Learning outcomes: Chapter 3

- 1. You should be able to give an outline proof for the distribution of threshold excesses (the distribution function for the *Generalised Pareto Distribution* (GPD) will be given in the exam paper).
- 2. You should be aware of the link between the parameters in the GPD and those in the GEV.
- **3.** Given simple marginal distribution functions F, you should be able to show that the limiting distribution for excesses over a high threshold is GPD.
- 4. You should know the *threshold stability property* of the GPD, and understand how it is used to interpret a *mean residual life plot*.
- 5. You should be able to construct the GPD log-likelihood and you should be able to maximise this in R, either from first principles or by using the ismev package.
- 6. You should understand the role of the *threshold exceedance rate*. By inverting the GPD distribution function, you should be able to derive an expression for return levels based on an analysis of threshold excesses, and you should understand why this is a function of the GPD parameters *and* the threshold exceedance rate (it would be helpful to memorise the return level equation for the exam, too).
- 7. Given some output from R, you should be able to obtain standard errors for the GPD parameters. You should also be able to obtain a standard error for the threshold exceedance rate and return levels (via the delta method in the latter).
- 8. You should be able to construct confidence intervals for the GPD parameters, the threshold exceedance rate and return levels, and you should understand the role of the profiled log-likelihood for the construction of confidence intervals for return levels (you will be given critical points from the χ^2 distribution, should these be required in the exam).