GPFG and the fiscal rules have provided a significant degree of insulation from sharp changes in oil prices and the so-called "Dutch disease," and allowed the use of counter-cyclical fiscal policy. In addition, Norway's flexible exchange rate has helped absorb foreign exchange shocks, while its flexible inflation targeting framework has enabled the inflation target to be met without causing significant volatility in interest rates and output. Norway's well-being indicators are among the highest in the world, which may increase demand for insurance products (Figure 3). On the other hand, rising longevity and low interest rates pose risks to life insurers.

Table 3. Norway's Well-Being Indicators

	Life satisfaction	Jobs and earnings	Household income	Work-life balance	Health	Safety	Education
Norway rank (among 35 countries)	2	2	3	3	13	16	17
Scores:							
Maximum	10	8.9	38001	9.8	9.4	10	9.5
Norway	9.7	8.6	31458	9.1	8.1	9.1	7.2
Average	6.2	6.2	23047	7.3	6.9	8.3	6.3
Minimum	0	2.3	11039	0	0.6	0	0.7

Source: OECD, *How's Life? 2013. Measuring Well-being.*

5.   **The specific features and relatively small size of the domestic financial market have affected the portfolio allocation of insurers.** The limited risk-taking ability of life insurers offering guaranteed rates forces insurers to hold larger shares of their investments in bonds and smaller shares in equities (Figures 3, 4, 5, and 6). As insurers have been increasingly offering unit-linked products,[2] they have started reallocating investments away from bonds towards equity and other assets. Reflecting the small size of the government securities market, insurers' holdings of private sector bonds and real estate investments are larger than in many countries. This factor has supported demand for covered bonds issued by banks/mortgage companies. Given a shortage of longer-term local currency investment opportunities, insurers also look abroad for suitable assets, and for hedges for the related currency exposure.[3]

6.   **Financial sector regulation is closely aligned with EU norms, as required by Norway's participation in the European Economic Area (EEA).** Thus, new EU initiatives in the area of insurance are to be adopted by Norway.

7.   **Currently, the valuation basis for assets, with the exception of held-to-maturity bonds, is market-consistent valuation.** For bonds held to maturity and loans, insurers can use amortized cost. This category represents about 30 percent of total assets for life insurers, 20 percent for non-life insurers and 10 percent for pension funds.

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[2] A unit-linked insurance plan is basically a combination of insurance and investment. A part of the premium paid is utilized to provide insurance cover to the policyholder while the remaining portion is invested in various equity and debt schemes. In other words, the money collected by the insurance provider is utilized to form a pool of funds that is used to invest in various market instruments (debt and equity) in varying proportions similar to mutual funds.

[3] Generally, FX positions are hedged. Losses/gains related to these FX hedges as well as counterparty risks were estimated in the stress tests described in the next chapter. Rollover risks were not separately estimated.

8.   The valuation of insurance liabilities is based on discounting future benefits with the (single) interest rate used when calculating the premiums (the guaranteed rate), which means that applying the current low market ra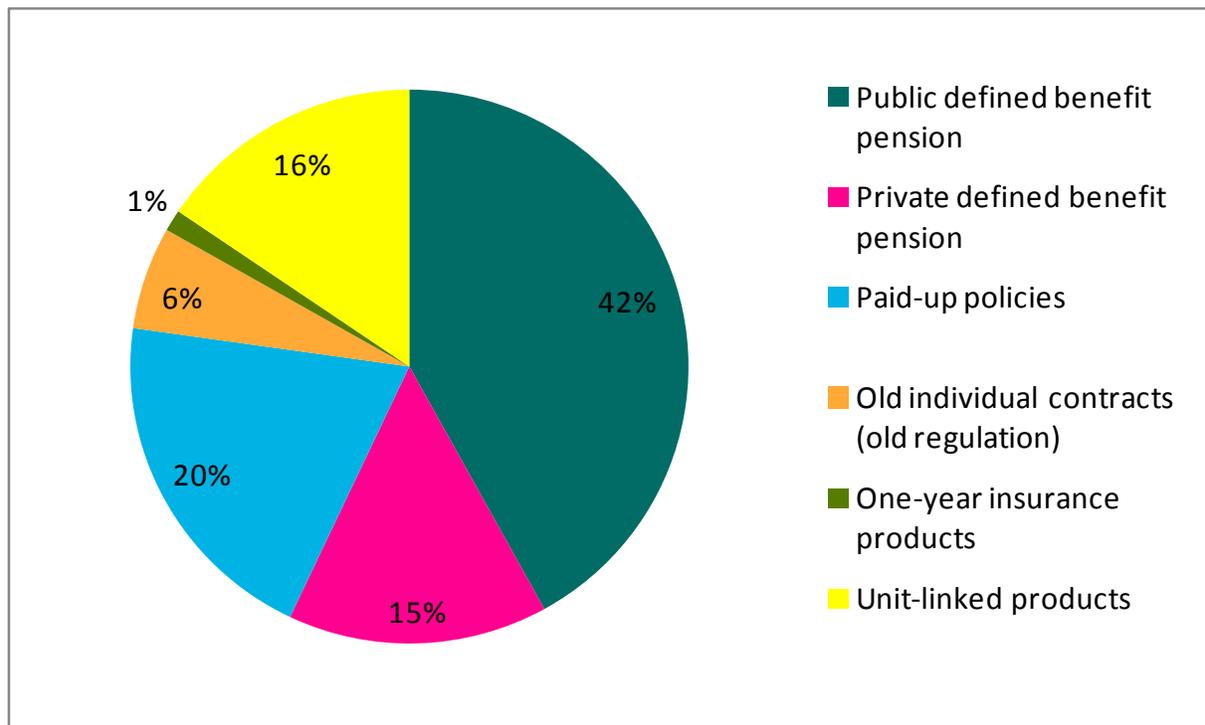tes would increase the need for technical provisions. The maximum guaranteed rate has been reduced on several occasions, and was reduced from 2.5 percent to 2.0 percent in 2015. The reduction of the rate only applies to new premium accrual, and does not affect the valuation of existing liabilities. Biometrical risk assumptions (i.e. mortality, longevity, and disability) have historically not been updated frequently, but larger revisions of mortality assumptions have been implemented in 2007 and 2014.

9.   The new mortality tariff implemented in 2014 is a dynamic tariff that includes a trend factor to cover the expected future continuous increase in life expectancy. Due to the large revisions, the undertakings have been granted a maximum 7-year transition period to increase the value of existing technical provisions.[4] More than half of the increase in technical provisions is expected to be financed by the policyholders through lower profit allocations.

10.   Under Solvency I, non-life insurance undertakings generally do not discount their premium provisions or provisions for outstanding claims—neither for accounting purposes nor for solvency purposes—but this will change under Solvency II. Discounting is allowed for long-tailed business (e.g. workers' compensation insurance) for accounting purposes, but not for solvency purposes. According to the current minimum requirements for technical provisions, the total of (1) premium provisions, (2) provisions for outstanding claims, and (3) fluctuation provisions is stipulated to cover the undertakings' overall future contractual claim payments and associated costs with a high degree of probability (99 percent).

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[4] http://www.FT.no/Global/Venstremeny/Brev_vedlegg/2013/New_mortality_table_for_collective_pension_insurance.pdf

Figure 3. Product Allocation in Life Insurance

Legend:
- Public defined benefit pension — 42%
- Private defined benefit pension — 15%
- Paid-up policies — 20%
- Old individual contracts (old regulation) — 6%
- One-year insurance products — 1%
- Unit-linked products — 16%

Source: FSA.

Figure 4. Investment Portfolio Allocation: Life Insurers (2013)

The shares of bonds and real estate in total investments of Norwegian life insurers are higher than in many other countries.

Bonds In Percent of Total Investments

Shares in Percent of Total Investments

Real Estate in Percent of Total Investments
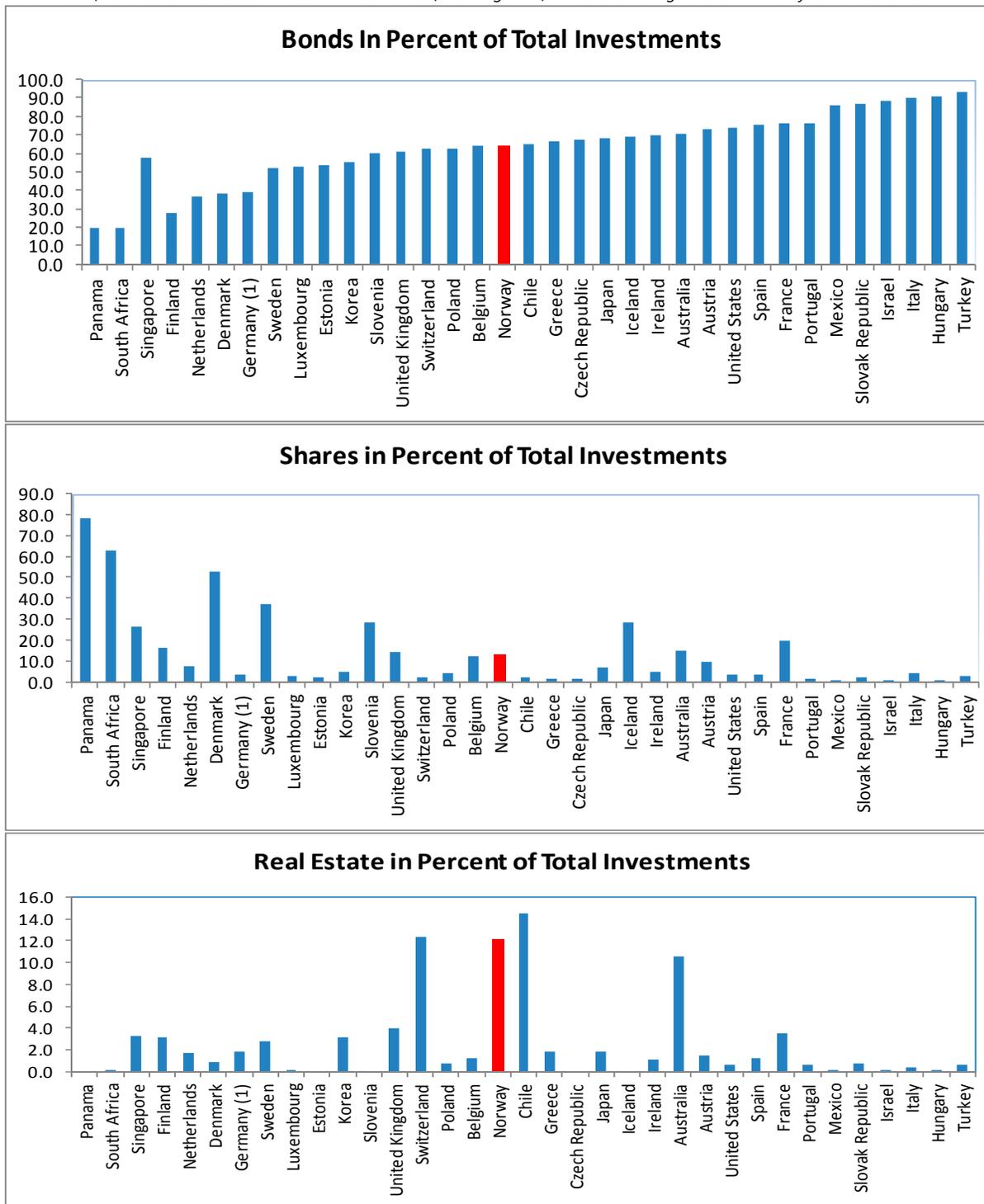
Source: OECD *Global Insurance Statistics*.

Figure 5. Investment Portfolio Allocation: Non-life Insurers (2013)

Norwegian non-life insurers hold more shares than life insurers.

Bonds

Shares

Real Estate
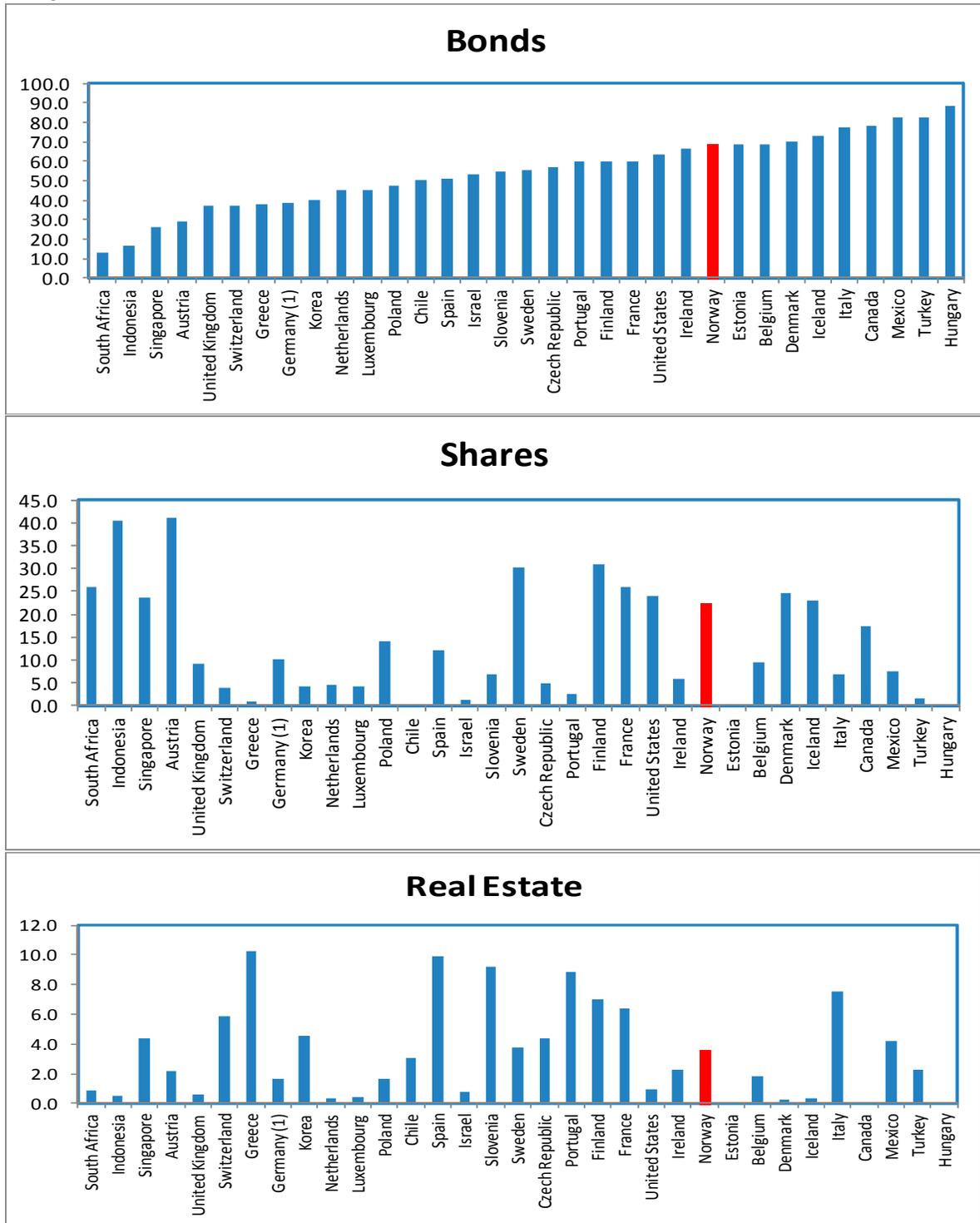
Source: OECD *Global Insurance Statistics*.

Figure 6. Portfolio Allocation to Public and Private Sector Bonds (2013)
(In percent)

The share of private sector bonds in total investments is among the highest in the world.
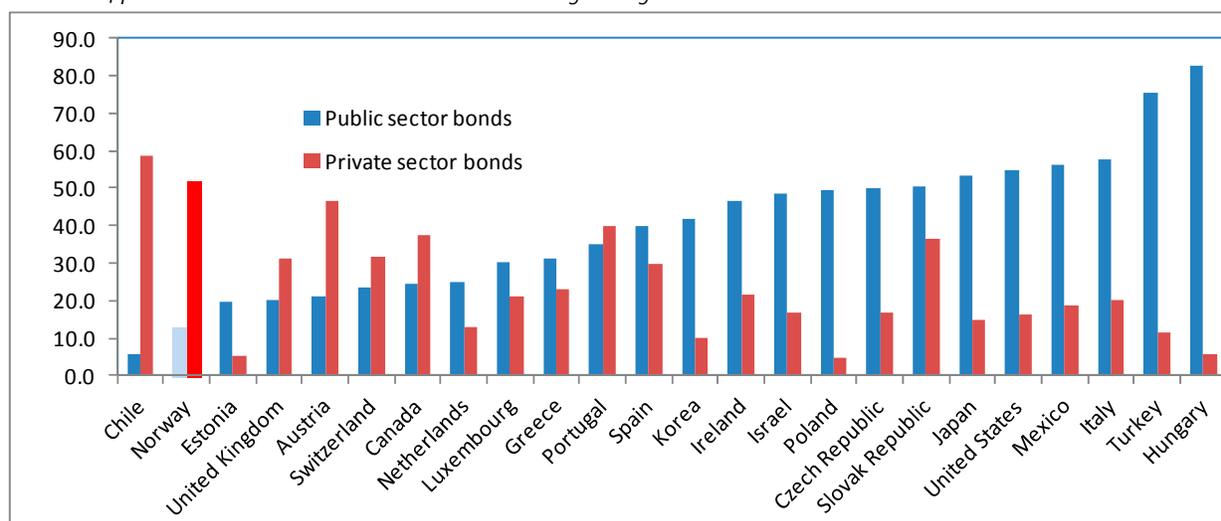

Source: Source: OECD *Global Insurance Statistics*.

RECENT PERFORMANCE

11.   The financial condition of insurance companies under Solvency I has generally been sound. They have low expense ratios, and made 3-4 percent real returns on their investments in 2012–14 (Table 4, Figures 7 and 8). Life insurers used about two-thirds of their profits after allocation of guaranteed returns to increase technical reserves to adopt the new mortality table and share profits with policyholders, and yet recorded pre-tax profits of about 0.5 percent of total assets in 2010–14. Non-life insurers have performed better, recording pre-tax profits of 27.7 percent of gross premiums. While insurers increased their premiums in real terms in 2012, this reversed in 2013. In 2014, the premiums rose by 10 percent. The capital buffer of life insurers (under Solvency I) has steadily increased (relative to insurance liabilities) since 2011 and was about 10.2 percent at the end of 2014, while the buffer capital of non-life insurers was significantly higher. Solvency ratios have remained stable at comfortable levels (Figure 8). Solvency capital consists of own funds and specific insurance funds. Tier 1 own funds is about 72 percent of total solvency margin capital in life insurance, compared with 53 percent in the non-life sector.[5]

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[5] Non-life insurers have large fluctuation provisions, which are included partly in the solvency margin capital. The Natural Perils Fund, which can only cover claims related to natural perils, is also partly included in the solvency margin capital.

Table 4. Average Real Net Investment Return by Type of Insurer
(in percent)

	Life		Non-life		Composite	
	2012	2013	2012	2013	2012	2013
Australia	12.2	13.0	5.4	3.2	n.a	n.a
Austria	…	…	1.3	…	1.2	…
Belgium	2.3	3.6	0.7	2.0	2.2	3.1
Canada	…	…	3.6	2.0	5.9	-1.6
Chile	5.4	4.8	3.4	4.5	n.a	n.a
Czech Republic	-0.6	0.0	3.2	-0.1	1.0	1.0
Estonia	1.2	0.5	…	0.1	n.a	n.a
Germany	3.0	4.0	1.7	2.4	n.a	n.a
Hungary	1.7	5.6	1.6	2.8	1.5	5.3
Iceland	-4.0	1.5	-3.9	-0.5	n.a	n.a
Ireland	5.3	-1.4	3.8	2.2	n.a	n.a
Israel	…	-0.2	7.0	2.7	5.0	4.8
Italy	3.2	3.3	2.9	2.2	2.1	3.3
Japan	3.3	0.8	3.1	…	n.a	n.a
Korea	2.8	3.0	2.3	2.3	n.a	n.a
Luxembourg	-2.2	1.9	-2.2	-0.1	n.a	n.a
Netherlands	5.8	4.7	4.4	1.8	n.a	n.a
Norway	4.4	3.2	4.4	…	n.a	n.a
Poland	4.0	4.5	4.7	9.9	n.a	n.a
Portugal	1.0	2.3	0.6	2.2	4.0	5.5
Spain	2.2	4.0	-0.2	3.1	-0.2	3.9
Switzerland	4.0	3.1	4.0	4.0	n.a	n.a
Turkey	0.2	-0.7	-5.6	-3.6	n.a	n.a

Source: OECD *Global Insurance Statistics*.

Figure 7. Insurance Sector Performance Indicators Under Solvency I

Life insurers have recorded relatively strong return in the collective portfolio (guaranteed products).

And, have been profitable in recent years.
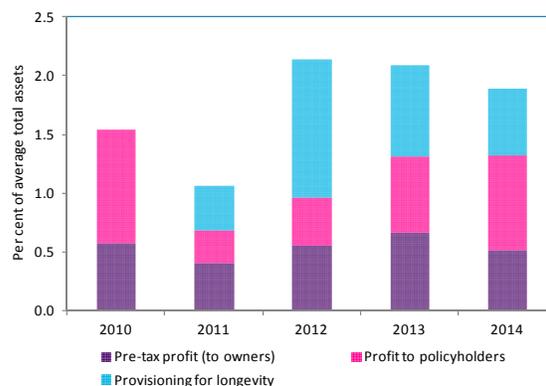
Recently, non-life insurers' earning performance has been even stronger.
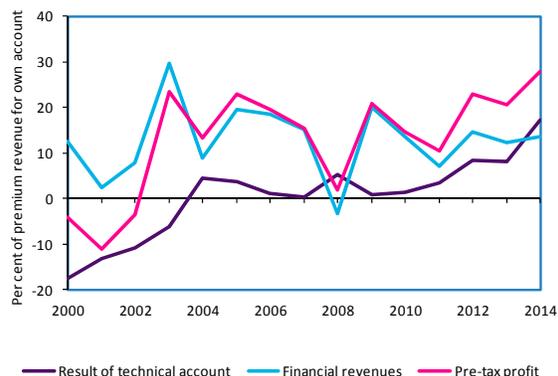
And, they have been reduced their combined ratio.

Solvency ratios have been broadly stable.

The solvency ratio in the non-life sector is among the highest in the world.

Sources: EIOPA; and Norwegian authorities.

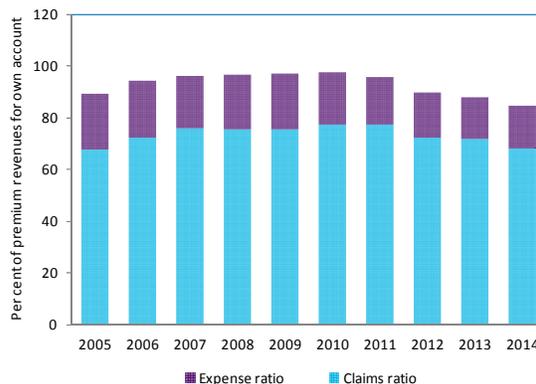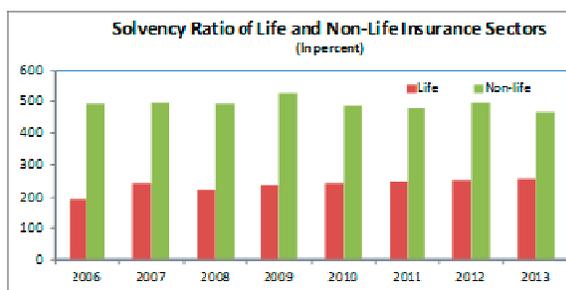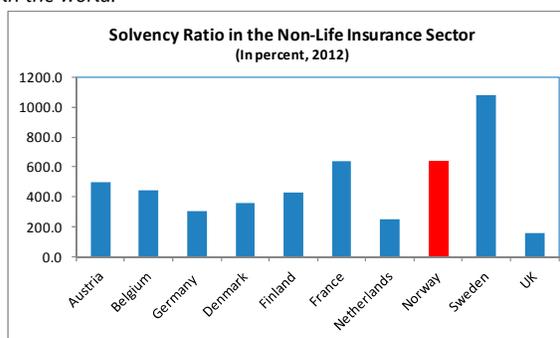## Figure 8. Combined Ratio for the Non-life Segment in OECD Countries (2012–2013)
(In percent)
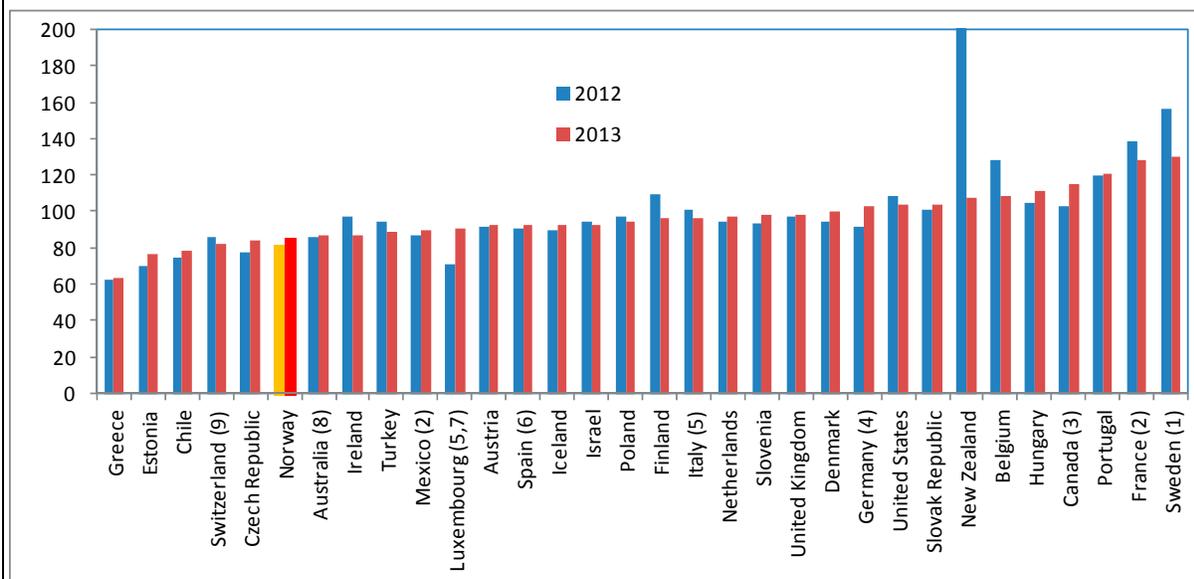
Source: OECD *Global Insurance Statistics*.

RISKS AND VULNERABILITIES

12.   Life insurers face major challenges, which heighten the importance of sound risk management and effective oversight by supervisors. A continued low-interest rate environment would adversely impact earnings and claims-paying capacity over the medium term, as some 83 percent of life insurers' liabilities carry guaranteed minimum rates of return.[6] For example, at end-2013, the guaranteed return averaged 3.2 percent, which was higher than the

Norway: Interest Rate Developments
(In percent)
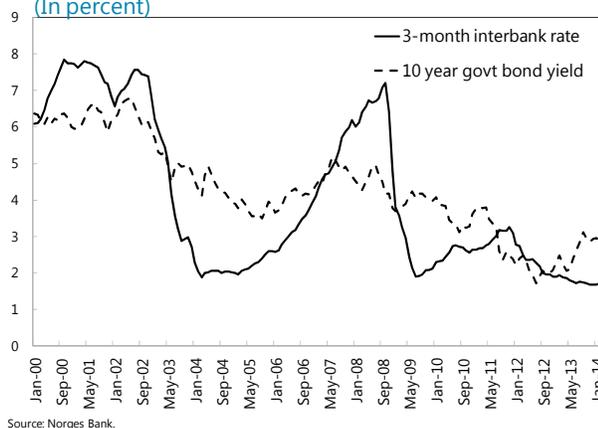
Source: Norges Bank.

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[6] Low interest rates heighten the reinvestment risk for new funds, and increase the present value of future claims (under Solvency II), which could give rise to reserve deficiencies. In this context, insurers have significant asset-liability maturity mismatch that affects their risk profile: life insurers' liability duration is about 16 years while asset duration is about 4 years; non-life insurers' liability duration is about 4 years compared with 2.5 years for asset duration.

return on 10-year government bonds, and the difference seems to have widened in 2014–15. In addition, life insurers' are exposed to rising longevity risks. In response, insurers have recently started to encourage existing policyholders with guaranteed products to switch their policies to "unit-linked" (nonguaranteed) products, thus shifting risks from insurers to policy holders (Box 1).

Box 1. Conversion of Paid-up Policies into Unit-linked Policies

In June 2014, the Ministry of Finance (MOF) adopted regulations allowing conversion of paid-up policies into unit linked policies. The regulation entered into force on September 1, 2014.

Where paid-up policies are converted to unit-linked policies, the paid-up policyholder must relinquish the guarantee regarding previously accrued rights. The regulation requires that the paid-up policyholder must be provided with sufficient information on the consequences of the potential conversion, including written examples showing what annual return on a given investment portfolio for a given age group is needed to achieve particular pension benefits.

The regulation requires a paid-up policy to be fully provisioned before conversion to a unit-linked policy. Had full provisioning not been required, the paid-up policyholders agreeing to conversion to unit-linked policies would have been exposed to biometric risks (such as longevity) as well as the interest rate risk, thus running a fairly high risk of accumulating significantly lower pension benefits under the unit-linked contract than those that had been guaranteed by the life insurer prior to the conversion.

The requirement for full provisioning will to some extent reduce the advantage for the insurers of converting paid-up policies to unit-linked policies. In particular, switching to unit-linked policies is assumed to be primarily suited to young pension plan members with many years left to retirement, but those members typically require the highest possible provisioning due to higher life expectancy. It is uncertain whether insurers will offer the conversion until the paid-up policies are fully provisioned. The delay in the conversion offering will in its turn render the conversion less attractive to the target group as the potential for a higher long-run investment return gets reduced.

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13.   The implementation of Solvency II represents additional challenges for life insurers (as in many peer countries). Under Solvency II, liabilities will be measured at fair value (compared with the current practice of discounting liabilities using the guaranteed rate),[7] meaning that the current market interest rate level will be used to estimate the value of future liabilities. Thus, it will be difficult for life insurers to meet the capital requirements under Solvency II because of the current low interest rates. Furthermore, the increased capital requirements on paid-up policies under Solvency II pose a particular challenge to insurers. In light of future capital requirements and low interest rates, life insurers have recently increased premiums on other products and have been trying to further reduce costs. The FSA has proposed to implement Solvency II through allowing (i) a 16-year transition period for implementing the Solvency II valuation of technical provisions and (ii) the use of volatility adjustment.[8]

14.   In contrast, for non-life insurers, the transition to Solvency II is expected to lead to a reduction of technical provisions. This is because the current regulation on technical provisions, including the fluctuation provisions requirement, represents a more demanding approach than the "best estimate" ("expected value") plus risk margin assessment under Solvency II. Under Solvency II, insurers will start discounting their insurance liabilities using market rates, which will reduce present values of their liabilities and thus improve (reported) capital adequacy ratios.

15.   Insurers' asset composition largely determines their market risks. The relatively large shares of private bonds and real estate assets of life insurers mean that they are vulnerable to credit spreads, overall economic slowdown (which could increase credit spreads), interest rate declines, and real estate price declines. On the other hand, non-life insurers' liabilities and assets have shorter maturities, which reduce their market risks.

16.   There is a possibility that the prolonged low interest rate environment will push insurers to shift their investments towards riskier assets (to maintain their profitability). Growth remains subdued in the euro zone, and several of Norway's important trade partners have reduced their policy rates or adopted a negative policy deposit rate. These are likely to put pressure on interest rates in Norway. The low interest rate environment has made it difficult for life insurers, with their generally large holdings of bonds, to earn adequate returns in relation to their obligations. This could lead to a shift of portfolio allocations towards more risky assets in a search for yield to improve investment returns. The current regulations for guaranteed-rate products constrain insurers' capacity to take investment risks, but the authorities should closely monitor the risks taken and avoid any deterioration in underwriting standards or under-pricing of premiums.

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[7] The maximum guaranteed rate for new polices has been reduced several times, and will be reduced from 2.5 percent to 2 percent starting from January 2015. The new rate will be used in the valuation of only new liabilities and does not affect the valuation of existing liabilities.

[8] Solvency II will not be implemented for Norwegian pension funds, but pension funds will need to conduct Solvency II stress tests and report their results.

17. **Life insurers face significant longevity risks.** Life expectancy at birth in Norway—which is higher than the OECD average—has been growing like in most peer countries, and is expected to grow further. Thus, the increase in longevity after contracts are written constitutes a risk. Health care costs have been growing as well.

Figure 9. Life Expectancy At Birth in Norway and OECD Countries
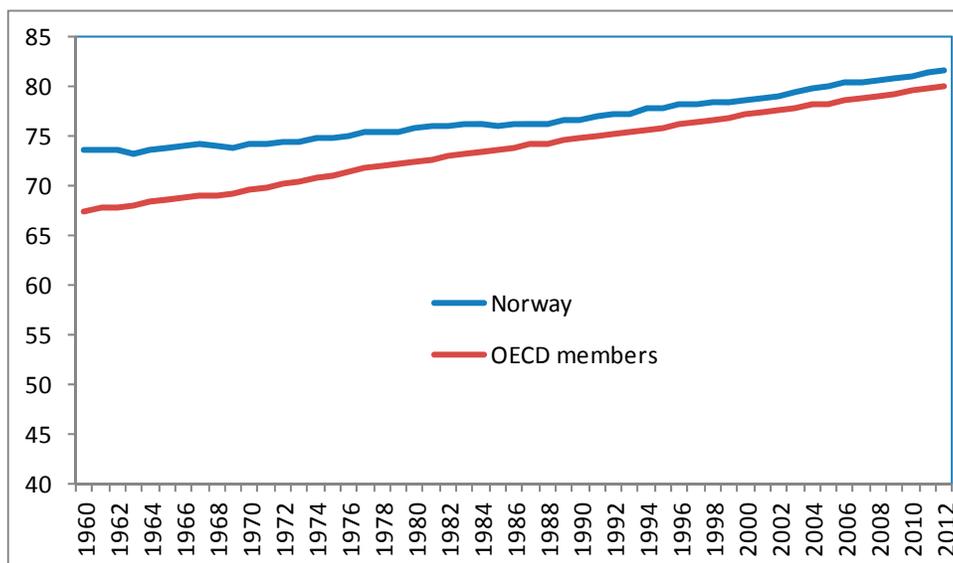
Sources: World Bank *World Development Indicators* database.

18. **The possibility of cross-sectoral contagion in Norway is to some extent limited by the regulations on exposures to companies in a conglomerate.** In particular, institutions may not provide loans/guarantees to another company within their group without consent from the MOF. This rule covers also investments in bonds issued by another entity within the group, but exemptions apply to certain exposures. At end-2014, insurers' investments in bank debt instruments (excluding deposits) averaged 7 percent of total assets in the life sector and 9 percent in the nonlife sector (Table 5).[9] However, contagion risks could be higher than implied by these figures because of contagion risks from common exposures (see the accompanying technical note on interconnectedness).

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[9] There is also a possibility of spillover risks to banks from insurance companies' selling their claims on banks.

Table 5. Insurers' Exposures to Banks at end–2014

	Life insurance		Non-life insurance	
	Millions of NOK	In percent of assets	Millions of NOK	In percent of assets
Deposits	30,915	2.6	7,846	3.5
Stocks and shares (inc. shares in subsidiaries)	46	0.0	1,620	0.7
Bonds and other fixed income securities	55,802	4.6	13,749	6.1
Loans and receivables	24,515	2.0	6,283	2.8
Financial derivatives	68	0.0	102	0.0
Other financial derivatives	6,400	0.5	474	0.2

Sources: Norwegian authorities, and IMF staff estimates.

STRESS TEST FRAMEWORK AND ASSUMPTIONS

A. The FSA's Insurance Stress Testing Framework

19.   The authorities have a broadly adequate framework to assess potential losses. Since 2008, insurance undertakings (and pension funds) have regularly reported stress tests to the FSA. Currently most small non-life undertakings report on a biannual basis, while the others report on a quarterly basis. The FSA has specified two stress tests to be reported. "Stresstest" I is a simplified version of the Solvency II calculations—a "Solvency II light" approach (see Appendix I for a description of the methodology used in the FSAP stress tests/Stresstest I). "Stresstest II" has a somewhat different approach, as it assesses the undertakings' ability to absorb losses without breaching existing capital requirements (Solvency I and the capital adequacy requirement). In addition, the FSA obtains companies' own risk and solvency assessment reports (ORSA), which require insurers to conduct a number of stress tests, including reverse stress tests.

20.   The Stresstest I framework is based on technical specifications formulated by the European Insurance and Occupational Pensions Authority (EIOPA). Market and other risks are covered in the form of a combination of single-factor shocks, and companies report the sensitivity to each of the shocks assuming them to occur instantaneously. Then, the risks are added using the so-called "diversification" matrix (which reduces the overall risk below the sum of the individual risks).

Box 2. Solvency II Capital Requirements

The Solvency II framework has three main areas (pillars).

- Pillar 1 consists of the quantitative requirements (for example, the amount of capital an insurer should hold).

- Pillar 2 sets out requirements for the governance and risk management of insurers, as well as for the effective supervision of insurers.

- Pillar 3 focuses on disclosure and transparency requirements.

The pillar 1 framework sets out the qualitative and quantitative requirements for calculation of technical provisions and Solvency Capital Requirement (SCR) using either a standard formula given by the regulators or an internal model developed by the insurance company. Technical provisions comprise two components: the best estimate of the liabilities (i.e. the central actuarial estimate) plus a risk margin. Technical provisions are intended to represent the current amount the insurance company would have to pay for an immediate transfer of its obligations to a third party.

The SCR is the capital required to ensure that the (re)insurance company will be able to meet its obligations over the next 12 months with a probability of at least 99.5 percent. In addition to the SCR capital, a minimum capital requirement (MCR) must be calculated, which represents the threshold below which the national supervisor (regulator) would intervene. The MCR is intended to correspond to an 85 percent probability of adequacy over a one-year period and is bounded between 25 percent and 45 percent of the SCR.

For supervisory purposes, the SCR and MCR can be regarded as "soft" and "hard" floors, respectively. That is, a regulatory ladder of intervention applies once the capital holding of the insurance undertaking falls below the SCR, with the intervention becoming progressively more intense as the capital holding approaches the MCR.

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21.   **The FSA's stress tests (Stresstest I) are built on a number of moderate-to-severe shock assumptions, suggested by the EIOPA.**

- On the asset side, (among others) these include the following:

    - An equity price shock of 45–55 percent (for Type 1 and Type 2 assets).

    - A domestic interest rate increase/decline of 0.64/0.56 basis points and a foreign interest rate increase/decline of 0.55/0.46 basis points.[10]

    - A 25 percent decline in real estate prices.

    - An exchange rate movement of 25 percent.

    - A spread risk applying to corporate bonds, covered bonds, subordinated debt investments, depending on the contractual terms, investment instruments with equity and bond features, etc.

- On the liability side, (among others) stress factors include two natural catastrophes with loss impact of NOK 5 billion each (NOK 10 billion in total), affecting insurers through their participation in the Natural Perils Pool (proportionate to their market share). This amount is more than the loss experienced during a severe storm in 1992, approximately NOK 2 billion in present value (in 2014 kroner).

22.   **Combined, these factors represent a severe shock.** In particular, a combination of the market, life/non-life underwriting, health underwriting, counterparty default, and operational risks correspond to the Value-at-Risk of the basic own funds of an insurance undertaking subject to a confidence level of 99.5 percent over a one-year period. These imply that the combined severe shock could happen once in about 200 years.

23.   **At this stage, the authorities do not conduct scenario analyses, and rely on companies' assessment of most risks on the liability side.** Until now, the FSA has focused on verifying the companies' own calculations through reviewing insurers' internal models. It does not have sufficient data and resources to conduct the liability side stress tests on its own.

Recommendation

24.   **The mission urges the authorities to continue to improve the stress test framework**. In particular, the FSA should continue to build its capacity to conduct liability side stress tests and

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[10] This reflects the method used in Solvency II, where the interest rate shock is relative to the current interest rate.

verify the reports by insurance companies. In addition, the authorities should consider applying macro-prudential stress scenarios. These would require additional resources for the FSA.

B.   FSAP Stress Test Assumptions

25.   The mission worked closely with the FSA to conduct insurance stress tests. In particular, the assumptions used for estimating market risks and insurance liability risks (top-down approach) were jointly agreed. Other liability-side risks (life underwriting risks, health underwriting risks, non-life underwriting risks, and non-life catastrophe risks) were estimated by the insurance companies (bottom-up approach), based on the assumptions given to them by the FSA (under the FSA's Stresstest I, which is independent of the FSAP), which were taken as given by the FSAP team.

26.   Three large life and non-life insurance companies were covered on a solo basis.[11] They represent 80 percent and 51 percent, respectively, of assets in the life and non-life sectors.

27.   The FSAP stress tests used the following stress factors:

- The first scenario assumes a combination of shocks similar to the adverse scenario used for the banking stress testing exercise (with a monetary policy response, Tables 6 and 7). This scenario is related to an upsurge in global financial market volatility. Higher financing costs and strains on the fiscal sustainability globally are assumed to push a number of countries into a tight policy mix, with repercussions for global growth and rising financial stability risks. A slowdown in Norway's key trading partners and, particularly, a decline in global oil prices have a strong downward impact on domestic growth, with higher unemployment and a sharp correction of real estate prices. The main difference from the banking stress test scenarios is that the insurance stress tests instantaneously apply the cumulative changes that will take place from 2015 to 2019 (as if the whole change took place immediately; as is done under the FSA's own insurance stress tests).

- The second scenario is based on the second scenario of the banking stress testing exercise. Under this scenario, there is no (monetary) policy response. Accordingly, the shock is stronger.

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[11] The use of solo-based data allows better coverage of intra-group exposures and transactions. Given that the insurance operations of most conglomerates constitute a relatively small share of their total operations, using consolidated data would not allow full coverage of their insurance operations.

Table 6. Key Assumptions for Insurance Sector Stress Tests
(Changes in percent unless otherwise specified)

		Adverse scenario with policy response	Adverse scenario without policy response	Ad hoc assumptions
Asset side	Interest rates (increase in pp)	2.5	2.5	2.5
	Interest rates (decrease in pp) 1/			-1.0
	Equity prices	-26.0	-26.0	-50.0
	(Nominal) Real estate prices	-29.0	-33.0	-40.0
	Exchange rate (depreciation)	-6.5	-5.6	-30
	Exchange rate (appreciation) 1/			30
	Spread risk 1/	70-750	70-750	70-750
	LGD for concentration risk 1/	45	45	45
Liability side 1/	Underwriting			
	Demographic (mortality)			
	Lapses			
	Disability			
	Operational			

1/ Not included in the banking stress testing.

Table 7. Bank Stress Test Assumptions
(Y-o-y percentage change in relevant factors; unless otherwise stated)

	Baseline Scenario						Adverse Scenario (with policy response)					Adverse Scenario (without policy response)				
	2014	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
GDP, mainland Norway	2.5	1.5	2.0	2.3	2.5	2.5	0.1	-2.8	-1.4	-0.4	0.2	-0.6	-3.4	-2.0	-0.8	0.0
Nominal house prices	2.3	6.6	3.5	2.6	2.6	2.6	-3.0	-10.8	-9.6	-5.4	-3.9	-4.5	-11.6	-10.7	-6.6	-5.2
Nominal commercial real estate prices	9.8	6.6	3.5	2.6	2.6	2.6	-1.4	-10.8	-9.6	-5.4	-3.9	-2.9	-11.6	-10.7	-6.6	-5.2
Equity prices	0.0	0.0	0.0	0.0	0.0	0.0	-26.0	0.0	0.0	0.0	0.0	-26.0	0.0	0.0	0.0	0.0
Key policy rate	1.5	1.2	1.2	1.5	1.5	1.5	0.5	0.0	0.0	0.0	0.0	1.2	1.2	1.5	1.6	1.6
3-month NIBOR rate	1.7	1.4	1.4	1.7	1.7	1.7	2.5	2.0	2.0	2.0	2.0	3.2	3.2	3.5	3.6	3.6
Lending rates, households	4.3	3.8	3.8	4.0	4.0	4.0	5.1	4.6	4.6	4.6	4.6	5.8	5.8	6.1	6.2	6.2
Lending rates, non-financial enterprises	4.4	4.0	4.0	4.2	4.2	4.2	5.2	4.7	4.7	4.7	4.7	5.9	5.9	6.2	6.3	6.3
Sovereign yields	1.4	1.7	1.8	1.9	2.0	2.1	3.7	3.8	3.9	4.0	4.1	3.7	3.8	3.9	4.0	4.1

Sources: Norwegian Authorities; and IMF staff estimates.

- The third scenario applies a combination of ad-hoc shocks, better tailored to insurance companies' vulnerabilities and, hence, with more adverse consequences for insurers. For example, instead of the 250 bp increase in interest rates, it is assumed that interest rates will decline by 100 bps (for more details see Appendix II).[12]

- The default of the largest banking counterparties, with loss given default (LGD) on all contractual obligations, was assumed as in the formula suggested by the EIOPA.

- Two catastrophic events were assumed, with an increased reinsurance reinstatement premium.

28.   These assumptions are similar to the authorities' own stress tests and represent very severe shocks. The combined shock under the first two scenarios is somewhat milder than that of the authorities' own stress tests (Stresstest I), while the third FSAP scenario represents a stronger shock (than assumed by the FSA stress tests).

FSAP INSURANCE STRESS TEST RESULTS

29.   Overall, the stress level in the solvency test was higher for insurers than under the macro-financial scenario used for the banking stress test. This results from the conservativeness of the FSA's own stress test specifications and the addition of further shocks in the FSAP stress test.

A.   Life Insurance

30.   Solvency indicators of life insurers drop substantially under all three scenarios. In fact, the system's capital buffer would be wiped out under all three (severe shock) scenarios: The system's buffer capital utilization (BCU) ratio (reverse of the Solvency Coverage Ratio, SCR) would increase to 139 percent, 142 percent, and 180 percent under the first, second, and third scenarios, respectively.[13] The companies' capital shortfall to fully cover all the risks (without restoring capital) would amount to NOK 32.7 billion, NOK 35.4 billion, and NOK 66.4 billion in the three scenarios, respectively, which corresponds to 39 percent, 42 percent, and 80 percent of the sample's available capital before stress, respectively, or 1 percent, 1.1 percent, and 2.1 percent of 2014 GDP (1.3, 2.4, and 2.6 percent of mainland GDP), respectively.

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[12] The assumption of a 100 bps decline in interest rates is more severe than assumed under the 2014 EIOPA stress tests, but is plausible given softening demand in Norway (in light of sharp declines in oil prices). Furthermore, declining (and sometimes negative) interest rates in Norway's key trading partner countries may put downward pressure on interest rates in Norway.

[13] While these results are similar to the results of the authorities' Stresstest I (under Solvency II), the authorities' Stresstest II (under Solvency I) and the companies' own stress tests (performed on a consolidated level) suggest much less vulnerability to shocks.

31.   The largest contribution to the deterioration in the life insurers' solvency position comes from the shocks to equity prices, real estate prices, and credit spread. The impact of equity price shock on the BCU varies between 39–60 percent. The credit spread risk, which is assumed to remain the same under all three scenarios, would be 48 percent of the buffer capital. The risk from a real estate price shock carried between 34–46 percent of the buffer capital. It should be noted that the interest rate shock has a substantial impact by increasing the value of liabilities, which affect the companies particularly adversely under the third scenario. Its net impact is much smaller, however, as the changes on the asset side and liability side partially offset each other. Using the "diversification matrix," the overall market risks are estimated at between 126–167 percent (of the buffer capital), instead of 136–193 percent if the individual factors were just added up.

32.   The estimated impact of the above risks on the companies' regulatory capital needs is significantly reduced by the rules for the transition to Solvency II. With the transition rules, the additional capital need under scenario 3 would decline to NOK 25 billion (0.8 percent of GDP) from NOK 66 billion (2.1 percent of GDP). The impact of the transition rules are minimal under the first and second scenarios where interest rates are assumed to increase (which would reduce insurance liabilities).

33.   Furthermore, the companies may have other cushions to meet the capital needs. First, the companies may be able to retain their profits. Second, the companies have higher levels of capital at the conglomerate level. This is in part because investments in subsidiaries have been fully deducted from own funds. In this context, the authorities should continue restricting the dividend distribution by the two companies with weaker capital adequacy until they have achieved a comfortable level of buffer capital.

Recommendations:

34.   The authorities should ask the institutions with weak capital adequacy ratios to prepare a plan to rebuild capital. This would likely be much easier in the current benign environment. Accordingly, the FSA should continue to restrict dividend distributions by these institutions until comfortable levels of capital adequacy have been achieved.

Figure 10. Life Insurance Stress Tests: BCU After Shocks

The combination of shocks would wipe out the system buffer capital under all three scenarios.
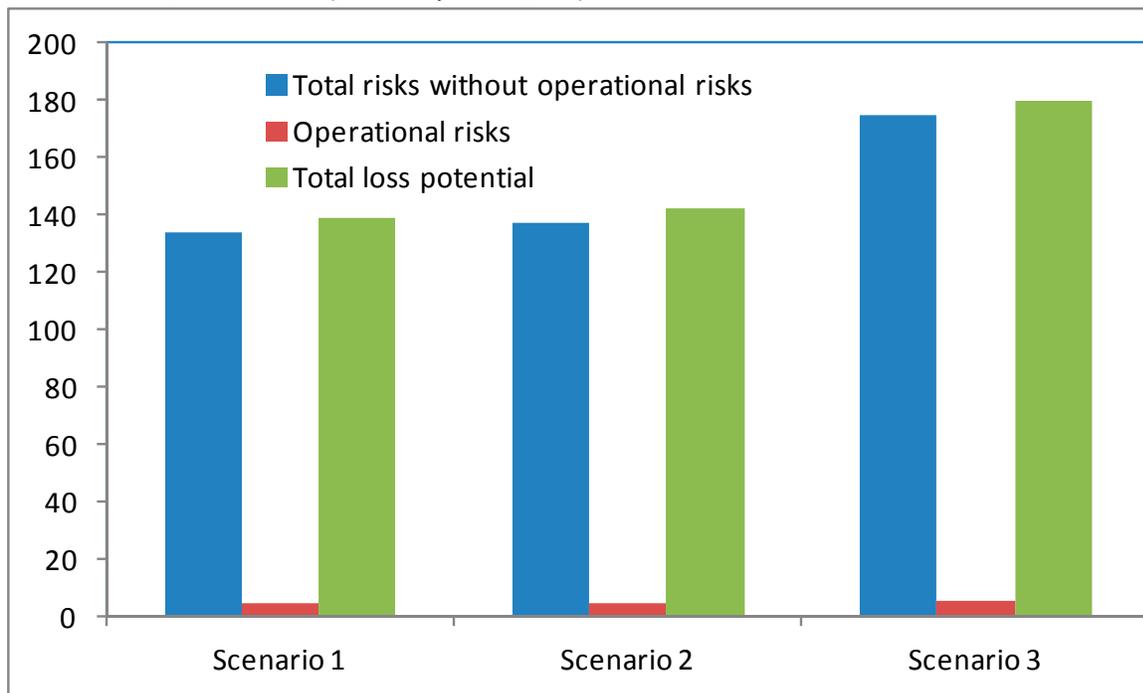
Legend:
- Total risks without operational risks
- Operational risks
- Total loss potential

Most contributing market risk factors are risks related to credit spread, share prices, and real estate prices.

Legend:
- Scenario 1
- Scenario 2
- Scenario 3
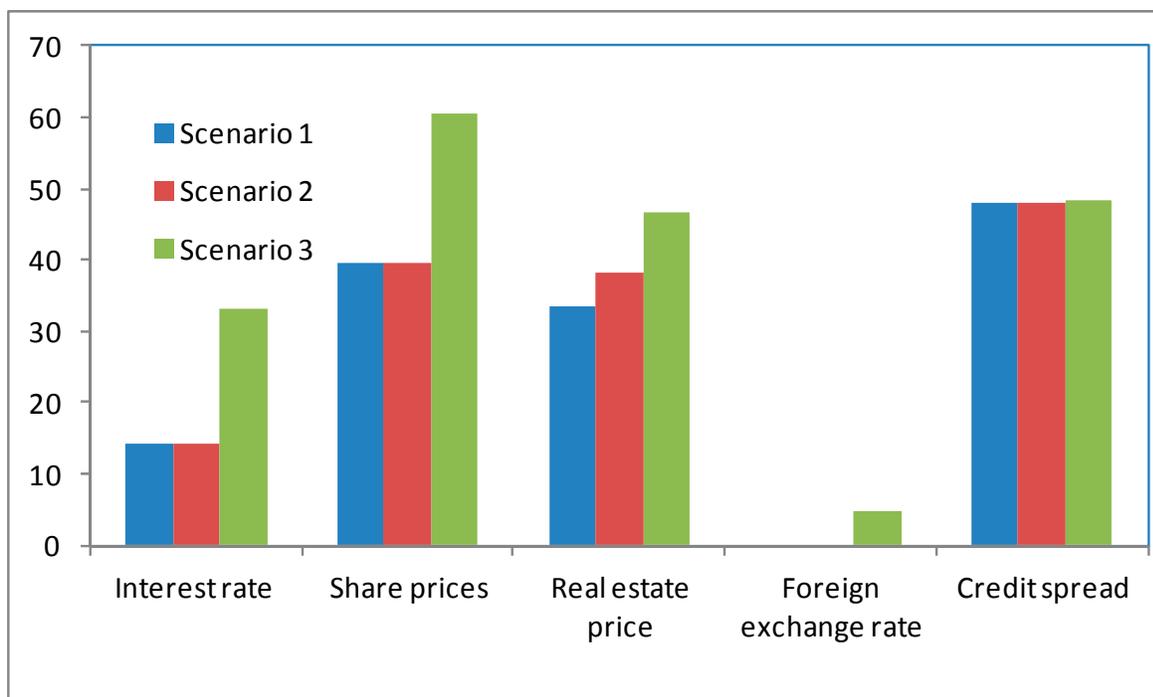
Sources: FSA/insurance companies; and IMF staff estimates.

B. Non-Life Insurance

36.   Non-life insurers show a much higher degree of resilience in the stressed scenarios.
This reflects non-life insurers' smaller asset-liability duration mismatches and current high capital
adequacy ratios, which makes them less sensitive to the shocks applied. Furthermore, the impact of
the regulatory changes under Solvency II will be more benign for non-life insurers (as the current
regulatory requirements are stricter than the Solvency II requirements). The system BCU increases to
77 percent, 78 percent, and 85 percent under the three scenarios, with all companies at or below
100 percent

**37.   For the non-life insurers, the underwriting (non-life and health) shocks and market
shocks are the main contributors to the decline in solvency ratios.** Overall, the scenarios affect
the non-life sector adversely via the reduced value in assets, and subsequently via lower available
capital. The value of liabilities is also affected as technical provisions will be discounted in the
Solvency II framework, but this would improve the capital adequacy.[14]

38.   The analysis with regard to catastrophe risks revealed a limited effect. This is because
the large non-life companies have wide-ranging coverage through the Norwegian Natural Perils
Pool and its associated foreign reinsurers.

C. Aggregating Banking and Insurance Stresses

**39.   At a conglomerate level, financial institutions could weather the combined losses from
their banking and insurance operations**. Recapitalizing their insurance companies would be within
the capacity of the corresponding conglomerates, owing to the small size of the capital required as
compared to the level of aggregate capital in the group. On the other hand, raising capital would be
a challenge for the conglomerates with their core activity in the insurance business.

Recommendations

**40.   The insurance business of conglomerates should be adequately capitalized on a solo
basis.** Under a crisis scenario, there would be competing claims on the capital of the conglomerates
and it may not be easy for the insurance companies to get the needed capital. In this context, the
authorities should identify systemically important insurance companies, ask them to prepare a
resolution plan as advised in the Financial Stability Board's Key Attributes (see also the
accompanying FSAP technical note on crisis preparedness and bank resolution), and conduct their
resolvability assessment.

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[14] Technical provisions in non-life insurance are not discounted under the Norwegian valuation framework which
means that companies (and ultimately policyholders) have an additional buffer to withstand shocks under Solvency II.

Figure 11. Non-Life Insurance Stress Tests: BCU After Shocks

The impact of shocks on the buffer capital is much smaller for non-life insurers.
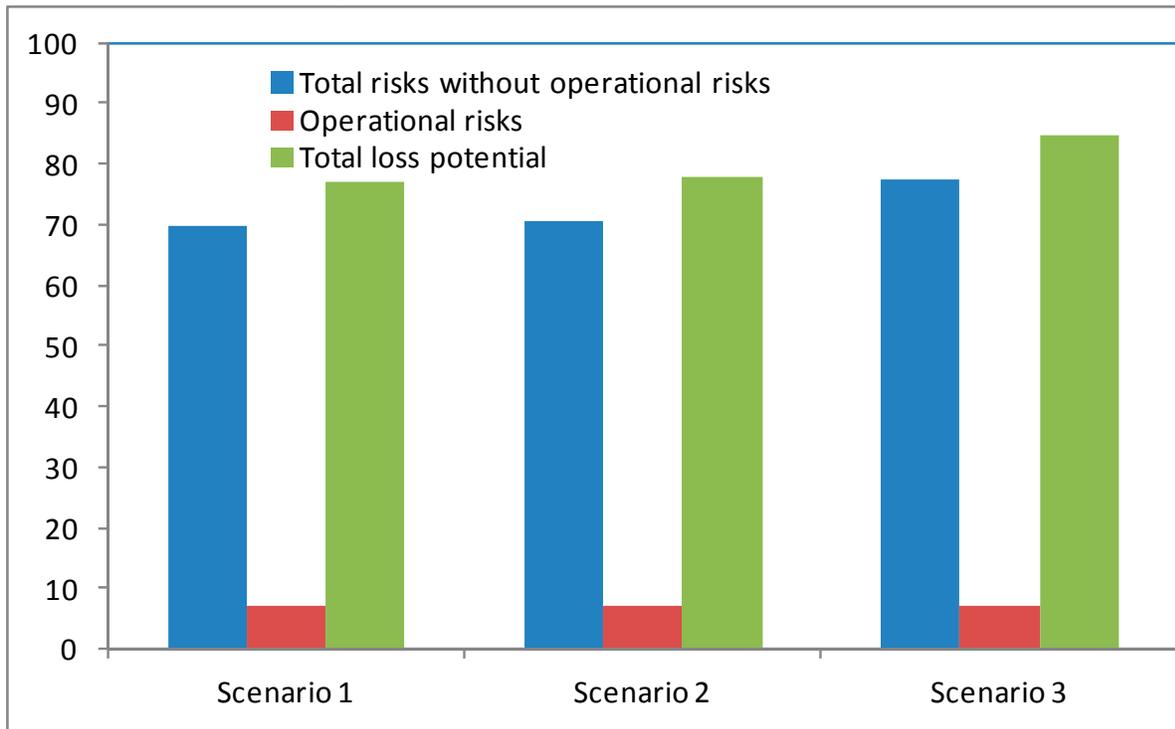
Most contributing market risk factors are risks related to credit spread, share prices, and real estate prices.
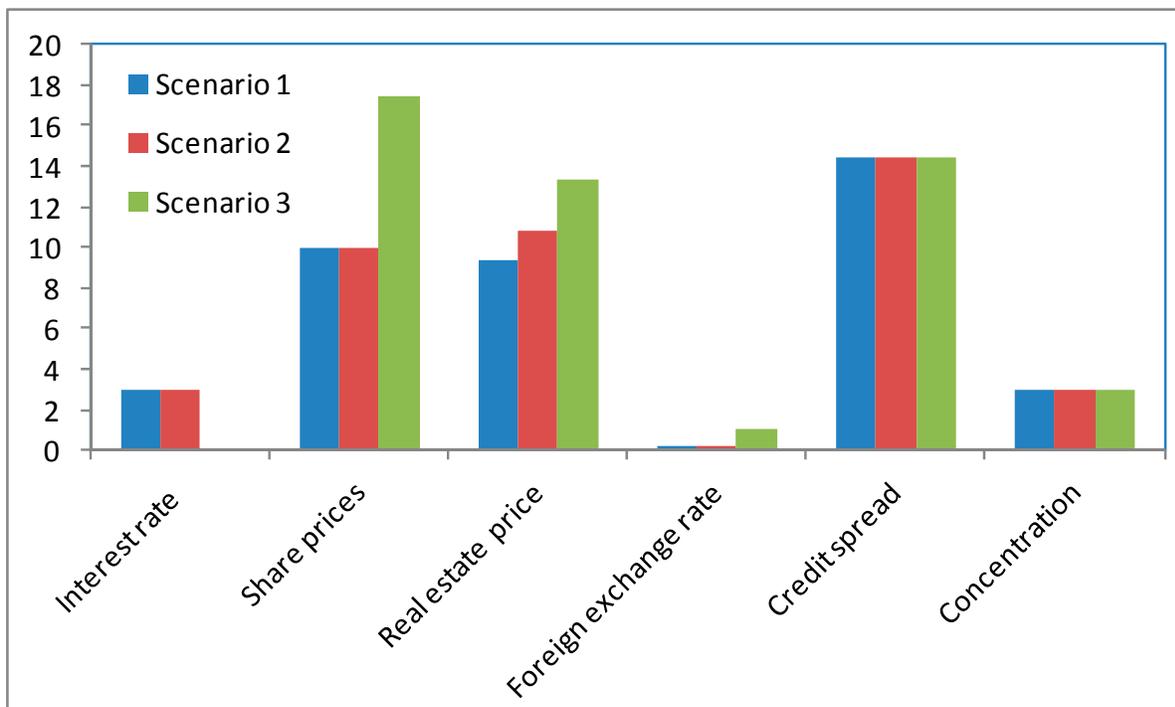
Sources: FSA/insurance companies; and IMF staff estimates.

Appendix I. Short Description of the Methodology for Insurance Stress Tests

Following EIOPA (2014), the solvency capital requirements were estimated as follows:[15]

1.   Market risks were estimated as the sum of the below risks, using the so-called "correlation matrix" as in EIOPA (2014).

- Capital requirements for **interest rate risk** were estimated as the change in net value of assets minus liabilities due to re-valuation of interest rate sensitive items using parallel shifts in the term structure. The stress causing the revaluations was assumed to be instantaneous. The underlying methodology is the duration analysis.

- Capital requirement for **equity risk** were assessed as the change in the net value of assets minus liabilities after the applied shocks to equity prices. Two types of assets are differentiated: the so-called Type 1 equities include equities listed in regulated markets in countries which are members of the EEA or the OECD. Type 2 equities comprise equities listed in stock exchanges in countries which are not members of the EEA or OECD, equities which are not listed, hedge funds, commodities and other alternative investments. Shocks for Type 2 assets were assumed to be stronger. Then, the capital requirement for equity risk was estimated using the so-called correlation matrix as in EIOPA (2014).

- Capital requirements for **property risk** were estimated as the change in the net value of assets minus liabilities due to price shocks, applied to the stock of real estate investments.

- Capital requirements for currency risk were estimated as the change in the net value of assets minus liabilities due to exchange rate movements, applied to the stock of FX positions, and taking into account derivative positions.

- Capital requirement for **spread risk** was estimated using the EIOPA suggested spread risk factors, based on the rating and duration of assets. This risk applies to the following classes of bonds: corporate bonds; subordinated debt investments, depending on the contractual terms; investment instruments with equity and bond features; covered bonds; loans other than retail loans secured by a residential mortgage; securitization positions; and credit derivatives other

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[15] The detailed methodology and technical specifications by the EIOPA ("Technical Specification for the Preparatory Phase (Part I)") can be found here: https://eiopa.europa.eu/Pages/SearchResults.aspx?k=Technical%20Specification%20for%20the%20Preparatory%20Phase%20%28Part%20I%29.

Some simplifications have been made in the stress test. The stress test instructions (in Norwegian only) can be found here: http://www.finanstilsynet.no/no/Forsikring-og-pensjon/Skadeforsikring/Tilsyn-og-overvakning/Rapportering/Stresstester/.

than for hedging purposes. A risk factor of zero percent applies to certain exposures such as exposures to EEA States' central government and central banks and instruments issued by a multilateral development bank.

- Capital requirement for **risk concentrations** was calculated in three steps:

  - (1) The relative excess exposure per single name exposure is calculated as:

$$XS_i = \max(0, E_i/Assets_{xi} - CT).$$

    where the relative excess exposure threshold CT, depending on the credit quality step of single name i, is set as follows:

Credit quality step	Relative excess exposure threshhold (CT)
0	3.0%
1	3.0%
2	3.0%
3	1.5%
4	1.5%
5	1.5%
6 or unrated	1.5%

  - (2) The capital requirement for market risk concentration on a single name exposure was equal to the loss in the basic own funds that would result from an instantaneous relative decrease in the value of the assets corresponding to the single name exposure i equal to: $XS_i * g_i$, where the parameter *gi*, depending on the credit quality step of the counterparty, is determined as follows:

Credit quality step	0	1	2	3	4	5	6	Unrated
Risk factor, gi	12	12	21	27	73	73	73	73

  - (c) Single name exposures were aggregated.

2.   Life underwriting risk,[16] **health underwriting risk, non-life underwriting risks, non-life catastrophe risk, and counterparty default risks were estimated as in EIOPA (2014), with some simplifications used in the FSA's stress tests).** The calculations had been carried out by insurance companies independent of the FSAP exercise. The FSAP team used these estimations as given.

3.   The total capital needs for the above risks before operational risks were estimated using a correlation matrix as in EIOPA (2014).

4.   Then, to derive the total solvency capital need, operational risks were estimated as follows:

$$SCR_{op}=\min(0.3*BSCR; \; Op)+0.25*Exp_{ul},$$

> where BSCR stands for basic solvency capital ratio, Op stands for basic operational risk charge for all business other than life insurance where the investment risk is borne by the policyholders, and Expul is the amount of expenses incurred during the previous 12 months in respect of life insurance where the investment risk is borne by the policyholders, excluding acquisition expenses.

Finally, the **buffer capital utilization ratio** was estimated as the ratio of the companies' buffer capital (under Solvency II) to the solvency capital need. The hurdle rate is 100 percent. Any ratio above this would mean that the capital would be depleted.

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[16] Life underwriting risks consist of four sub-modules for mortality risk, longevity risk, disability/morbidity risk, and lapse risk. The life catastrophe sub-module is restricted to (re)insurance obligations contingent on mortality, where an increase in mortality leads to an increase in technical provisions.

Catastrophe risk stems from extreme or irregular events (e.g., a pandemic event) whose effects are not sufficiently captured in the other life underwriting risk sub-modules.

Appendix II. Stress Test Matrix (STeM) for the Insurance Sector

Domain		Assumptions
		Bottom-Up by Insurance Corporations
Insurance Sector: Solvency Risk		
1. Institutional Perimeter	Institutions included	• Three large life insurance companies • Three large non-life insurance companies
	Market share	• Life: 80 percent (assets) • Non-Life: 60 percent (premiums); 51 percent assets
	Data and baseline date	• Data provided by the FSA • Reference date: 31/12/2014 • Solo-entity basis
2. Channels of Risk Propagation	Methodology	• IMF&FSA staff estimates and companies' internal models
	Valuation	• Market-consistent valuation of assets and liabilities
	Stress test horizon	• Applying cumulative changes in 2015-19 in bank stress testing scenarios • Instantaneous shocks in sensitivity analyses
3. Tail shocks	A combination of single factor analysis	• Scenario 1 and 2. Severe declines in asset prices, increasing interest rates • Scenario 3: Severe declines in asset prices, and a sudden decline in interest rates
4. Risks and Buffers	Risks/factors assessed	• Interest rates, equity, property, FX, credit spreads, lapses, concentration risks • Underwriting risks, counterparty risks, operational risks • Summation of risks within scenarios with diversification effects
	Buffers	• Absorption effect of technical provisions (profit sharing and policyholder buffer funds) for some products
	Behavioral adjustments	• Limited to rules in place at the reference date

5. Regulatory and Market-Based Standards and Parameters	Calibration of risk parameters	• Interest rates: +250 bp parallel shift/-100 bp parallel shift • Equity: -26 percent;-45 percent for ordinary shares and -55 percent for others) • Real estate: -29 percent, -33 percent, and -40 percent • FX: 6.5/5.6/30 percent depreciation of NOK • Corporate spreads: ratings based • Default of largest banking counterparty: 45 percent LGD on obligations
	Regulatory/Accounting and Market-Based Standards	• Solvency II
6. Reporting Format for Results	Output presentation	• Impact on the buffer capital • Capital shortfall for companies with a BCU above 100 percent • Contribution of individual shocks