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Exam III: Risk Management Frameworks

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Question: 95

Which of the following are considered properties of a 'coherent' risk measure:

I. Monotonicity

II. Homogeneity

III. Translation Invariance

IV. Sub-additivity
A. II and III
B. II and IV
C. I and III
D. All of the above

Answer: B

Explanation:

All of the properties described are the properties of a 'coherent' risk measure. Monotonicity means that if a portfolio's future value is expected to be greater than that of another portfolio, its risk should be lower than that of the other portfolio. For example, if the expected return of an asset (or portfolio) is greater than that of another, the first asset must have a lower risk than the other. Another example: between two options if the first has a strike price lower than the second, then the first option will always have a lower risk if all other parameters are the same. VaR satisfies this property.

Homogeneity is easiest explained by an example: if you double the size of a portfolio, the risk doubles. The linear scaling property of a risk measure is called homogeneity. VaR satisfies this property.

Translation invariance means adding riskless assets to a portfolio reduces total risk. So if cash (which has zero standard deviation and zero correlation with other assets) is added to a portfolio, the risk goes down. A risk measure should satisfy this property, and VaR does. Sub-additivity means that the total risk for a portfolio should be less than the sum of its parts. This is a property that VaR satisfies most of the time, but not always. As an example, VaR may not be sub-additive for portfolios that have assets with discontinuous payoffs close to the VaR cutoff quantile.

Question: 96

Which of the following credit risk models focuses on default alone and ignores credit migration when assessing credit risk?
A. CreditPortfolio View
B. The contingent claims approach
C. The CreditMetrics approach
D. The actuarial approach

Answer: D

Explanation:

The correct answer is Choice 'd'. The following is a brief description of the major approaches available to model credit risk, and the analysis that underlies them:

Question: 97

For a US based investor, what is the 10-day value-at risk at the 95% confidence level of a long spot position of EUR 15m, where the volatility of the underlying exchange rate is 16% annually. The current spot rate for EUR is 1.5. (Assume 250 trading days in a year).
A. 526400
B. 2632000
C. 1184400
D. 5922000

Answer: C

Explanation:

The VaR for a spot FX position is merely a function of the standard deviation of the exchange rate. If V be the value of the position (in this case, EUR 15m x 1.5 = USD 22.5m), z the appropriate z value associated with the level of confidence desired, and be the standard deviation of the portfolio, the VaR is given by ZV.

In this case, the 10-day standard deviation is given by SQRT(10/250)*16%. Therefore the VaR is =1.645*15*1.5*(16%*SQRT(10/250)) = USD 1.1844m. Choice 'c' is the correct answer.

Question: 98

Which of the following statements are true:

I. Top down approaches help focus management attention on the frequency and severity of loss events, while bottom up approaches do not.

II. Top down approaches rely upon high level data while bottom up approaches need firm specific risk data to estimate risk.

III. Scenario analysis can help capture both qualitative and quantitative dimensions of operational risk.
A. III only
B. II and III
C. I only
D. II only

Answer: B

Explanation:

Top down approaches do not consider event frequency and severity, on the other hand they focus on high level available data such as total capital, income volatility, peer group information on risk capital etc. Bottom up approaches focus on severity and frequency distributions for events. Statement I is therefore not correct.

Top down approaches do indeed rely upon high level aggregate data and tend to infer operational risk capital requirements from these. Bottom up approaches look at more detailed firm specific information. Statement II is correct.

Scenario analysis requires estimating losses from risk scenarios, and allows incorporating the judgment and views of managers in addition to any data that might be available from internal or external loss databases. Statement III is correct. Therefore Choice 'b' is the correct answer.

Question: 99

Which of the following need to be assumed to convert a transition probability matrix for a given time period to the transition probability matrix for another length of time:

I. Time invariance

II. Markov property

III. Normal distribution

IV. Zero skewness
A. I, II and IV
B. III and IV
C. I and II
D. II and III

Answer: C

Explanation:

Time invariance refers to all time intervals being similar and identical, regardless of the effects of business cycles or other external events. The Markov property is the assumption that there is no ratings momentum, and that transition probabilities are dependent only upon where the rating currently is and where it is going to. Where it has come from, or what the past changes in ratings have been, have no effect on the transition probabilities. Rating agencies generally provide transition probability matrices for a given period of time, say a year. The risk analyst may need to convert these into matrices for say 6 months, 2 years or whatever time horizon he or she is interested in. Simplifying assumptions that allow him to do so using simple matrix multiplication include these two assumptions – time invariance and the Markov property. Thus Choice 'c' is the correct answer. The other choices (normal distribution and zero skewness) are non-sensical in this context.

Question: 100

The CDS rate on a defaultable bond is approximated by which of the following expressions:
A. Hazard rate / (1 – Recovery rate)
B. Loss given default x Default hazard rate
C. Credit spread x Loss given default
D. Hazard rate x Recovery rate

Answer: B

Explanation:

The CDS rate is approximated by the [Loss given default x Default hazard rate]. Thus Choice 'b' is the correct answer.

Note that this is also equal to the credit spread on the reference bond over the risk free rate. Therefore credit spreads and CDS rates are generally the same. Also, 'loss given default' is nothing but (1 – Recovery rate). This can be substituted in the formula for the credit spread to get an alternative expression that directly refers to the recovery rate. Therefore all other choices are incorrect.

Question: 101

Which of the following steps are required for computing the aggregate distribution for a UoM for operational risk once loss frequency and severity curves have been estimated:

I. Simulate number of losses based on the frequency distribution

II. Simulate the dollar value of the losses from the severity distribution

III. Simulate random number from the copula used to model dependence between the UoMs

IV. Compute dependent losses from aggregate distribution curves
A. I and II
B. III and IV
C. None of the above
D. All of the above

Answer: A

Explanation:

A recap would be in order here: calculating operational risk capital is a multi-step process. First, we fit curves to estimate the parameters to our chosen distribution types for frequency (eg, Poisson), and severity (eg, lognormal). Note that these curves are fitted at the UoM level – which is the lowest level of granularity at which modeling is carried out. Since there are many UoMs, there are are many frequency and severity distributions. However what we are interested in is the loss distribution for the entire bank from which the 99.9th percentile loss can be calculated.

From the multiple frequency and severity distributions we have calculated, this becomes a two step process:

– Step 1: Calculate the aggregate loss distribution for each UoM. Each loss distribution is based upon and underlying frequency and severity distribution.

– Step 2: Combine the multiple loss distributions after considering the dependence between the different UoMs. The 'dependence' recognizes that the various UoMs are not completely independent, ie the loss distributions are not additive, and that there is a sort of diversification benefit in the sense that not all types of losses can occur at once and the joint probabilities of the different losses make the sum less than the sum of the parts.

Step 1 requires simulating a number, say n, of the number of losses that occur in a given year from a frequency distribution. Then n losses are picked from the severity distribution, and the total loss for the year is a summation of these losses. This becomes one data point. This process of simulating the number of losses and then identifying that number of losses is carried out a large number of times to get the aggregate loss distribution for a UoM.

Step 2 requires taking the different loss distributions from Step 1 and combining them considering the dependence between the events. The correlations between the losses are described by a 'copula', and combined together

mathematically to get a single loss distribution for the entire bank. This allows the 99.9th percentile loss to be calculated.

Question: 102

Which of the following are valid techniques used when performing stress testing based on hypothetical test scenarios:

I. Modifying the covariance matrix by changing asset correlations

II. Specifying hypothetical shocks

III. Sensitivity analysis based on changes in selected risk factors

IV. Evaluating systemic liquidity risks
A. I, II, III and IV
B. II, III and IV
C. I, II and III
D. I and II

Answer: D

Explanation:

Each of these represent valid techniques for performing stress testing and building stress scenarios. Therefore d is the correct answer. In practice, elements of each of these techniques is used depending upon the portfolio and the exact situation.

Question: 103

For identical mean and variance, which of the following distribution assumptions will provide a higher estimate of VaR at a high level of confidence?
A. A distribution with kurtosis = 8
B. A distribution with kurtosis = 0
C. A distribution with kurtosis = 2
D. A distribution with kurtosis = 3

Answer: A

Explanation:

A fat tailed distribution has more weight in the tails, and therefore at a high level of confidence the VaR estimate will be higher for a distribution with heavier tails. At relatively lower levels of confidence however, the situation is reversed as the heavier tailed distribution will have a VaR estimate lower than a thinner tailed distribution.

A higher level of kurtosis implies a 'peaked' distribution with fatter tails. Among the given choices, a distribution with kurtosis equal to 8 will have the heaviest tails, and therefore a higher VaR estimate. Choice 'a' is therefore the correct answer. Also refer to the tutorial about VaR and fat tails.

Question: 104

Which of the following measures can be used to reduce settlement risks:
A. escrow arrangements using a central clearing house
B. increasing the timing differences between the two legs of the transaction
C. providing for physical delivery instead of netted cash settlements
D. all of the above

Answer: C

Explanation:

increasing the timing differences between the two legs of the transaction will increase settlement risk and not reduce it. Using escrow arrangements, such as central clearing houses to settle transactions (eg the DTCC in the United States) reduces settlement risk. Cash settlements based on netting arrangements reduce settlement risk, while physical delivery combined with gross cash payments increase it. Therefore Choice 'a' is the correct answer.

Question: 105

CORRECT TEXT

The standard error of a Monte Carlo simulation is:
A. Zero
B. The same as that for a lognormal distribution
C. Proportional to the inverse of the square root of the sample size
D. None of the above

Answer: C

Explanation:

When we do a Monte Carlo simulation, the statistic we obtain (eg, the expected price) is an estimate of the real variable. The difference between the real value (which would be what we would get if we had access to the entire population) and that estimated by the Monte Carlo simulation is measured by the 'standard error', which is the standard deviation of the difference between the 'real' value and the simulated value (ie, the 'error').

As we increase the number of draws in a Monte Carlo simulation, the closer our estimate will be to the true value of the variable we are trying to estimate. But increasing the sample size does not reduce the error in a linear way, ie doubling the sample size does not halve the error, but reduces it by the inverse of the square root of the sample size. So if we have a sample size of 1000, going up to a sample size of 100,000 will reduce the standard error by a factor of 10 (and not 100), ie, SQRT(1/100) = 1/10. In other words, standard error is proportional to 1/N, where N is the sample size.

Therefore Choice 'c' is correct and the others are incorrect.

Question: 106

If the 1-day VaR of a portfolio is $25m, what is the 10-day VaR for the portfolio?
A. $7.906m $79.06m
B. $250m
C. Cannot be determined without the confidence level being specified

Answer: B

Explanation:

The 10-day VaR is = $25m x SQRT(10) = $79.06m. Choice 'b' is the correct answer.

Question: 107

Which of the following are elements of 'group risk':

I. Market risk

II. Intra-group exposures

III. Reputational contagion

IV. Complex group structures
A. II, III and IV
B. II and III
C. I and IV
D. I and II

Answer: A

Explanation:

The term 'group risk' has been defined in the FSA document 08/24 on stress testing as the risk that a firm may be adversely affected by an occurrence (financial or non-financial) in another group entity or an occurrence that affects ther group as a whole.

These risks may occur through:

– reputational contagion,

– financial contagion,

– leveraging,

– double or multiple gearing,

– concentrations and large exposures (particularly intra-group).

Thus, the insurance sector may be considered a group, and a firm may suffer just because another group firm has had losses or reputational issues.

The FSA statement goes on to identify some elements of group risk as follows:

– intra-group exposures (credit or operational exposures through outsourcing or service arrangements, as well as more standard business exposures);

– concentration risks (from credit, market or insurance risks which could put a strain on capital resources across entities simultaneously);

– contagion (reputational damage, operational or financial pressures); and

– complex group structures (with dependencies, complex split of responsibilities and accountabilities).

Therefore Choice 'a' is the correct answer and the rest of the choices are incorrect.

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