

## 2020年10月FRM二级押题卷（答案+解析）

### 1. Answer: D

In regard to true statements (I.) and (II.), the capital conservation buffer (CCB), the GSIB buffer, and the countercyclical buffer (CCyB) each require common equity Tier 1 (CET1) which is buffer of the highest quality. Further, each of any them implies restrictions on dividend payments (in addition to other supervisor tools such as restriction on executive bonuses).

In regard to true statement (III.), the BCBS says that "the capital conservation buffer [CCB] was introduced to ensure that banks have an additional layer of usable capital that can be drawn down when losses are incurred"<sup>26</sup> and GARP says "In the case of the CCB, the rationale roughly follows that for the Prompt Corrective Action (PCA) system built into U.S. capital regulation beginning in 199; i.e., a bank with ratios that begin to approach the minimums should be subject to increasingly stringent supervisory intervention in order to induce a return to well-capitalized status."<sup>27</sup>

In regard to true statement (IV.), the G-SIB requirement includes five buckets {1.0%, 1.5%, 2.0%, 2.5%, or 3.5% } and, explains GARP, "In the case of the G-SIB buffer, the rationale is similar to that for the CCB but also recognizes the very large costs to society of distress at G-SIBs (and the higher volatility of losses at some of them). Thus, larger buffers are specified to further reduce the chance of failure."<sup>27</sup>

In regard to true statement (V.), "The CCyB [countercyclical capital buffer] has two rationales. One is to provide an instrument for macroprudential restraint of overheating; the other is attentive to the cost of capital," says GARP.

Further, explains BCBS, "The countercyclical capital buffer [CCyB] aims to ensure that banking sector capital requirements take account of the macro-financial environment in which banks operate. Its primary objective is to use a buffer of capital to achieve the broader macroprudential goal of protecting the banking sector from periods of excess aggregate credit growth that have often been associated with the build-up of system wide risk. Due to its countercyclical nature, the countercyclical capital buffer regime may also help to lean against the build-up phase of the credit cycle in the first place. In downturns, the regime should help to reduce the risk that the supply of

credit will be constrained by regulatory capital requirements that could undermine the performance of the real economy and result in additional credit losses in the banking system."

**2. Answer: D****3. Answer: C****4. Answer: D**

The hedge fund has wrong-way risk. As interest rates rise, both Bank HJK's and Bank PQR's equity value would decline since the performances of the two banks are highly correlated. Therefore, the value of the long put option on PQR would increase, resulting in a higher exposure to bank HJK for the hedge fund. This is a wrong-way risk since the hedge fund's exposure to HJK would be increasing as the credit quality of HJK is declining.

The manufacturer also has wrong-way risk. Since the credit spread of Bank HJK is increasing and credit spreads of different banks in the same market tend to be positively correlated, the credit spread of Bank PQR should also increase. Therefore, the value of the manufacturer's long CDS position on Bank PQR is increasing at the same time the credit quality of Bank HJK is decreasing; thus, that is wrong-way risk.

**5. Answer: B**

95% VaR: Mean=1000\*5%=50; STDEV=sqrt (1000\*5%\*95%) = 6.9

Critical value = (33-50)/6.9 = 2.46 (cannot reject)

99% VaR: Mean=1000\*1%=10; STDEV=sqrt (1000\*1%\*99%) = 3.14

Critical value = (11-10)/3.14 = 0.318 (cannot reject)

**6. Answer: C****7. Answer: D**

Merton model assumes that firm value is lognormally distributed with constant volatility and that the firm has one zero-coupon debt issue. If firm value exceeds the face value of debt at maturity, the firm is not in default.

#### 8. Answer: C.

Basel II did NOT eliminate risk-weighted assets (or risk weights); risk-weighted assets (RWA) do continue in Basel III/IV. According to GARP's Mark Carey<sup>31</sup>, the four significant innovations of Basel II (as an improvement over the original Basel I accord) were: more sophisticated risk weight formulas; the addition of an operational risk capital charge; Pillars 2 and 4; and the repeated use of the Quantitative Impact Studies (QIS). Many experts consider the additional Pillars to be a highly significant development.

As Carey explains, "The three pillars represented a push toward convergence of national practices [especially in the context of the "rules versus principles" disparity]. Specifically, Pillar 2 mandated that supervisors require banks to have more than the minimum amount of capital as well as internal capital adequacy and assessment processes (ICAAP) that take their risk profile into account ... National discretion regarding enforcement of the accord's provisions was reduced, and national regulators were to be transparent about their implementation efforts, including those concerning the requirements in excess of the minimums. Pillar 3 required more qualitative and quantitative disclosures, in the hope that pressure from market participants would help improve banks' practices [aka, market discipline]."<sup>31</sup>

#### 9. Answer: B

The relationship between the size and operational risk of bank does not remain constant or that operational risk exposure increase with a bank's size in a non-linear fashion.

Johnson SB distribution is a suitable approach for equity default correlation distribution.

#### 10. Answer: D

$$\lambda = 6.0 \quad 1 - e^{-6 \times \frac{3}{12}} = 0.77686$$

**11. Answer: C**

$$\text{Original RAROC} = \frac{50 - 6 - (800 \times 2.5\%) - 14 + 100 \times 3.5\%}{100} = 13.5\%$$

$$\text{A : New RAROC} = \frac{50 - 6 - (800 \times 2.5\%) - 14 * 1.25 + 100 \times 3.5\%}{100} = 10\%$$

$$\text{B : New RAROC} = \frac{50 - 6 * 1.5 - (800 \times 2.5\%) - 14 + 100 \times 3.5\%}{100} = 10.5\%$$

$$\text{C : New RAROC} = \frac{50 - 6 - (800 \times 3\%) - 14 + 100 \times 3.5\%}{100} = 9.5\%$$

$$\text{D : New RAROC} = \frac{50 - 6 - 20 - 14 + 100 \times 3.5\%}{125} = 11.5\%$$

**12. Answer: B**

Notional \* (LIBOR+3%) = 80M \* (1%+3%) = 3.2M (cash inflow from loan)

10M \* (LIBOR+5%) = 0.6M (Mezzanine payout)

65M \* (LIBOR+0.5%) = 0.975M (Senior payout)

3.2-0.6-0.975 = 1.625M (net cash inflow)

1.625+5 = 6.625M (equity + net cash inflow), the same as the loss amount.

B is the correct answer.

**13. Answer: C**

The weekly return =  $7\% \div 52 = 0.1346\%$

The weekly volatility =  $4\% \div \sqrt{52} = 0.5547\%$

Normal VaR =  $|0.001346 - 2.33 * 0.005547| * 1000000 = 11580$

Lognormal VaR =  $(1 - e^{0.001346 - 2.33 * 0.005547}) * 1000000 = 11512$

Hence, lognormal VaR is smaller than Normal VaR by 68 per week.

**14. Answer: D****15. Answer: A**

Asset requiring funding:

$$20 \times 0\% + 30 \times 50\% + 30 \times 65\% + 20 \times 100\% = 54.5$$

Deposits and capital:

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专业来自101%的投入!

$$40 \times 90\% + 48 \times 50\% + 4 \times 100\% + 8 \times 100\% = 72$$

Thus,  $72/54.5 > 1$ , then KRW 54.5 billion; the bank satisfies the NSFR requirement is correct.

### 16. Answer: C

The monotonicity in coherent risk measure indicates the smaller risk, the larger return.

### 17. Answer: D

SMA introduces historical loss component to account for future operational risk loss exposure, this approach is depend on historical data, while the AMA method was based on the models. So SMA is less sensitivity to risk in comparison with AMA.

### 18. Answer: A

A is correct. To derive the credit valuation adjustment (CVA), we use the standard formula:

$$CVA = \sum_{i=0}^n LGD_i \times EE_i \times PD_i \times DF_i$$

Where (at any time f),

The discount factor ( $DF_f$ ) is determined from the risk-free rate of 2%; and

$$\text{Hazard rate} = \frac{\text{Spread}}{1 - RR} = 12\% \text{ (True for years 2 and 3)}$$

The probability of default  $PD(t)$ , marginal probability, is derived from the relationship between cumulative probability of default  $PD(c,t)$  and the constant hazard rate (X):

$$PD(c,t) = 1 - e^{-\lambda t}.$$

$$PD(c,1) = 1 - e^{-0.12 \times 1} = 11.31\%, \text{ and so } PD_1 = 11.31\%$$

$$PD(c,2) = 1 - e^{-0.12 \times 2} = 21.34\%, \text{ and so } PD_2 = 21.34\% - 11.31\% = 10.03\%$$

$$PD(c,3) = 1 - e^{-0.12 \times 3} = 30.23\%, \text{ and so } PD_3 = 30.23\% - 21.34\% = 8.89\%$$

	Year 0	Year 1	Year 2	Year 3
Hazard Rate ( $\lambda$ )		12%	12%	12%
Probability of default (cumulative) ( $PD(c,t)$ )		11.31%	21.34%	30.23%
Probability of default (marginal) ( $PD(t)$ )		11.31%	10.03%	8.89%
Discount factor (DF)		0.9804	0.9612	0.9423
Recovery rate		0.85	0.75	0.65

Expected exposure (EE) (AUD million)		15	15	15
Collateral (C) (AUD million)		13	13	13
EE' (netted) (AUD million)		2	2	2
LGD × EE' × PD(t) × DF		0.0333	0.0482	0.0586
CVA (AUD million)	0.1401			

B is incorrect. AUD 0.172 million is the result obtained when the hazard rate is used instead of the PD. C is incorrect. AUD 0.442 million is the result obtained when the recovery rate and not the LGD is used. D is incorrect. AUD 1.051 million is the result obtained when collateral is not considered.

#### 19. Answer: D

Policies and procedures should require basic due diligence for all customers and commensurate due diligence for all customers and commensurate due diligence as the level of risk associated with the customer varies. The customer due diligence processes typically requires a standard level of verification and then is varied depending on the risk. It ideally includes electronic verification where required/possible.

#### 20. Answer: D

Because of the Jensen's inequality,

$$E\left[\frac{1}{(1+r)}\right] > \frac{1}{E(1+r)}$$

The value calculated by method B is greater because method B includes a convexity adjustment.

#### 21. Answer: D

Incremental VaR = MVaR \* P

Stock D's MVaR is the largest one.

#### 22. Answer: C

#### 23. Answer: A

The implied distribution of the underlying equity prices derived using the general volatility smile of equity options has a heavier left tail and a less heavy right tail than a lognormal distribution of underlying prices.

Therefore, using the lognormal distribution instead, deep-out-of-the-money call options on the underlying to be priced relatively high.

The implied distribution of underlying foreign currency prices derived using the general volatility smile of foreign currency options has heavier tails than a lognormal distribution of underlying prices. Therefore, using the lognormal distribution of prices causes deep-out-of-the-money call options on the underlying to be priced relatively low.

#### 24. Answer: D

I. Cluster analysis, II. Natural Language Processing (NLP), and III. Reinforcement learning

About (I.) Cluster analysis, the lack of labeled data implies this is unsupervised learning and grouping observations according to similar features is cluster analysis; e.g. k-means clustering. FSB FIN: "Machine learning is often used to identify groups of bonds that behave similarly to each other. By doing so, they can rely on many more data points, providing better estimates of price movements when the market is thin. The resulting tool groups bonds into broad, intuitively similar buckets and then, using cluster analysis, collects the most comparable products together in each bucket, to score the liquidity of individual bonds." According to the paper's Glossary: "Cluster analysis: A statistical technique whereby data or objects are classified into groups (clusters) that are similar to one another but different from data or objects in other clusters."

About (II.) Natural Language Processing (NLP), FSB FIN: "3.4.3 SupTech: uses and potential uses by central banks and prudential authorities: Machine learning can be applied to systemic risk identification and risk propagation channels. Specifically, NLP tools may help authorities to detect, measure, predict, and anticipate, among other things, market volatility, liquidity risks, financial stress, housing prices, and unemployment. In a recent Bancad'Italia (BdI) study, still in progress, textual sentiment derived from Twitter posts is used as a proxy for the time-varying retail depositors' trust in banks. The indicator is used to challenge the predictions of a banks' retail funding model, and to try to capture possible threats to financial stability deriving from an increase of public distrust in the banking system. Furthermore, at the BdI, in order to extract the most relevant information available on the web, newspaper articles are processed

through a suitable NLP pipeline that evaluates their sentiment. In another study, academics developed a model using computational linguistics and probabilistic approaches to uncover semantics of natural language in mandatory US bank disclosures. The model found risks as early as 2005 related to interest rates, mortgages, real estate, capital requirements, rating agencies and marketable securities. Other studies are able to predict and anticipate market outcomes and economic conditions, including volatility and growth." According to the paper's Glossary: "Natural Language Processing (NLP): An interdisciplinary field of computer science, artificial intelligence, and computation linguistics that focuses on programming computers and algorithms to parse, process, and understand human language."

About (III.) Reinforcement learning, FSB FIN: "Also, AI can be used to help identify how the timing of trades can minimize market impact. Market impact models can be developed that describe how the effect of a trade depends on previous trades as a starting point. The models attempt to avoid scheduling trades too closely together to avoid having a market impact greater than the sum of its parts. These models can be used to set out the best possible trading schedules for a range of scenarios and then tweak the schedule as the real trade progresses, using supervised learning techniques to make the short term predictions determining those tweaks. Banks are also testing reinforcement learning to teach artificial intelligence tools to react to order imbalance and queue position in the limit order book." According to the paper's Glossary: "Reinforcement learning: a subset of machine learning in which an algorithm is fed an unlabelled set of data, chooses an action for each data point, and receives feedback (perhaps from a human) that helps the algorithm learn."

## 25. Answer: C

We first adjust the oldest ten data and replace the first, third and fifth data

Then the 1-day 95% VaR is 3700 and the ES is the average of the updated 1th to 5th loss data,  $(6900+6000+5100+4900+4100)/5=5400$ .

## 26. Answer: A

## 27. Answer: A.

In regard to (B), (C) and (D), each is FALSE. Instead, the following are true statements:

Banks are allowed to serve high-risk customers, but "if a bank chooses to do business with a high-risk customer, more intensive ongoing monitoring of that customer's activity is needed."

Previous or preexisting bank accounts do not exempt this bank's ML/FT obligations: "Though information about a customer's previous banking relationships may be helpful, the fact that a customer previously had accounts at another bank is not sufficient to classify the customer as low-risk or as well-identified. For example, the previous bank may have ejected the customer due to ML/FT concerns."

Politically exposed person (PEP) are high-risk and require the attention deserved by high-risk customers, but a bank is not required to avoid them.

## 28. Answer: A

The power of test weakness means an increase in type II error.

I: The hypothesis that the model is correct should be rejected if  $LR_{uc} > 3.84$ . If 3.69 is mistaken for 3.96, it will increase the type II error.

II: Increasing the sample size allows us to reject the model more easily. So the assumption that number of failures increases in a constant proportion to time periods would not achieve the "easier-to-reject" effect, thus increasing the type II error.

III: The lower the confidence level for constructing VaR model, the larger the non-rejection regions and it would give people the false impression that the number of exceptions is within the non-rejection regions.

## 29. Answer: C

$$\text{RAROC} = \frac{500 \times (7\% - 2\% - 1.5\% - 1\%) + 500 \times 10\% \times 6\%}{500 \times 10\%} = 31\%$$

the cost of common equity =  $1.5\% + 2 \times (6\% - 1.5\%) = 10.5\%$

$$\text{hurdle rate} = \frac{2}{3} \times 10.5\% + \frac{1}{3} \times 3\% = 8\% < 31\%$$

So it is profit for your bank to deal the loan.

## 30. Answer: A

A is correct. The change in the pension fund's surplus ( $\Delta S$ ) for the year 2018 is equal to the ending surplus ( $S_1$ ) at the end of 2018 less the initial surplus ( $S_0$ ) at the end of 2017.

That is,  $\Delta S = S_1 - S_0$ .

The initial surplus is calculated as  $S_0 = A_0 - L_0 = 840 - 450 = \text{USD } 390$  million, where  $A_0$  = the firm's initial assets and  $L_0$  = the firm's initial liabilities.

Next, we must calculate  $S_1$ , the surplus at the end of 2018:

Given the 14.0% decline in asset value, the new level of assets  $A_1$  at the end of 2018 is equal to:

$$A_1 = (1 - 0.14) * 840 = \text{USD } 722.40 \text{ million.}$$

Given the 3.5% increase in the value of liabilities, the new level of liabilities  $L_1$  at the end of 2018 is equal to:  $L_1 = (1 + 0.035) * 450 = \text{USD } 465.75 \text{ million.}$

Thus, the ending surplus for 2018 =  $S_1 = A_1 - L_1 = 722.40 - 465.75 = \text{USD } 256.65 \text{ million}$

Therefore, the change in surplus for 2018 =  $\Delta S = S_1 - S_0 = 256.65 - 390 = \text{USD } -133.35 \text{ million.}$

B is incorrect. USD -117.6 million is the change in asset values ( $722.4 - 840 = \text{USD } 117.6 \text{ million}$ )

C is incorrect. USD 256.7 million is the year-end 2018 surplus.

D is incorrect. USD 390.0 million is the year-end 2017 surplus.

### 31. Answer: D

The other factor in the Fama-French model is the HML factor, which stands for the returns of a portfolio of high book-to-market stocks minus a portfolio of low book to market stocks. The book-to-market ratio is book value divided by market capitalization, or the inverse of equity value normalized by book value. In essence, a value strategy consists of buying stocks that have low prices (normalized by book value, sales, earnings, or dividends, etc.) and selling stocks that have high prices (again appropriately normalized).

### 32. Answer: A

One of the characteristics of poor liquidity asset is lower liquidity.

### 33. Answer: D

$$\text{NSFR} = \frac{\text{Amount of stable funding, ASF}}{\text{Required Amount of stable funding, RSF}}$$

- A: Increase in cumulative perpetual preferred stock, debt subordinated to depositors with an original maturity of five years would increase Tier 1 and Tier 2 Capital, of which the ASF factor is 100%.
- B: Borrowing with remaining maturity greater than one year has a 100% ASF factor.
- C: Cash, short-term instruments, securities and increase loans to financial entities within one year have a RSF factor of 0%. These are the most robust assets.
- D: Obviously, loans to retail and small business customers with a remaining maturity less than one year have a bigger RSF factor of 85% and it will increase the required amount of stable funding in comparison with choice C.

**34. Answer: C**

C is correct. The Basel three lines of defense model establishes the following lines of defense: In the first line of defense business line managers manage the risk of their business lines, in the second line of defense the corporate operational risk function (CORF) reviews the risk controls put in place by the first line of defense and establishes firm-wide risk management procedures, and in the third line of defense, an independent review (such as an internal auditor) reviews the effectiveness of the risk controls in the first two lines of defense. C is correct, since as part of the second line of defense, the CORF should challenge inputs from business line managers.

A is incorrect, as internal audit is part of the third line of defense and the validation team is generally part of the corporate risk function as part of the second line of defense.

B is incorrect, business line managers do not challenge the audit function as part of the first line; rather, they manage the risk of the business lines.

D is incorrect, as the CORF is the second line of defense.

**35. Answer: B**

$$(1 - e^{0\%-1\% \times 2.33}) \times 50000 \times 20 + \frac{1}{2} \times \frac{1.5}{20} \times 50000 \times 20 = 60,530$$

**36. Answer: C**

The BSM call option price =  $100 \times 0.64 - 100 \times e^{-3\%} \times 0.4 = \$25.182$

which does not include counterparty risk incurred by the long option position (the short has no counterparty risk). The CVA-adjusted value =  $\$25.182 - \$23.00 \times 5\% \times 75\% = \$24.32$

**37. Answer: C**

When the severity of the incident increased, make us overestimate its operational risk capital.

**38. Answer: D**

Back testing the 95% VaR model on 99% or even higher confidence level would widen the confidence interval for number of exceptions and would trigger an increase in type II error.

**39. Answer: C**

This Q-Q plot has flatter slopes at the tails of the plot, which indicate lighter tails in the distribution. A normal distribution would result in a linear QQ plot. A distribution with thin tails would produce a QQ plot with less steep slopes at the tails of the plot than a linear relationship, while this one is less steeper at the tails. It is not a negatively skewed distribution, as the Q-Q plot is symmetric.

**40. Answer: A**

According the information, calculate the ratio of expected excess return to margin VAR

$$\frac{\text{excess return for asset X}}{\text{MVaR}_X} = \frac{R_X - R_f}{Z \times \sigma_p \times \beta_X} = \frac{9\%}{Z \times \sigma_p \times 0.97} = \frac{9.278\%}{Z \times \sigma_p}$$

$$\frac{\text{excess return for asset Y}}{\text{MVaR}_Y} = \frac{R_Y - R_f}{Z \times \sigma_p \times \beta_Y} = \frac{8\%}{Z \times \sigma_p \times 0.99} = \frac{8.081\%}{Z \times \sigma_p}$$

$$\frac{\text{excess return for asset Z}}{\text{MVaR}_Z} = \frac{R_Z - R_f}{Z \times \sigma_p \times \beta_Z} = \frac{9.5\%}{Z \times \sigma_p \times 1.08} = \frac{8.976\%}{Z \times \sigma_p}$$

In that case, choose to add weight of asset X that has the highest ratio of expected excess return to margin VAR and liquidate that of asset Y that has the lowest ratio of expected excess return to margin VAR will sure increase the overall performance of the portfolio.

**41. Answer: D****42. Answer: C**

$$\text{Default Correlation} = \frac{0.4\% - 2\% \times 3\%}{\sqrt{2\% \times 98\% \times \sqrt{3\% \times 97\%}}} = 0.142365$$

**43. Answer: B**

The return for the perfect timer in each year is the maximum of the return on stocks and the return on bills

**44. Answer: B****45. Answer: A**

When employing a number of managers, nonsystematic risk will be largely diversified away, so systematic risk becomes the relevant measure of risk. The appropriate performance metric when evaluating potential components of the full risky portfolio is now the Treynor measure: this reward-to-risk ratio divides expected excess return by systematic risk.

**46. Answer: A**

For Basel III purposes, the leverage ratio is Tier 1 Capital/Total Exposure = 146/3,950 = 3.69%

**47. Answer: A**

$$\text{VaR}_{\text{U.S.stock}} = 2.33 \times 10\% \times 90 = 20.97\text{million}$$

$$\text{VaR}_{\text{U.S.bond}} = 2.33 \times 9\% \times 50 = 10.485\text{million}$$

$$\text{VaR}_{\text{Euro stock}} = 2.33 \times 2\% \times 50 = 2.33\text{million}$$

$$\text{VaR}_{\text{U.S.stock+U.S.bond}} = \sqrt{(20.97)^2 + (10.485)^2 + 2 \times 0.7 \times 20.97 \times 10.485} = 29.3\text{million}$$

$$\text{VaR}_{\text{U.S.stock+Euro stock}} = \sqrt{(20.97)^2 + (2.33)^2} = 21.1\text{million}$$

Euro stock keeps the total portfolio within the risk budget.

**48. Answer: B**

A long call option experiences RWR if risk exposure and counterparty default probability results in decreased counterparty risk. A long put option is subject to WWR if both risk exposure and counterparty default probability increase. Declining local currency can increase the position gain in a foreign currency transaction, while increasing counterparty risk exposure. The 2007-2009 credit crisis provides an example of WWR from the perspective of a long who had bought CDSs as protection against bond issuers' default.

**49. Answer: B**

The joint probability of survival up to time  $t$  and default over  $(t, t+\tau)$  is:

$$P[t^* > t \cap t^* < t+\tau] = 1 - e^{-\lambda(t+\tau)} - (1 - e^{-\lambda t}) = e^{-\lambda t}(1 - e^{-\lambda\tau})$$

The joint probability of survival the first year and default over the first year and the second year is:

$$P[t^* > 1 \cap t^* < 1+1] = e^{-0.12*1}(1 - e^{-0.12*1}) = 8.61\%$$

**50. Answer: C**

Credit default swaps can be thought of as insurance against the default of some underlying instrument or as a put option on the underlying instrument.

**51. Answer: D.**

Carretta and Schwizer refer to several definitions of risk culture. In particular, consistent with Betty's definition, the Institute of Risk Management emphasizes beliefs (aka, basic assumptions): "Risk Culture is a term describing the values, beliefs, knowledge, and understanding about risk shared by a group of people with a common purpose, in particular, the employees of an organization or of teams or groups within an organization."

On the other hand, the Financial Stability Board (FSB) and the Institute of International Finance (IIF), consistent with Peter's definition, emphasize conduct. Says IIF: "Risk culture can be defined as the norms and traditions of the behavior of individuals and of groups within an organization that determine the way in which they identify, understand, discuss, and act on the risks the organization confronts and the risks it takes" (IIF, 2009). Says FSB: "A bank's norms, attitudes, and behavior related to risk awareness, risk-taking and risk management and controls that shape decisions on risks. Risk culture influences the decisions of management and employees during the day-to-day activities and has an impact on the risks they assume"

**52. Answer: D****53. Answer: B**

The NASDAQ will increase 25%, or  $(3625/2900) - 1$ , over the next year, so the index payer will pay USD 5 million ( $0.25 \times 20$  million) to ABC Corp. Since ABC Corp's payments depend on today's LIBOR, it will pay 3.75% ( $1.25\% + 2.5\%$ ) or USD  $0.75(0.0375 \times 20\text{million})$ . So the firm's net cash flow would be  $0.75$  million – 5 million = -USD 4.25 million.

**54. Answer: C**

The synergies from this acquisition would increase the ABC stock value, while the illiquidity in near future would decrease the stock value and trigger the loss from acquisition. The probability distribution of the stock price might consist of a mixture of two lognormal distributions, the first corresponding to favorable news, the second to unfavorable news.

**55. Answer: D**

With the default correlation equal to 1, the portfolio will act as if there is only one credit. Viewing the portfolio as a binomial distributed random variable, there are only two possible outcomes for a portfolio acting as one credit. The portfolio has a 2% probability of total loss and a 98% probability of zero loss. Therefore, with a recovery rate of zero, the extreme loss given default is \$1,000,000. The expected loss is equal to the portfolio value times  $\pi$  and is \$20,000 in this example. The credit VaR is defined as the quantile of the credit loss less the expected loss of the portfolio. At the 99% confidence level, the credit VaR is equal to \$980,000.

**56. Answer: B****57. Answer: C.**

The Basel 2.5 market risk capital requirement requires a 99.0% confidence level and is given by:

$MRC = \max[VaR(t-1), m^*VaR(60\text{-day avg})] + \max[SVaR(t-1), m(S)^* SVaR(60\text{-day avg})]$ . In this case,  $MRC = \max[185.0, 3.0^*140.0] + \max[360.0, 3.0^* 270.0] = \$1,230.0$  million.

**58. Answer: B**

Defining  $F^R$  and  $F^N$  as the face amounts of the real and nominal bonds, respectively, and their corresponding DV01 as  $DV01^R$  and  $DV01^N$ , a DV01 hedge is adjusted by the hedge adjustment factor, or beta, as follow:

$$F^R = F^N \times \frac{DV01^N}{DV01^R} \times \hat{\beta} = 100,000 \times 0.072 / 0.051 \times 1.2 = 169,412$$

**59. Answer: A**

A is correct. Spreadsheets involve a high level of manual intervention and are therefore prone to error. Also, as per the Federal Capital Planning paper, “Using standalone tools or spreadsheets in the aggregation process is a weak process.”

B is incorrect. Banks are encouraged to integrate technology systems of acquired companies as quickly as possible after a merger or acquisition in order to reduce fragmentation.

C is incorrect. Aggregating risk data from different divisions into a centralized data warehouse is a recommended practice.

D is incorrect. It is also a recommended practice for the bank to envision the technology system requirements.

**60. Answer: A****61. Answer: A****62. Answer: D**

D is correct. The friction between the servicer and the mortgagor is a moral hazard problem. The servicer and the mortgagor do not share the full consequence of bad outcomes (e.g. loan foreclosure, delinquencies). The mortgagor typically has limited liability, and has little incentive to expend effort or resources to maintain a property close to foreclosure. On the other hand, the servicer strives to work in investors' best interest by keeping up with payment of property taxes and insurance, and generally maintaining the property. A way to mitigate this friction is to require the mortgagor to regularly escrow funds for insurance and tax payments in order to forestall the risk of foreclosure.

A is incorrect. Friction between the asset manager and the investor is a principal-agent problem. The investor is less sophisticated than the asset manager, does not fully understand the investment strategy of the asset manager, has uncertainty about the manager's ability, and does not observe any effort that the manager makes to conduct due diligence. Some of the ways to mitigate this friction is through the use of investment mandate, and the evaluation of manager performance relative to its peers or a peer benchmark.

B is incorrect. Friction between the arranger and originator is a predatory borrowing and lending problem. It is one of the key frictions in the process of securitization involving an information problem between the originator and arranger. In particular, the originator has an information advantage over the arranger with regard to the quality of the borrower. Without adequate safeguards in place, an originator can have the incentive to collaborate with a borrower in order to make significant misrepresentations on the loan application. Depending on the situation, this could be either construed as predatory lending (where the lender convinces the borrower to borrow too large of a sum given the borrower's financial situation) or predatory borrowing (the borrower convinces the lender to lend too large a sum). To mitigate the problem, the arranger should have safeguards in place, including carrying out a thorough due diligence on the originator and requiring the originator to have adequate capital to buy back problem loans.

C is incorrect. Friction between the investor and credit rating agencies is a model error problem. Investors are not able to assess the efficacy of rating agency models and, so, are susceptible to both honest and dishonest errors. Worse still, rating agencies are paid by the arranger and not by the investors for their opinion, which creates a potential conflict of interest. This friction can be mitigated by requiring public disclosure of the criteria for ratings and downgrades, and for holding rating agencies accountable for their reputation.

### 63. Answer: C.

Please note:

Inherent Risk (aka, gross risk): The risk embedded in an operational process or activity as if no controls or mitigation were in place; i.e., the gross risk before controls/mitigation Residual Risk (aka, net risk): The risk that remains after controls are taken into account (the net risk or risk after controls)

**64. Answer: A**

A. TRUE: The study substitutes a predictive model for a conventional control group in order to demonstrate causality. Rather than a conventional control group, the case study employs a machine learning time series method (i.e., Bayesian Structural Time Series, BSTS) in order to PREDICT website visits without advertising spend; aka, the "as if" counterfactual. In this way, an experiment is SIMULATED rather than explicitly conducted such that causal inferences can be drawn; e.g., advertising has a significant causal impact on website visits. In general, to establish causation (rather than correlation), an experiment is required.

**65. Answer: A****66. Answer: C.**

\$200,000. The one-day 99.0% VaR is given by  $-0 + 1.43\% * 2.326 * \$3.0 \text{ million} = \$99,800$ . The liquidity cost (LC) is given by  $(31.00 - 29.00)/30.00 * 0.5 * \$3.0 \text{ million} = \$100,000$ . The one-day 99.0% VaR is therefore  $99,800 + 100,000 = 199,800$

**67. Answer: A**

If CIP is enforced, then  $F - S = S * [(1 + R_f_{JSD})/(1 + R_f_{UDS}) - 1] = 110.00 * [(1 + 0.45\%)/(1 + 2.50\%) - 1] = -2.20$ .

**68. Answer: B**

Inflows include:

Deposit inflows = 100 +

Scheduled loan repayments = 60 +

Borrowings from the money market = 80 +

Sales of bank assets = 30 +

Revenues from sale of nondeposit services = 10;

for total inflows of  $\$100 + \$60 + \$80 + \$30 + \$10 = 280.0 \text{ million}$ .

Outflows include:

Deposit withdrawals = 70 +

Acceptable loan requests = 90 +

Stockholder dividend payments = 20 +

Repayment of bank borrowings = 50 +

Operating expenses = 40;

for total outflows of \$70 + \$90 + \$20 + \$50 + \$40 = \$270.0 million

Therefore, the projected net liquidity position = \$280 - 270 = +10.0 million.

#### 69. Answer: B

The Dollar IS GAP = ISA - ISL = \$490.0 - \$610.0 = -120.0. The Relative IS GAP = -120.0/490.0 = -0.245. The ISR = 490.0/610.0 = 0.803. This bank is liability-sensitive such that rising interest rates will lower its net interest margin (NIM).

#### 70. Answer: C

Maturity	Assets	Liabilities	$\Delta$	Net
1	30	10	20	20
2		20	-20	0
5	40	10	30	30
7	10	30	-20	10
10	20	20	0	10
>10		10	-10	0
Sum	100	100		

#### 71. Answer: B

Loan-to-deposit (LTD) ratio (current and forecast) versus board approved upper ceiling (limit) of 80.0.

Explains Choudhry: "Deposit Tracker Report: The deposit tracker is a simple report of the current size of deposits, together with a forecast of what the level of deposits are expected to be going forward. This report is tracked weekly and monthly because it provides an idea of the LTD ratio in the immediate short term. As we saw in the previous chapter, the LTD is a key management liquidity ratio ... [referring to illustrative report in Table 14.1.A] We see that this bank is required

to meet a Board-approved LTD ratio limit of 85%, which it is just exceeding as at the date of this report, but the forecast for year-end is within this."

In regard to (A), (C) and (D), each is FALSE.

## 72. Answer: B

Explain Lai and Tuosto66 (emphasis ours), "II. Integrate with Broader Risk Management Frameworks: The CFP is not a stand-alone tool, but rather, an integrated part of the institution's liquidity risk management and firm-wide risk management frameworks, including enterprise risk management (ERM), capital management, and business continuity and crisis management. This integration of the CFP to other components of the ERM disciplines increases the CFP's effectiveness and consistency by enabling it to leverage and reference established controls and processes.

The CFP should be explicitly linked to the liquidity risk measurement framework and the liquidity stress test, in particular through its limit structure and escalation levels. For example, the liquidity risk measures used in the institution's BAU risk management activities serve as a foundation from which the CFP defines its early warning indicators (EWIs). Additionally, linkages to the business continuity and crisis management frameworks will reinforce key operational and communication protocols during times of crisis."

## 73. Answer: D

From the Study Notes: "Advanced from Federal Home Loan Banks: In recent years, the Federal Home Loan Bank (FHLB) System has moved into lending money to home mortgage lenders. Comprising 12 regional banks, the FHLB was created in 1932 as a source of stable funding for depository institutions facing potential runs by depositors. According to many scholars, the involvement of FHLB in the "sources of funds" arena has not only increased the amount of available funds for financial institutions that use FHLB as a source (with mortgages as collateral), but FHLB has also increased the liquidity of home loans and provided an incentive for more financial institutions to provide credit to the housing market. The presence of FHLB has quickly expanded in recent years, with over 6,000 commercial banks, over 1,300 thrift institutions, over 700 credit unions, and over 80 insurance companies now eligible to borrow from the FHLB. The draw to FHLB funds stems from it being a stable source of finance and offering below-market interest rates. Financial institutions can borrow from the FHLB for a flexible time period, ranging from overnight to over 20 years, with fixed or variable interest rates. Part of the reason the FHLB can offer below-market interest rates is because its federal charter allows it to borrow money on the cheap and pass those savings on to member banks, who are stockholders and receive dividends.

The Federal Home Loan Banks System also has a favorable position in the event of failure. Legally, the FHLB is first in line, even in front of the FDIC, to recover funds if a failure occurs."

- The Fed Funds market is the most popular and its effective interest rate tends to be LOWER than the alternatives, although it is VOLATILE (is its downside)
- Repurchase agreements are less popular and more complex than Fed Funds; also, they incur less credit risk because they are secured by collateral (they are often viewed as "collateralized Fed funds transactions").
- Commercial paper (CP) is high in volume, moderate in cost (advantages) but volatility in available capacity and subject to credit risk (disadvantages)

#### 74. Answer: C

$\$180,414,000 = 180,000,000 * (1 + 0.0090 * 92/360)$ ; there are 92 actual days between June 1st and September 1st as both July and August have 31 days ( $30*3 + 2 = 92$ ).

#### 75. Answer: D

Short sellers are not cited; further, equity capital is the most stable source of funds because "equity holders do not have to be paid according to any particular schedule and because they cannot compel a redemption of their shares."

#### 76. Answer: A

The authors consider smartphones and mobile banking to be a supply factor that drives FinTech innovation, which expands the range of financial services (might it be the primary factor?)

#### 77. Answer: A

The paper includes the authors' multivariate cross-country regression analysis of fintech credit drivers: "Our analysis suggests that, under various different model specifications, GDP per capita and its quadratic term account for 64–78% of the explained variation in fintech credit volume per capita. The stringency of banking regulation explains 14–20%, the banking sector markup (Lerner index) 1–2%, and the country dummies about 10%, 5% and 6% for China, the United States and the United Kingdom, respectively."

#### 78. Answer: B

Because classification and regression trees are good at handling incomplete case (i.e., observations with missing values) as there exists several methods for coping with missing values.

**79. Answer: C**

Rather, the inverse is true: random forests are something of a black box but their performance is generally superior!

**80. Answer: B**

The authors say the trend is toward augmented intelligence, but not replacement of humans (we did not mean to scare you!); and the article asserts that AI cannot contextualize.