

## Oblig 2: Equity risk II

**Background** When things go badly in the stock market there is a tendency for the correlations to go up. A formal scientific verification is Longin and Solnik (2001). This might conceivably affect extreme downside risk considerably which is what your project is going to investigate through copula modelling adapted the model outlined in Oblig 1.

**Cooperation** You are allowed to and encouraged to cooperate with the student presenting Solvency II equity risk (Oblig 1).

**Objective:** Determine how sensitively a copula-based model would affect the Solvency Capital Requirement for equity in Solvency II.

**Material:** Section 6.6 in Bølviken, E. (2014). *Computation and modelling in Insurance and Finance*, Cambridge University Press. Section 5.4 in that book is also relevant and even the chapters on Solvency modelling offered the STK4520 students as handouts, especially Chapter 5 on Market Risk. If you like, you might look up Longin, F. and Solnik, B. (2001). *Extreme correlation of international equity markets*. *Journal of Finance*, 56, 649-676.

**Details and simplifications** Regard the model in Oblig 1 as the default one. You are to build a competing model using the Clayton Copula. For comparisons to be meaningful the two models must be calibrated carefully. You may do that in any reasonable way you like. One possibility is to determine the Clayton parameter  $\theta$  so that it yields the same average correlation as the default model. There is an application of that idea in Section 6.6 in Bølviken (2014). You probably have to use Monte Carlo. Apart from these points feed on the work in Oblig 1 as much as you want.

**Main points:** The presentation (45 minutes) should cover

- 1 The default model for equity with general volatilities and correlations as in Oblig 1.
- 2 An introduction to copula modelling with the Clayton copula in particular.
- 3 How the copula is calibrated the default model
- 4 How you simulate the copula model.
- 5 Calculations for an equally weighted portfolio where you present results on how much those in Oblig 1 change upon introducing the copula.