CHANGES TO THE SYLLABUS AND CORE READING FOR SUBJECT CT8 FOR THE 2008 EXAMINATIONS

Changes to the Syllabus and their impact on Core Reading

No changes have been made to the Syllabus.

Changes to Core Reading

Unit 1 — Section 1.4 has been revised as follows:

1.4 Shortfall probabilities

A shortfall probability measures the probability of returns falling below a certain level.

For continuous variables, the risk measure is given by:

Shortfall probability = $\int_{-\infty}^{L} f(x)dx$

The benchmark level, *L*, can be expressed as the return on a benchmark fund if this is more appropriate than an absolute level. In fact any of the risk measures discussed can be expressed as measures of the risk relative to a suitable benchmark which may be an index, a median fund or some level of inflation.

Unit 1 — a new Section 1.6 has been added as follows:

1.5 Tail VaR and Expected Shortfall

Closely related to both shortfall probabilities and VaR are the TailVaR and Expected Shortfall measures of risk.

The risk measure can be expressed as the expected shortfall below a certain level:

Expected shortfall = E[X|X < L] = $\int_{-\infty}^{L} (L-x) f(x)dx$,

where *L* is the chosen benchmark level. If L is chosen to be a particular percentile point on the distribution, then the risk measure is known as the TailVaR.

Other similar measures of risk have been called expected tail loss, tail conditional expectation, conditional VaR, tail conditional VaR and worst conditional expectation. They all measure the risk of underperformance against some set criteria. It should be noted that the characteristics of the risk measures may vary depending on whether the variable is discrete or continuous in nature.

Downside risk measures have also been proposed based on an increasing function of ($L - x$), rather than ($L - x$) itself in the integral above.

Shortfall measures are useful for monitoring a fund's exposure to risk because the expected underperformance relative to a benchmark is a concept that is apparently easy to understand. As with semi-variance, however, no attention is paid to the distribution of outperformance of the benchmark.

Unit 7 — A new Section 0 has been added as follows:

0 Notation

The notation used in financial economics generally is not standardised and similar notation can refer to different quantities: readers should check the definitions provided in each section.

Unit 9 — A new Section 6 has been added as follows:

6 Calibrating binomial models

It is often convenient when calibrating the binomial model to have the mean and variance implied by the binomial model correspond to the mean and variance of a log-normal distribution. The reasoning will become clearer when considering continuous time versions in later units.

For recombining binomial models an additional condition that leads to a unique solution is:

$$u = \frac{1}{d}.$$

If we parameterise the log-normal distribution (under the risk neutral law) so that:

$$\ln S(t)/S(t_0) \sim N\left(\left(r - \frac{\sigma^2}{2}\right)(t - t_0), \sigma^2 (t - t_0)\right)$$

then the conditions that must be met are:

$$E[S(t + \delta_t) / S(t)] = \exp(r\delta_t)$$

and $$\text{Var} \ln[S(t + \delta_t) / S(t)] = \sigma^2\delta_t$$

where:

δ_t is the time interval of each step in the binomial model
$S(t)$ denotes the price of the asset at time t

Noting that:

$$E[S(t + \delta_t) / S(t)] = qu + (1 - q)\, d,$$

it follows from the first condition that:

$$q = (\exp(r\delta_t) - d) / (u - d).$$

Using the second condition and the assumption that $u = 1/d$:

$$\mathrm{Var}[\ln(S(t + \delta_t) / S(t))] =$$

$$q(\ln u)^2 + (1 - q)(-\ln u)^2 - E[\ln(S(t + \delta_t) / S(t))]^2$$

$$= (\ln u)^2 - E[\ln(S(t + \delta_t) / S(t))]^2$$

The last term involves terms of higher order than δ_t. If we ignore these and equate the expression to $\sigma^2\delta_t$, then we solve to get $u = \exp(\sigma\sqrt{\delta_t})$ and hence also $d = \exp(-\sigma\sqrt{\delta_t})$.

When a (continuously payable) dividend is paid on the underlying asset, it is convenient and conventional to adjust the up-steps and down-steps to be:

$$u = \exp(\sigma\sqrt{\delta_t} + \upsilon\delta_t)$$

$$d = \exp(-\sigma\sqrt{\delta_t} + \upsilon\delta_t)$$

where υ is the continuously payable dividend rate.

Unit 14 — Section 2.3 has been revised as follows:

1.6 Intensity-based Models

An intensity-based model is a particular type of continuous-time reduced form model. It typically models the "jumps" between different states (usually credit ratings) using transition intensities.

The only other changes that have been made to the Core Reading are to correct typographical errors and improve the style.

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