

Oblig 1: Solvency II equity risk

Background The Solvency II evaluation of equity risk is based on a general market downturn with diversification on different assets handled by an adjustment module called *Concentration*. This is only an approximate procedure. An accurate one requires an underlying model that describes the fluctuations of the individual assets. You shall in this oblig compute the Solvency Capital Requirement for equity risk in Solvency II when you merge the Equity and Concentration sub-modules the way it is done in that regulatory system and compare with what you obtain under a more plausible model. The latter has to be built along the lines in Section 5.4 in Bølviken (2014).

Cooperation You are allowed and encouraged to cooperate with the student presenting Equity risk II (Oblig 2).

Objective: Determine whether the Solvency II approach yields the 99.5% certainty that is the target.

Material: Chapters on Solvency modelling offered the STK4520 students as handouts, especially Chapter 5 on Market Risk and also parts of Chapter 5 in Bølviken, E. (2014). *Computation and modelling in Insurance and Finance*, Cambridge University Press.

Details and simplifications The model for equity should be log-normal, and you may allow assets to have equal volatility σ and the same correlations ρ between all pairs and also expectations zero. To compare Solvency II with the output of your model there is the issue of calibration. If there are J different assets with weights w_1, \dots, w_J (adding to one), the portfolio volatility becomes

$$\sigma^{\text{port}} = \sigma \left(\rho + (1 - \rho) \sum_{j=1}^J w_j^2 \right)^{1/2},$$

and for given w_1, \dots, w_J and ρ it is reasonable to determine σ so that σ^{port} matches the portfolio volatility that is implicit in the Solvency II specification of equity risk.

Main points: The presentation (45 minutes) should cover

- 1 How Solvency II calculates the Solvency Capital Requirement for equity risk with Concentration included.
- 2 The model for equity with general volatilities and correlations. Explain how you pass to the log-normal model.
- 3 How the model is calibrated Solvency II.
- 4 How you simulate the model.
- 5 Calculations for an equally weighted portfolio where you vary ρ and J .