

P1.T1.20.1.2

The classic risk management process affirms the job of a risk manager to include four activities: identifying risks, analyzing and measuring risks, assessing the impact of risk events, and managing risks. This process culminates in the series of decisions as to how to handle identified risks. Which of the following is (**TRUE** as) a common activity of the risk manager?

A. To either avoid or transfer each risk

B. To quantify every risk in an exact way; i.e., single number

C. To eliminate each risk to the fullest extent possible

D. To help identify where the firm should add risk

D is CORRECT.

As GARP¹ (Chapter 1, 2020) explains, "The risk management process culminates in a series of choices that both manage risk and help to define the identity and purpose of the firm.

- **Avoid Risk:** There are risks that can be sidestepped by discontinuing the business or pursuing it using a different strategy. For example, selling into certain markets or offshoring production might be avoided to minimize political or foreign exchange risks.
- **Retain Risk:** There are risks that can be retained within the firm's risk appetite. Large risks can be retained through mechanisms such as risk capital allocation, self-insurance, and captive insurance.
- **Mitigate Risk:** There are risks that can be mitigated by reducing exposure, frequency, and severity (e.g., improved operational infrastructure can mitigate the frequency of some kinds of operational risk, hedging unwanted foreign currency exposure can mitigate market risk, and receiving collateral against a credit exposure can mitigate the severity of a potential default).
- **Transfer Risk:** There are risks that can be transferred to a third party using derivative products, structured products, or by paying a premium (e.g., to an insurer or derivatives provider)."¹

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

- In addition, to avoid or transfer, we can retain or mitigate a risk
- Not nearly every risk can be quantified, but we should at least attempt to determine frequency and severity distributions (or ranges)
- The goal is not necessarily to eliminate or reduce every risk. This is a crucial feature of modern risk management: it seeks to add value and offer inputs into strategy. As GARP explains (**emphasis ours**), "As the risk taker improves its risk management strategy, it will begin to avoid or mitigate non-essential or value-destroying risk exposures, which in turn **will allow it to assume more risk in areas where it can pursue more value-creating opportunities for its stakeholders** ... In modern economies, risk management is therefore not only about corporate survival. It is critically important to the broader processes of specialization, scaling, efficiency, and wealth creation."¹

¹ 2020 FRM Part I: Foundations of Risk Management, 10th Edition. Pearson Learning Solutions, 10/2019

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P1.T1.20.1.3

The risk department at an investment firm has been asked to evaluate the impact of environmental, social, and governance (ESG) factors on some of its fund investments. In regard to climate change, the staff has determined that climate change does present a risk that is important and possibly very large, but they cannot currently calculate the risk. Among the following four classic risks (which constitute part of the second building block in GARP's risk management process: Analyze), which most accurately describes the firm's orientation toward climate change?

A. Expected loss

B. Unexpected loss

C. Knightian uncertainty

D. Unknown unknown

C is CORRECT.

Says GARP (Chapter 1, 2020): In his famous 1921 paper, Knight distinguished between variability that cannot be quantified at all, which he called uncertainty, and "true" risk that can be quantified in terms of statistical science. Incalculable Knightian uncertainties can be very large and important. Nuclear war is a major threat to the world, but its chances of happening are impossible to estimate."¹

This brief article is also helpful: <http://news.mit.edu/2010/explained-knightian-0602>. Including, "according to Knight, risk applies to situations where we do not know the outcome of a given situation but can accurately measure the odds. Uncertainty, on the other hand, applies to situations where we cannot know all the information we need in order to set accurate odds in the first place."

¹ 2020 FRM Part I: Foundations of Risk Management, 10th Edition. Pearson Learning Solutions, 10/2019.

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P1.T1.20.2.3

About tail risk, GARP observes, "Some risk events have a diabolical side that seems designed to outwit the human mind. This may be because such events are very rare and extreme or they arise from unobserved structural changes in a market."¹ Which of the following statements about tail risk is **TRUE**?

- A. Extremely rare events can happen even if the system is structurally stable
- B. The problem with tail risk is that we lack statistical techniques to help us make the tails visible
- C. Structural change by definition impacts neither expected loss nor unexpected loss nor tail risk
- D. The risk manager can approach tail risk in financial markets in the same way that she would approach a natural or mechanical system

A is CORRECT.

Explains GARP, "In complex systems, such as the global climate or financial markets, extremely rare events can happen over long time periods, even if the system remains structurally stable. These risks, really an extreme version of unexpected loss, are difficult to find in the data because (by definition) there are not a lot of them. Tail risk events might be rare, but a long enough time series of data should reveal evidence of their existence. Where data are scarce, modern risk management can sometimes apply statistical tail risk techniques, utilizing a branch of statistics called Extreme Value Theory (EVT) to help make tails more visible and to extract the most useful information."¹

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

¹ 2020 FRM Part I: Foundations of Risk Management, 10th Edition. Pearson Learning Solutions, 10/2019.

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P1.T1.501.1

You are having lunch with a client who suddenly asks you, "I noticed that you studied risk. To me, risk is when bad stuff can happen. Can you tell me, what is your definition of risk?" As far as the financial risk manager (FRM) is concerned—at least among the following potential responses to your client's question—which of the following definitions of risk is **BEST**?

A. Risk is the source or cause of a financial loss or cost

B. Risk is a condition that increases the probability of a loss

C. Risk is the size of a loss or cost: if a cost is greater, then its risk is greater

D. Risk is the variability of adverse outcomes that are unexpected

D is CORRECT.

The general form of the statement is: risk is the variability of unexpected, adverse outcomes; this incorporates non-financial risks (the client asked for a definition of "risk," not "financial risk"). The equivalent form that is specific to financial risk is: financial risk is the volatility (or variability) of unexpected losses.

The two keywords are "variability" (or the narrower volatility) and "unexpected." A key point in the reading is the distinction between expected losses (which are NOT risks) and unexpected losses (which are risks) and the variability about these unexpected losses. Note that firm-wide risk can be parsed into either business risk or financial risk (at least according to Jorion). Finally, the Crouhy reading does not seem to require that risk be quantifiable uncertainty.

- In regard to incorrect (A), the cause of a loss is called a peril.
- In regard to incorrect (B), a condition that increases the probability of a loss is called a hazard.
- In regard to incorrect (D), risk does not refer to the magnitude of a loss.

To summarize the above definitions:

- a **peril** is the cause of a loss
- a **hazard** is a condition that increases the probability (and/or frequency and/or severity) of a loss
- a **risk** is the *variability* of an *unexpected* loss or adverse outcome (for our

purposes)

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P1.T1.501.2

According to Crouhy, Galai, and Mark, which of the following is **TRUE** about the 2007 to 2009 global financial crisis (GFC) and its implication on risk management?

A. Soft factors--e.g., corporate governance structures and risk cultures--did NOT cause the GFC; instead, the GFC was effectively caused by hard factors and, in particular, technical deficiencies in risk measurement

B. Since the GFC, risk managers have--to at least some degree--shifted away from historical-statistical treatments of risk and toward scenario analysis and stress testing

C. Contrary to the popular mainstream narrative, financial engineering and derivatives helped mitigate losses during the GFC due to their innate ability to disperse risk; for example, "without credit derivatives, financial risk would have been far more concentrated and the consequences of the crisis would have almost certainly been worse."¹

D. Although risk management was narrowly responsible for minor failures leading up to (and during) the GFC, these failures were small exceptions to the general rule that risk management has consistently and successfully prevented market disruptions and accounting scandals for over three decades

B is CORRECT.

- **In regard to (B), this is false:** while Crouhy¹ acknowledges several contributors in the run-up to the GFC, he clearly implicates corporate governance structures as a culprit.
- **In regard to (C) and (D), these are clearly false statements,** at least according to Crouhy et al.: the authors implicate credit derivatives (via financial engineering) as a key contributing factor due to their unintended tendency to concentrate, rather than disperse, risk.

¹ Michel Crouhy, Dan Galai, and Robert Mark, *The Essentials of Risk Management*, 2nd Edition (New York, NY: McGraw-Hill, 2014).

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P1.T1.501.3

According to Crouhy et al., each of the following statements about the numerical measurement of risk is true **EXCEPT**, which is false?

A. Merely judgmental rankings of risk (e.g., Risk Rating 3 versus Risk Rating 2) can help us make more rational in-class comparative decisions

B. If we can put an absolute cost or price on risk, then we can make rational economic decisions about risks; at this point, risk management decisions become fungible with other management decisions

C. The best numerical measure of risk during abnormal markets, over longer periods, or for illiquid portfolios is value at risk (VaR)

D. All risk measures depend on a robust control environment; for example, in many rogue-trading case studies (debacles), traders found some way of circumventing trading controls and suppressing risk measures

C is CORRECT.

"the VaR measure works well as a risk measure only for markets operating under normal conditions and only over a short period, such as one trading day. Potentially, it's a very poor and misleading measure of risk in abnormal markets, over longer time periods, or for illiquid portfolios."¹

In regard to (B), (C), and (D), each is TRUE.

¹ Michel Crouhy, Dan Galai, and Robert Mark, *The Essentials of Risk Management*, 2nd Edition (New York, NY: McGraw-Hill, 2014).

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P1.T1.502.1

Crouhy writes that “understanding [the difference between expected loss and unexpected loss] is the key to understanding modern risk management concepts such as economic capital attribution and risk-adjusted pricing.”¹ Which of the following statements is **TRUE** about unexpected loss (UL)?

- A. Unexpected loss levels tend to be higher for a consumer credit card portfolio than a corporate loan portfolio
- B. In a credit portfolio, higher default correlation implies lower portfolio unexpected losses
- C. Unexpected loss (UL) is typically priced into the products or services offered to customers, while expected loss is the denominator of risk-adjusted return on capital (RAROC)
- D. Market risk value at risk (MVaR) can be expressed as either relative MVaR or absolute MVaR, but it is "relative MVaR" that matches (better captures) unexpected losses (UL)

D is CORRECT.

- **In regard to (A), this is false:** portfolio unexpected loss (UL) increases with correlation. If the correlation is less than a perfect 1.0, the portfolio UL is less than the sum of individual ULs; as correlation tends toward 1.0, the portfolio UL increases and approaches the sum of individual ULs.
- **In regard to (B), this is false:** Crouhy¹ distinguishes the lower unexpected loss of a consumer credit card portfolio (due to lower default correlation, better diversification, and higher granularity) from the higher unexpected loss of a corporate loan portfolio (due to a "lumpy" portfolio which is less diversified and exhibits higher correlation risk).
- **In regard to (D), this is false:** expected loss (EL) is typically priced into products as an ongoing "cost of doing business." Unexpected loss (UL) tends to refer to the denominator of RAROC, which is economic capital.

¹ Michel Crouhy, Dan Galai, and Robert Mark, *The Essentials of Risk Management*, 2nd Edition (New York, NY: McGraw-Hill, 2014).

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P1.T1.502.2

Crouhy's risk typology is consistent with Jorion's. This typology includes the three major financial risks (market, credit, and operational risk) and includes liquidity risk as a key financial risk. Non-financial risks are either business or non-business risks. Non-business risks include reputation and political risks; business risks include strategy and technological innovation. For FRM purposes, however, the domain is financial risks, primarily: market risk, liquidity risk, credit risk, and operational risk. According to this risk typology, each of the following is true, but which statement is **FALSE**?

A. Basis risk is a context-specific form of market risk

There are four major types of market risk: interest rate risk, equity price risk, foreign exchange risk, and commodity price risk; interest rate risk parses into trading risk and the special case of gap risk (gap risk relates to the risk that arises in the balance sheet of an institution as a result of the different sensitivities of assets and liabilities to changes of interest rates).

C. Credit risk can be decomposed into four main types: default risk, bankruptcy risk, downgrade (credit deterioration) risk, and settlement risk.

Because legal and regulatory risk are classified as business risks rather than financial risks, many of the large losses from derivatives trading case studies (debacles) over the last decade are technically business risk failures, not financial risk failures

D is CORRECT.

Legal and regulatory risks are classified as operational risks.

According to Basel (**emphasis ours**), "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."¹ (see https://www.bis.org/basel_framework). Legal risk "includes, but is not limited to, exposure to fines, penalties, or punitive damages resulting from supervisory actions, as well as private settlements."¹ Operational risk is broad and includes human factor risk, technology risk, and regulatory risk.

In regard to (A), (B), and (D), each is TRUE.

¹ Basel framework at https://www.bis.org/basel_framework

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P1.T1.502.3

According to Crouhy, at least among the given choices, which of the following is probably the most important current and future challenge to the wider risk management profession as it seeks to improve the efficacy of the risk manager's job?

In the extended wake of the financial crisis and ensuing confidence loss in many
A. quantitative approaches, restore the reputation of financial engineering by building better mathematical measures of risk

Build a wider risk culture and promote risk literacy in which key staff members
B. understand how they can affect the risk profile of the organization, i.e., "put down deeper risk management roots in each organization."¹

Improve the ability of firms to predict the expected future value (i.e., the expected
C. mean) of financial variables with better accuracy; e.g., "dispersions won't matter if we can't find a more accurate crystal ball for forecasting"¹

Promote the continual "upgrading" from naive, simple metrics (e.g., notional limits)
D. toward more sophisticated methods which are almost universally more robust and automatically comparable

B is CORRECT.

At least in Crouhy's first chapter, the going-forward importance of rooting risk management in a firm's culture is stressed as both imperative and highly difficult. This includes a sub-theme of including non-mathematicians, which is arguably a call for communication and collaboration.

- In regard to (A), this is not seen as a major widespread challenge, although it may be at some firms. Rather, Crouhy points out the danger posed by supposedly more sophisticated and their oft-observed lack of useful comparability.
- **In regard to (B)**, better measures are not dismissed as unnecessary, but "Perhaps the biggest task in risk management is no longer to build specialized mathematical measures of risk (although this endeavor certainly continues)."¹ Says Crouhy
- **In regard to (D)**, this is a bad choice: Risk is concerned with a good approximate future distribution and its second, third and fourth moments more than its mean. Valuation (aka, pricing) strives for accurate present-value point estimate. A key theme in P1.T1. FRM is the difference between valuation/pricing (where precise present value point estimates are necessary)

valuation/pricing (where precise present-value point estimates are necessary) and risk measurement (where we are satisfied with approximate future-state distributions including tails). Explains Crouhy: "First and foremost, a risk manager is not a prophet! The role of the risk manager is not to try to read a crystal ball, but to uncover the sources of risk and make them visible to key decision makers and stakeholders in terms of probability."¹

¹ Michel Crouhy, Dan Galai, and Robert Mark, *The Essentials of Risk Management*, 2nd Edition (New York, NY: McGraw-Hill, 2014).

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P1.T1.20.4.1

According to GARP, "a recent trend among corporations is to use a board-approved risk appetite to guide management and (potentially) to inform investors."¹ Which of the following statements is **TRUE** about the firm's risk appetite?

A. Risk appetite is the total amount of risk a firm can bear without becoming insolvent

In practice, the risk appetite should be focused on a single thing: one broad, durable
B. philosophical statement that avoids linkages to the firm's day-to-day risk management operations because these are bound to change

Although risk appetite has an upper bound (an upper trigger), it is similar to a one-
C. sided confidence interval: there is no such thing as a lower bound (a lower trigger) for risk appetite, given that less risk is better

A risk appetite includes the mechanisms (e.g., detailed policy, business-specific risk
D. statements, and a framework for risk limits) that link a top-level statement to the firm's day-to-day risk management operations

D is CORRECT.

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

- Risk capacity is the total amount of risk a firm can bear without becoming insolvent
- In practice, the risk appetite is two things, a top-level statement and the sum of the mechanisms linking this statement to the firm's day-to-day operations. Explains GARP: "In truth, forging a robust link between top-of-house risk appetite statements and the operational metrics of risk appetite in a particular risk type or business line is a challenging task. As seen in Chapter 1, there is no single measure of risk, even within a single risk type, that allows us to monitor risk at the business level and then easily aggregate this to the enterprise level. The result is that firms operationalize their risk appetite using a multiplicity of measures. For financial firms, this can include business and risk-specific notional limits, estimates of unexpected loss, versions of value-at-risk (VaR), and stress testing. The level of detail needs to reflect the nature of the risk and the sophistication of the risk management strategy."¹
- Risk appetite is bounded on the upside (below risk capacity) but also has a lower bound: the firm does not aspire to be risk-free

¹ 2020 FRM Part I: Foundations of Risk Management, 10th Edition. Pearson Learning Solutions, 10/2019

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P1.T1.20.4.3

To hedge risk, the firm's toolbox includes derivatives such as swaps, futures, forwards, and options. About the use of derivatives to hedge, each of the following is true **EXCEPT**, which is inaccurate?

A. Derivatives represent a decision to transfer (or mitigate) the risk(s) when the firm neither wants to retain nor avoid the risk

B. Because hedging can only mute the volatility of accrual-based earnings, hedging cannot increase (or even alter) the firm's cash flows and therefore cannot influence agency risks

C. A large conglomerate (i.e., a firm with multiple business units operating in different industries/sectors) is more likely to create natural hedges than a small, focused firm

D. Airlines can cross-hedge the cost of jet fuel with futures contracts on (crude or heating) oil, but if the commodity's price drops rapidly, unhedged airlines are likely to outperform their hedged competitors

B is CORRECT.

Hedging can alter cash flows and can leverage agency risks

Explains GARP, "[H]edging can make sense for investors if it is used as a tool to increase the firm's cash flows (rather than to reduce equity investor risk). For example, firms may need to offer their customers a stable price over the next three years, which may be impossible without hedging a key cost input. If hedging like this increases customer demand, then equity investors are happy ... Equity investors are also happy if the firm uses hedging to reduce its tax bill (e.g., by stabilizing revenues from one year to the next). Again, hedging has the effect of increasing after-tax revenues. Finally, equity investors are not the only stakeholders, and certainly not the only decision-makers. Managers, regulators, and general staff expect the firm to be financially sound and protected from sudden mishaps. Less legitimately, managers may use hedging to ensure their firm meets key short-term targets (e.g., stock analyst expectations) that affect their prestige and compensation. Risk managers need to pay close attention to how derivatives can leverage agency risks."¹

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

¹ 2020 FRM Part I: Foundations of Risk Management, 10th Edition. Pearson Learning Solutions, 10/2019

P1.T1.503.1

You are the Chief Risk Officer (CRO) at a non-financial company, and the board of directors has asked you to make a recommendation with respect to hedging one of the firm's key exposures. The board wants you to make a recommendation of either "in favor" or "against" the implementation of a hedge against the exposure. Your staff prepared the following arguments, three in favor and three against:

Three Arguments **AGAINST** hedging an exposure at a non-financial firm

1. Our investors own diversified portfolios such that, in theory, our firm's specific risks are effectively costless to them
2. If markets are perfect, hedging is theoretically a zero-sum game
3. Practical (non-theoretical) objections include that risk management requires specialized skills and can incur high compliance costs

Arguments **IN FAVOR** of hedging an exposure at a non-financial firm

1. Financial distress incurs high fixed costs, which is a salient market imperfection
2. Risk management gives management better economic control over the firm's natural economic performance
3. Hedging has the potential to reduce the firm's cost of capital, reduce its cash flow volatility, and enhance its ability to grow

Which of these arguments is valid, or at least plausible?

A. None of the arguments are valid

B. Each set of arguments contains one mistake (or fallacy) and two valid arguments

C. Each set of arguments contains two mistakes (or fallacies) and one valid argument

D. All of the arguments are valid in both sets

D is CORRECT.

All of the arguments are valid in both sets

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P1.T1.503.2

Crouhy refers to the difference between hedging activities related to a firm's operations and hedging related to the balance sheet. When it comes to hedges, as risk-reducing positions, which of the following best summarizes his advice to managers?

A. If markets are perfect and the capital asset pricing model (CAPM) assumptions are true, then hedging and risk reduction are theoretically useless in all cases, including both operations and financial positions

B. Even if markets are imperfect and CAPM assumptions are false, hedging and risk reduction, in theory, cannot add value

C. Firms should risk-manage (e.g., hedge) their operations and, if markets are imperfect, maybe should hedge their assets and liabilities (so long as they disclose their hedging policy)

D. Firms should always hedge their balance sheets, even if markets are perfect, but they probably should not hedge their operations (and they should avoid disclosure in order to protect confidential information that might be revealed by, for example, forward transactions)

C is CORRECT.

Crouhy¹ stresses the importance of the distinction between hedging operational hedges (which includes so-called natural hedges) and financial hedges because firms should (in general) *always manage the risk of their operations* but may or may not hedge their assets and liabilities.

Asked why C is false, David wrote: "Well, let me confess that I do believe it's debatable prima facie. As I read C, I perceive that a good argument can be made for it being a true statement. That's because (as now I lean on previously assigned Stulz rather than Crouhy, but Crouhy is informed by Stulz...) Stulz put forth a risk management irrelevance proposition which, to really boil it down in my paraphrase reduces to: under an assumption of perfect markets, risk management cannot add value (with respect to either systematic or idiosyncratic risk). I think we could use the risk management irrelevance proposition to infer that C is TRUE. So perhaps it is not well written?"

That said, the reason I have it as "not true" is that, to start with the most primitive reason, I don't think it comes even nearly close to capturing Crouhy's advice (the question asks, which of the following best summarizes his advice)! The question is a "which is best" variation, after all. He's not trying to establish the theoretical reasons why risk doesn't work, he's trying to get to the essence captured in choice (B), right?

But more specifically, the literal reason that C is meant to be false hinges on the assertion that the irrelevance proposition extends to hedging operations; i.e., If markets are perfect and the capital asset pricing model (CAPM) assumptions are true, then hedging and risk reduction are theoretically useless in all cases, including both operations and financial positions. Maybe that's unfairly nuanced (?). Notice below how Crouhy affirms the role of hedging--even if it is not theoretically justified with respect to financial or balance sheet positions--when the hedging activity relates to the operations of the firm (**emphasis mine**):

"Hedging Operations Versus Hedging Financial Positions: ... it is important to look at how the risk arises. Here we should make a clear distinction between hedging activities related to the operations of the firm and hedging related to the balance sheet. **If a company chooses to hedge activities related to its operations ...This is basically an operational consideration and, as we outlined above, lies outside the scope of the CAPM model, or the perfect capital markets assumption.**"¹

¹ Michel Crouhy, Dan Galai, and Robert Mark, The Essentials of Risk Management, 2nd Edition (New York, NY: McGraw-Hill, 2014).

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