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PRM Certification - Exam III: Risk Management Frameworks, Operational Risk, Credit Risk, Counterparty Risk, Market Risk, ALM, FTP - 2015 Edition

PRMIA 8008

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QUESTION NO: 1

The sensitivity (delta) of a portfolio to a single point move in the value of the S&P500 is $100. If the current level of the S&P500 is 2000, and has a one day volatility of 1%, what is the value-at-risk for this portfolio at the 99% confidence and a horizon of 10 days? What is this method of calculating VaR called?

A. $14,736, parametric VaR

B. $4,660, Monte Carlo simulation VaR

C. $14,736, historical simulation VaR

D. $4,660, parametric VaR

ANSWER: A

Explanation:

:

If the current level of the S&P 500 is 2000, and a single day volatility is 1%, and the delta (ie change in portfolio value from a one point change) is $100, then the 1 day volatility for the portfolio in dollars is 2000 * 1% * $100 = $2,000.

At the 99% confidence level, the value of the inverse cumulative density function for the normal distribution is 2.33 (=NORMSINV(99%), in Excel). Therefore the 1 day VaR will be 2.33 * $2000 = $4,660. Extending it to 10 days using the square root of time rule, we get the 10 day VaR as equal to SQRT(10)*4660 = $14,736.

Since this method of calculating VaR relies upon a delta approximation of a risk factor (in this case the S&P500), it is the parametric approach to calculating VaR (the other methods being historical simulation, and Monte Carlo simulation).

The 2015 Handbook provides an excellent example of parametric (and other) VaR calculations in Chapter 3 of Volume III of Book 3. The spreadsheet used for the illustration can be downloaded from http://www.prmia.org/prm-exam/handbook-resources.

QUESTION NO: 2

Which of the following would not be a part of the principal component structure of the term structure of futures prices?

A. Curvature component

B. Trend component

C. Parallel component

D. Tilt component

ANSWER: C

Explanation:

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The trend component refers to parallel shifts in the term structure, the tilt refers to changes in the shape of the term structure at the long and short ends, and the curvature refers to movements in the medium term part. The phrase 'parallel component' has no meaning and is not a part of the principal components in analyzing term structures.

Changes in the term structure can also be analyzed as "level, slope and curvature", so you should be aware of this terminology as well to refer to the principal components of a term structure analysis.

QUESTION NO: 3

When compared to a high severity low frequency risk, the operational risk capital requirement for a low severity high frequency risk is likely to be:

A. Higher

B. Zero

C. Lower

D. Unaffected by differences in frequency or severity

ANSWER: C

Explanation:

: High frequency and low severity risks, for example the risks of fraud losses for a credit card issuer, may have high expected losses, but low unexpected losses. In other words, we can generally expect these losses to stay within a small expected and known range. The capital requirement will be the worst case losses at a given confidence level less expected losses, and in such cases this can be expected to be low. On the other hand, medium severity medium frequency risks, such as the risks of unexpected legal claims, 'fat-finger' trading errors, will have low expected losses but a high level of unexpected losses. Thus the capital requirement for such risks will be high. It is also worthwhile mentioning high severity and low frequency risks - for example a rogue trader circumventing all controls and bringing the bank down, or a terrorist strike or natural disaster creating other losses - will probably have zero expected losses & high unexpected losses but only at very high levels of confidence. In other words, operational risk capital is unlikely to provide for such events and these would lie in the part of the tail that is not covered by most levels of confidence when calculating operational risk capital.

Note that risk capital is required for only unexpected losses as expected losses are to be borne by P&L reserves. Therefore the operational risk capital requirements for a low severity high frequency risk is likely to be low when compared to other risks that are lower frequency but higher severity. Thus Choice 'c' is the correct answer.

QUESTION NO: 4

Which of the following statements is the most appropriate description of feedback effects:

A. The amplification of smaller initial shocks to one risk factor creating larger subsequent shocks through system-wide interactions between other risks, creating self-perpetuating downward stresses in the markets

B. The lack of a comprehensive view of risk across credit, market and liquidity risks leading to an underestimation of correlations that tend to spike up in the event of a crisis C. The spread of contagion from the bankruptcy of one participant leading to a similar outcome for other market participants

C. The revision of stress testing scenarios based upon management, business unit and regulatory feedback on the plausibility or otherwise of stress scenarios.

ANSWER: A

Explanation:

: Choice 'a' (The amplification of smaller initial shocks to one risk factor creating larger subsequent shocks through system-wide interactions between other risks, creating self-perpetuating downward stresses in the markets) is the most comprehensive description of 'feedback effects', as described in the BCBS document on stress testing. Choice 'c' is one manifestation of feedback effects, but does not describe the entire effect. Choice 'b' is not a description of 'feedback effects', but one of the various weaknesses in stress testing that was seen during the crisis. Choice 'd' is plain nonsensical. The BCBS paper provides a good and succinct description of feedback effect: how mortgage default shocks led to a deterioration of market prices of CDOs, followed by a drying up of the liquidity in these markets. This led to banks having to hold on to assets they intended to securitize (securitization and warehousing risk), and given the absence of transparency on who was exposed to what, banks refusing to lend to each other and a drying up of the wholesale funding market as well. All of this was additionally accompanied by a general flight to quality, households withdrawing money from money market funds creating a crisis in that market as well. At each stage, the initial shock was amplified and fed back into the system through interactions that had not been imagined by any market participant or regulator, leave alone risk managers.

QUESTION NO: 5

Which of the following is not an event of default covered in the ISDA Master Agreement?

I. failure to pay or deliver

II. credit support default

III. merger without assumption

IV. Bankruptcy

A. All are considered events of default

B. II and III

C. I

D. IV

E. failure to pay or deliver

II. credit support default

III. merger without assumption

IV. Bankruptcy

ANSWER: C

Explanation:

:

Note that events of default under the ISDA MA are caused by one of the parties that is considered 'at fault'. In contrast, "termination events" are events for which no one is at fault, for example changes in legislation, illegality etc that still justify termination of the transactions under the contract.

The ISDA MA describes the following 8 types of events of default:

1. failure of pay or deliver 2. breach of agreement credit support default 4. misrepresentation

5. default under specified transaction

6. cross default

7. bankruptcy

8. merger without assumption

All of the options presented in the question are events of default.

QUESTION NO: 6

The returns for a stock have a monthly volatilty of 5%. Calculate the volatility of the stock over a two month period, assuming returns between months have an autocorrelation of 0.3.

A. 8.062%

B. 7.071%

C. 5%

D. 10%

ANSWER: A

Explanation:

: The square root of time rule cannot be applied here because the returns across the periods are not independent. (Recall that the square root of time rule requires returns to be iid, independent and identically distributed.) Here there is a 'autocorrelation' in play, which means one period's returns affect the returns of the other period. This problem can be solved by combining the variance of the returns from the two consecutive periods in the same way as one would combine the variance of different assets that have a given correlation. In such cases we know that:

Variance (A + B) = Variance(A) + Variance(B) + 2*Correlation*StdDev(A)*StdDev(B).

The standard deviation can be calculated by taking the square root of the variance. Therefore the combined volatility over the two months will be equal to =SQRT((5%^2) + (5%^2) + 2*0.3*5%*5%) = 8.062%. All other answers are incorrect.

QUESTION NO: 7

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:

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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:

1. CreditMetrics: based on the credit migration framework. Considers the probability ofmigration to other credit ratings and the impact of such migrations on portfolio value.

2. CreditPortfolio View: similar to CreditMetrics, but adds the impact of the business cycleto the evaluation.

3. The contingent claims approach: uses option theory by considering a debt as a putoption on the assets of the firm.

4. KMV's EDF (expected default frequency) based approach: relies on EDFs and distanceto default as a measure of credit risk.

5. CreditRisk+: Also called the 'actuarial approach', considers default as a binary event thateither happens or does not happen. This approach does not consider the loss of value from deterioration in credit quality (unless the deterioration implies default).

QUESTION NO: 8

The 99% 10-day VaR for a bank is $200mm. The average VaR for the past 60 days is $250mm, and the bank specific regulatory multiplier is 3. What is the bank's basic VaR based market risk capital charge?

A. $250mm

B. $200mm

C. $750mm

D. $600mm

ANSWER: C

Explanation:

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The current Basel rules for the basic VaR based charge for market risk capital set market risk capital requirements as the maximum of the following two amounts:

1. 99%/10-day VaR,

2. Regulatory Multiplier x Average 99%/10-day VaR of the past 60 days

The 'regulatory multiplier' is a number between 3 and 4 (inclusive) calculated based on the number of 1% VaR exceedances in the previous 250 days, as determined by backtesting.

- If the number of exceedances is <= 4, then the regulatory multiplier is 3.

- If the number of exceedances is between 5 and 9, then the multiplier = 3 + 0.2*(N-4),where N is the number of exceedances.

- If the number of exceedances is >=10, then the multiplier is 4.

So you can see that in most normal situations the risk capital requirement will be dictated by the multiplier and the prior 60-day average VaR, because the product of these two will almost often be greater than the current 99% VaR.

The correct answer therefore is = max(200mm, 3*250mm) = $750mm.

Interestingly, also note that a 99% VaR should statistically be exceeded 1%*250 days = 2.5 times, which means if the bank's VaR model is performing as it should, it will still need to use a reg multiplier of 3.

QUESTION NO: 9

Which of the following best describes the concept of marginal VaR of an asset in a portfolio:

A. Marginal VaR is the value of the expected losses on occasions where the VaR estimate is exceeded.

B. Marginal VaR is the contribution of the asset to portfolio VaR in a way that the sum of such calculations for all the assets in the portfolio adds up to the portfolio VaR.

C. Marginal VaR is the change in the VaR estimate for the portfolio as a result of including the asset in the portfolio.

D. Marginal VaR describes the change in total VaR resulting from a $1 change in the value of the asset in question.

ANSWER: D

Explanation:

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The correct answer is choice 'd'

Marginal VaR is just the change in total VaR from a $1 change in the value of the asset in the portfolio. All other answers are incorrect. Mathematically, it is expressed as follows, where VaRp is the VaR for the portfolio, and Vi is the value of the asset in question.

$$MVaR_i = \frac{\delta VaR_p}{\delta V_i}$$

Other answers describe other VaR related concepts such as incremental VaR, Component VaR and Conditional VaR.

QUESTION NO: 10

Which of the following is a most complete measure of the liquidity gap facing a firm?

A. Residual liquidity gap

B. Liquidity at Risk

C. Marginal liquidity gap

D. Cumulative liquidity gap

ANSWER: A

Explanation:

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Marginal liquidity gap measures the expected net change in liquidity over, say, a day. It is just equal to the liquidity inflow minus liquidity outflow. The cumulative liquidity gap measures the aggregate change in liquidity from a point in time, in other words it is just the summation of the marginal liquidity gap for each of the days included in the period under consideration. The residual liquidity gap goes one step further and adds available 'opening balance' of liquidity to the cumulative liquidity gap to reveal the days or times when the net liquidity is most at risk.

Liquidity at Risk measures the expected time to survival at a certain confidence level applied to the firm's cash flows - and is not a measure of the liquidity gap.

Therefore Choice 'a' is the correct answer.

QUESTION NO: 11

Changes in which of the following do not affect the expected default frequencies (EDF) under the KMV Moody's approach to credit risk?

A. Changes in the debt level

B. Changes in the risk free rate

C. Changes in asset volatility

D. Changes in the firm's market capitalization

ANSWER: B

Explanation:

:

EDFs are derived from the distance to default. The distance to default is the number of standard deviations that expected asset values are away from the default point, which itself is defined as short term debt plus half of the long term debt. Therefore debt levels affect the EDF. Similarly, asset values are estimated using equity prices. Therefore market capitalization affects EDF calculations. Asset volatilities are the standard deviation that form a place in the denominator in the distance to default calculations. Therefore asset volatility affects EDF too. The risk free rate is not directly factored in any of these calculations (except of course, one could argue that the level of interest rates may impact equity values or the discounted values of future cash flows, but that is a second order effect). Therefore Choice 'b' is the correct answer.

QUESTION NO: 12

The definition of operational risk per Basel II includes which of the following:

I. Risk of loss resulting from inadequate or failed internal processes, people and systems orfrom external events

II. Legal risk

III. Strategic risk

IV. Reputational risk

A. I, II, III and IV

B. II and III

C. I and III

D. I and II

E. Risk of loss resulting from inadequate or failed internal processes, people and systems orfrom external events

II. Legal risk

III. Strategic risk

IV. Reputational risk

ANSWER: D

Explanation:

:

Operational risk as defined in Basel II specifically excludes strategic and reputational risk.

Therefore Choice 'd' is the correct answer.

Note that Basel II defines operational risk as follows:

Operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk.

QUESTION NO: 13

Which of the following statements is true in relation to collateral management?

I. A collateral management system need not consider the failure by counterparties to returncollateral when due

II. The extent to which counterparties may have rehypothecated collateral is not aconsideration for a collateral management system

III. Cash is an acceptable substitute for any type of collateral required to be posted

IV. Haircuts do not apply to treasury issued instruments posted as collateral

A. I, II and III

B. I, II, III and IV

C. II and III

D. None of the statements is true

E. A collateral management system need not consider the failure by counterparties to returncollateral when due

II. The extent to which counterparties may have rehypothecated collateral is not aconsideration for a collateral management system

III. Cash is an acceptable substitute for any type of collateral required to be posted

IV. Haircuts do not apply to treasury issued instruments posted as collateral

ANSWER: D

Explanation:

:

Strong management of collateral, both receivable and payable, is emerging as an area requiring significant investment by financial institutions and asset managers in IT infrastructures and business processes. A bank needs to make collateral calls

daily, based upon the P&L of the previous day, and likewise receives collateral calls from its counterparties. Just like cash, a bank needs to make sure that it does not run out of collateral to post when a call is received. Interestingly, based upon the agreements between banks and their mutual understanding, only certain types of instruments often qualify as valid collateral - and in such cases even cash is not acceptable if the right type of bond or other agreed security is not available to post. The operational challenges of managing collateral increase manifold due to 'rehypothecation', ie when collateral received from one counterparty gets posted out as collateral where it is due. In such cases, the bank should have the mechanisms to receive the right assets back in a timely way in case rehypothecated assets are to be returned. The systems should be able to deal with delays, failures without impacting the ability of the bank to post collateral as needed. All of this requires major investments in IT and processes.

Statement I is not true as a bank is bound to post collateral to third parties when needed regardless of the failure of its counterparties to post collateral to it when owed. In the markets, failures by counterparties can and do happen, and a collateral management system needs to account for and keep a buffer for the fact that some collateral when due will not be received.

Statement II is not true as rehypothecation by counterparties of collateral posted increases the chances of the collateral not being received in time. The system should consider the need for liquidity to generate assets that can be posted as collateral when others have failed to return the collateral in a timely way.

Statement III is not correct as cash may not be acceptable to counterparties as collateral. From a practical point of view, they may not have the infrastructure to receive and account for cash as collateral. A Swiss bank, for example, may have an 'account' to receive US tbills as collateral but may not even have a US dollar account to receive cash. Even if it did, the volumes of transactions going back and forth may make tracking and reconciliations impossible. Thus a bank should always make sure that it has the right type of collateral available to post.

Statement IV is incorrect as well, as treasury issued instruments are also subject to haircuts. Their value also fluctuates in response to changes in yields, and therefore they are subject to haircuts as well.

Thus none of the statements are correct and Choice 'd' is the correct answer.

QUESTION NO: 14

Which of the following statements is true in respect of a non financial manufacturing firm?

I. Market risk is not relevant to the manufacturing firm as it does not take proprietarypositions

II. The firm faces market risks as an externality which it must bear and has no control over

III. Market risks can make a comparative assessment of profitability over time difficult

IV. Market risks for a manufacturing firm are not directionally biased and do not increasethe overall risk of the firm as they net to zero over a long term time horizon

A. III only

B. IV only

C. I and II

D. III and IV

E. Market risk is not relevant to the manufacturing firm as it does not take proprietarypositions

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III. Market risks can make a comparative assessment of profitability over time difficult

IV. Market risks for a manufacturing firm are not directionally biased and do not increasethe overall risk of the firm as they net to zero over a long term time horizon

ANSWER: A

Explanation:

:

A non-financial firm such as a manufacturing company faces market risks similar to those faced by financial firms, except perhaps for not being exposed to risks from the equity markets. Non financial firms commonly face interest rate risks in respect of their debts, commodity price risks in respect of their inputs and products, and foreign currency risks in respect of their overseas operations. It is therefore not correct to say that the manufacturing firm does not face market risk because it does not take proprietary positions. While decisions on positions may not be actively taken, positions in foreign exchange (eg, through overseas debtors owing foreign currency, or liabilities in foreign currencies to overseas suppliers), commodities (through exposure to the need for raw material and inventory of finished goods) and interest rates (through debt financed, whether at fixed or floating rates) exist and create market risk much in the same way as they would for a proprietary position. Therefore statement I is incorrect.

While the firm faces market risks as an externality (as do financial firms for that matter, though often they seek such exposure to profit from their view on which way the externality will express itself), it is incorrect to say that these risks must be borne. They can be measured and hedged. Therefore statement II is incorrect.

The results of a manufacturing firm will include gains and losses arising from exposure to market risk, and will cloud the true profitability of the business. A firm with significant unhedged overseas sales may show vastly different results across time periods due to the FX gains and losses, making comparative assessment of profitability difficult. Therefore statement III is correct.

Market risks for a manufacturing firm may be directionally biased in terms of exposure, ie there may be a consistent 'long' position in a particular commodity that the firm produces, and a consistent 'short' position in the commodities consumed. In the same way, directional biases may exist in FX or interest rate exposures too. Regardless of the bias, the existence of market risk exposures increase the volatility of the income stream and make the firm more risky, even though the long term expected returns from such exposures is zero (ie, returns may be zero but standard deviation is not). Therefore statement IV is not correct as market risks form non financial firms do increase the overall risk of the firm.

QUESTION NO: 15

Which of the following statements is true in respect of different approaches to calculating

VaR?

I. Linear or parametric VaR does not take correlations into account

II. For large portfolios with little or no optionality or other non-linear attributes, parametric

VaR is an efficient approach to calculating VaR

III. For large portfolios with complex sources of risk and embedded optionalities, the fullrevaluation method of calculating VaR should be preferred

IV. Delta normal local revaluation based VaR is suitable for fixed income and optionportfolios only

A. I, II, III and IV

B. I and IV

C. II and III

D. III only

E. Linear or parametric VaR does not take correlations into account

II. For large portfolios with little or no optionality or other non-linear attributes, parametric VaR is an efficient approach to calculating VaR

III. For large portfolios with complex sources of risk and embedded optionalities, the fullrevaluation method of calculating VaR should be preferred

IV. Delta normal local revaluation based VaR is suitable for fixed income and optionportfolios only

ANSWER: C

Explanation:

: This question is different in that it uses terminology you will not find in the PRMIA handbook. Yet it is important to understand these as there may be a question based on this slightly different terminology. (It is only the terminology that is different, the concepts are the same.)

If you read the PRMIA handbook, there are three methods of calculating VaR: Analytical or parametric, historical simulation and Monte Carlo simulations. There is one more way of categorizing the methods of calculating VaR, and these are as follows:

1. Local valuation: This refers to analytical or parametric VaR. This relies upon a neat statistical formula to calculate VaR and assumes a normal distribution. It also relies upon a known covariance matrix between the different components of VaR. Local valuation based VaR is further subdivided into two types:

a. Linear VaR: Linear VaR is calculated assuming the portfolio is linear, and its valuechanges just based upon the delta of the portfolio. In such cases, once a change (eg, in stock values) is known, that change is multiplied by the delta alone to get the VaR. Second order effects, such as gamma or convexity are ignored.

b. Non-linear VaR: Non linear analytical VaR is calculated using both delta and the secondderivative, ie gamma or the convexity. This is more accurate if the portfolio is non-linear. The key thing about 'local revaluation' VaR is that it does not require us to reprice or completely value all instruments in the portfolio. All we have to know is the delta (or the gamma and convexity as well) and multiply that with the number of standard deviations of change in the risk factor that we are interested in. So if we are considering a bond, we don't have to recalculate the new value of the bond as we can just use the delta. This can be a significant computational advantage for a large financial institution where there may be a large number of positions.

2. Full revaluation: This refers to a VaR method where the asset in question is fully repriced based on the new value of the risk factor - and this includes both historical and Monte Carlo based VaR methods.

Local revaluation, or analytical method based VaR is computationally easier to calculate, specially if based on just the delta-normal method (ie ignoring second order effects from convexity or gamma). But it will give incorrect results if the portfolio includes substantial non-linearity or other complexities. The full revaluation methods will always give the correct results, but they can be computationally difficult to arrive at.

Statement I is completely inaccurate - local revaluation methods do take correlations into account through the correlation or covariance matrices. Statement IV is false too - the 'delta normal' VaR refers to Var calculations based upon just the delta

and do not account for the convexity or optionality. Statements II and III are correct. Therefore Choice 'c' is the correct answer.