



LEVEL 1: PORTFOLIO MANAGEMENT

Reading 53 (6th out of 8): RISK MANAGEMENT

Difficulty:

medium

Benchmark Study Time:

3h

2022





THIS E-BOOK:

- ❖ is a selective summary of the corresponding Reading in your CFA® Program Curriculum,
- ❖ provides place for your own notes,
- ❖ helps you structure your study and revision time!

How to use this e-book to maximize your knowledge retention:

1. **Print** the e-book in duplex and bind it to keep all important info for this Reading **in one place**.
2. **Read** this e-book, best twice, to grasp the idea of what this Reading is about.
3. **Study** the Reading from your curriculum. **Here add** your notes, examples, formulas, definitions, etc.
4. **Review** the Reading using this e-book, e.g. write your summary of key concepts or revise the formulas at the end of this e-book (if applicable).
5. **Done?** Go to [your study plan](#) and change the Reading's status to **green** :
(it will make your Chance-to-Pass-Score™ grow ☺).
6. **Come back** to this e-book from time to time to **regularly review for knowledge retention!**

NOTE: While studying or reviewing this Reading, you can use the tables at the end of this e-book and mark your study/review sessions to hold yourself accountable.



DEFINITIONS

risk = exposure to uncertainty

risk exposures = how much a company or an individual taking risks is exposed to these risks; state of being exposed to risk

risk drivers = fundamental factors that are potential sources of risks for a company or an individual

risk management = the process used by a company or an individual to define, measure, adjust to, and monitor the risk being taken to maximize the company's value or the individual's utility; risk management is not the same as avoiding risk, it's rather about taking risk actively and knowingly

risk governance = the top-down process that helps define risk tolerance, oversees risks and goals, and provides guidance for risk management

risk tolerance = entity's risk appetite (how much loss it is ready to accept) + deciding which risks are acceptable and which are not

risk budgeting = allocates the entity's tolerable risk by specific metrics

risk identification and measurement = quantitative core of risk management + qualitative assessment of potential risk drivers and exposures affecting an enterprise

risk infrastructure = people and systems required to do quantitative tasks related to risk management and covering topics like risk measurement, risk monitoring, tracking of risk exposures, and assessment of the company's risk profile

defined policies and processes = extension of risk governance focusing on every-day policies and processes related to risk management

risk monitoring, mitigation, and management = here "main work" happens; we take risk governance, risk identification and measurement, risk infrastructure, and defined policies and processes to monitor, mitigate, and manage risks and align risk exposures with defined risk tolerance; also we have to make sure to factor in changing risk drivers and risk exposures

communications = communication of risk-related issues across all levels of the company including feedback loops, continuity and timeliness of the information, and review and discussion of risk-related topics

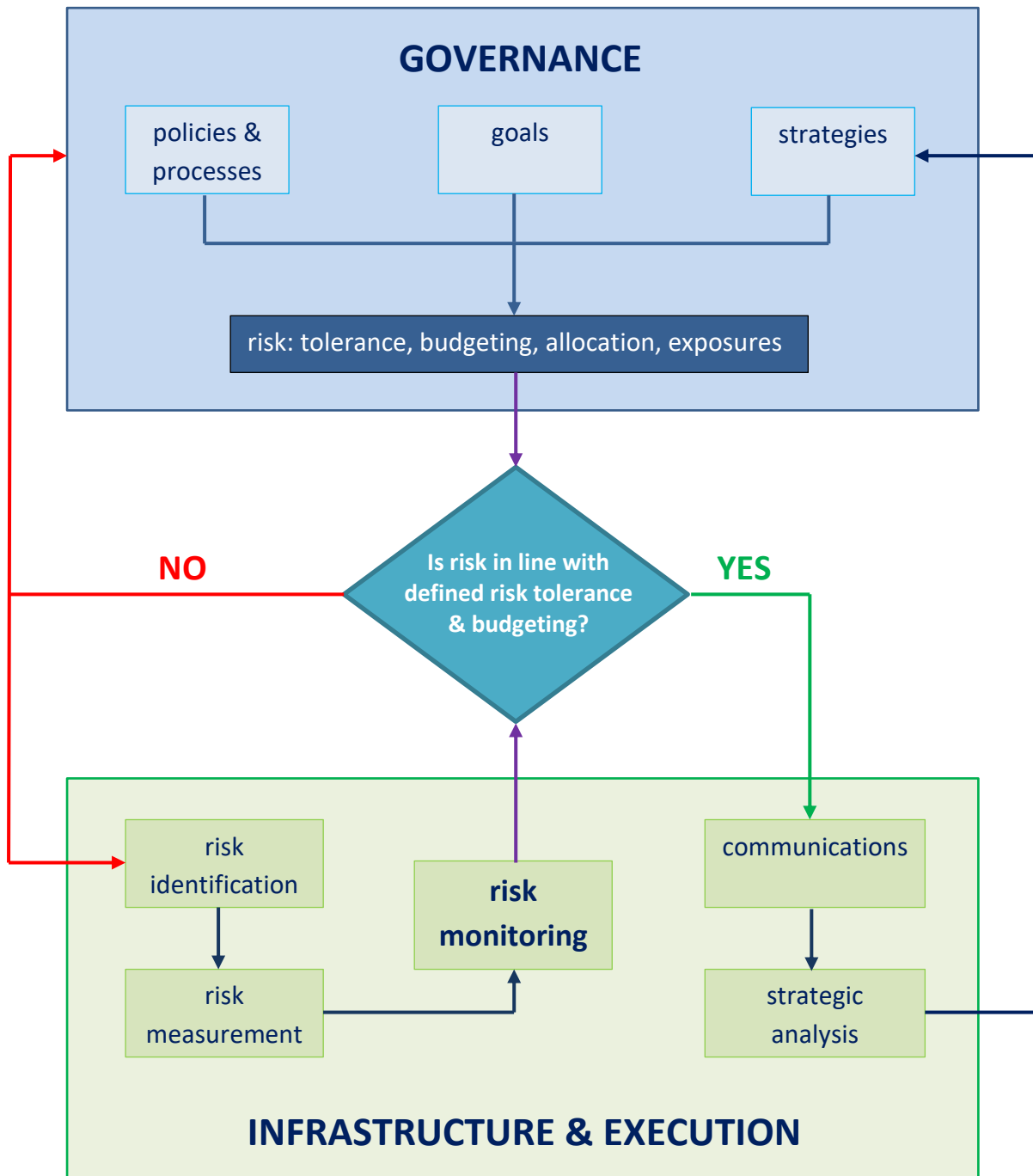
strategic analysis and integrations = taking into account the big picture, deciding what works and what does not, and what brings the most value per amount of risk taken



HERE KNOWLEDGE RETENTION HAPPENS | WRITE: notes, examples, formulas, definitions, relations, etc.



RISK MANAGEMENT FRAMEWORK





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FINANCIAL RISKS VS NON-FINANCIAL RISKS

Financial risks

Market risk

The risk that stock prices, commodity prices, interest rates, or exchange rates change in an adverse direction.

Credit risk

The risk that the counterparty will not be able to fulfill its financial obligations.

Liquidity risk (transaction cost risk)

The risk of the bid-ask spread getting wider or the risk that there will be no counterparty willing to buy the financial asset from the company for a price that is not below the perceived fundamental value of the asset.

Non-financial risks

Settlement risk

The risk that one party of the contract defaults just before settling the payments.

Regulatory risk, accounting risk, tax risk (also collectively called compliance risk)

Update of laws and regulations may result in unexpected costs and losses for an organization.

Model risk

The risk that an error occurs in a valuation model or that a correct model is used incorrectly, which may lead to incorrect investment decisions.

Tail risk

Tail risk occurs for example if we assume normal distribution in modeling but the distribution of data is in fact characterized by fatter tails than the normal distribution. In such a case, a probability of extreme results is higher than expected from the model.



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Operational risk (internal risk)

The risk that can affect the company's day-to-day operations and that results from errors of stuff, systems, procedures, and processes. Also, the risk of external events, such as natural disasters, is included in this category, as well as other risks that can affect the company's operations and that could be mitigated if proper processes and procedures were in place. Additionally, in the category of operational risk, the cyber risk (e.g. hackers attack) is included.

Solvency risk

The risk that a company becomes insolvent because it runs out of cash.

Risks borne by individuals

- identity theft,
- health risk,
- mortality risk,
- property and casualty risks.

Risk interactions

It's very important to factor in that different risks can interact with each other and adverse events can trigger other adverse events, so risk may increase by an order of magnitude (wrong-way risk). Potential risk interactions should be carefully assessed during the risk management process.

Examples:

market risk → credit risk → settlement risk → operational risk

credit risk → legal risk



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RISK METRICS

Probability

It is the simplest metric of risk.

Standard deviation, variance

Standard deviation and variance are basic risk metrics. Standard deviation is a square root of variance and it tells us what is an average deviation from the mean for a given probability distribution. Standard deviation may not be an appropriate risk measure for non-normal probability distributions.

Beta

Beta is a measure of systematic risk, so we can use it for both (i) well-diversified portfolios and (ii) single securities (the latter is true if we assume that investors are rational, in which case non-systematic risk shouldn't be priced).

Beta tells us how much a rate of return for a stock / portfolio will change if the market return changes by 1 percentage point. By the definition, the beta of the market is equal to 1. Very often for defensive stocks beta is lower than 1. On the other hand, cyclical stocks are very often characterized by beta higher than 1.

The Greeks: delta, gamma, vega, rho

The Greeks tell us how the price of an option or other derivative reacts to changes in some related variables.

delta

Delta is a measure of a derivative's sensitivity to changes in the price of the underlying asset. If, e.g. delta is 0.4, then if the price of the underlying asset increases by USD 1, the price of the derivative increases by USD 0.4. Delta is the first-order risk.

gamma

Gamma tells us how delta changes if the price of the underlying asset changes. Gamma is the second-order risk.

vega

Vega is a measure of an option's sensitivity to changes in the volatility of the underlying asset.

rho

Rho is a measure of an option's sensitivity to changes in the risk-free interest rate.



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Duration

Tells us how much a price of a bond will change if the interest rate changes by 1 percentage point. Duration is the first-order risk, whereas convexity (which we discussed in Fixed Income readings) is the second-order risk.

Value at Risk (VaR)

Value at Risk is a measure of downside risk because it is the measure that informs us about the minimal amount of money we can lose with a given probability, e.g.

If 5% VaR for a portfolio is USD 500,000 for 1 month →

→ there is a 5% probability that losses will exceed USD 500,000 in one month

Together with VaR, we very often use scenario analysis and stress testing.

A big drawback of VaR is that it doesn't give us information about what the loss will be if we exceed the threshold. For the example given above, we know that there is a 5% probability that losses will exceed USD 500,000 in one month but we don't know whether in this adverse case we should expect USD 1,000,000 of loss or maybe USD 10,000,000 or any other value/even more? This drawback of value at risk is mitigated by conditional value at risk.

Conditional VaR (CVaR)

For a given probability distribution, conditional VaR measures weighted average loss for losses that exceed the VaR loss. The CVaR is similar to the **loss severity given default** that we measure for bonds and which tells us how big investors' loss will be in case of default.

Standard deviation, variance, beta, the Greeks, duration, VaR, CVaR are market-related risk metrics.

Note: Generally, it is a lot easier to measure market-related risks than other types of risk, like operational risk or credit risk. This is because there are lots of quantitative data available in the market, which cannot be said about other types of risk.

Measures of credit risk

Measures of credit risk include: credit ratings, ratios (liquidity, solvency, profitability ratios), credit VaR, probability of default, expected loss given default, and probability of credit rating change.

Credit default swaps (CDS)

Bondholders very often pay attention to prices of CDSs and based on them estimate the probability of default for an issuer. Also, the pricing of other derivatives can tell us a lot about the probability of adverse and extreme events perceived by the market.



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RISK MODIFICATION

There are different ways of managing risk:

- risk prevention & avoidance,
- risk acceptance,
- risk transfer,
- risk shifting.

Risk prevention & avoidance

It is nearly impossible to completely prevent or avoid risk and the trade-off between the benefits of bearing risk and the costs of avoiding risk should be carefully considered. However, it is hard to correctly quantify both the possible gains and losses of risky activities and their assessment may be biased by subjective beliefs.

Risk acceptance

Self-insurance

Forms: bearing the risk, establishing reserve funds to cover potential losses

Always make sure that the risk you are going to accept is in line with your risk tolerance.

Diversification

Diversification is a risk mitigation tactic. It is the most efficient when combined with other risk management tactics.

Risk transfer

Risk transfer is about selling the risk to another party, mainly using an insurance policy.

The insured buys an insurance policy from the insurer.

The insurer can cover its risks thanks to:

- diversification / pooling of risks,
- deductible provision requiring that a small amount of loss is covered also by the insured.

surety bond = form of insurance that is used when there is a risk of non-performance by another party

fidelity bond = variation of surety bond; it is used to mitigate the losses resulting from employees' dishonesty



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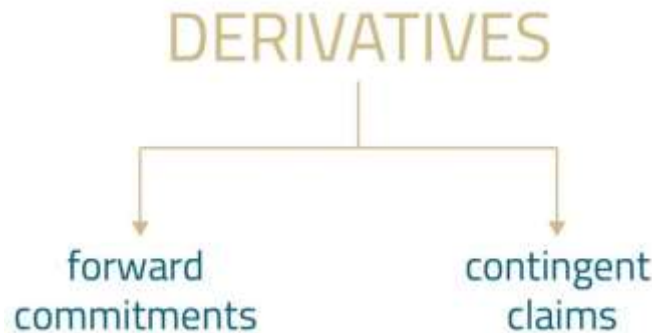


Risk shifting

Risk shifting is about changing the distribution of risk outcomes.

The primary tools used for risk shifting are derivatives like forwards, futures, options, and swaps.

A derivative is a financial instrument whose value depends on the value of some underlying asset and which derives its performance by **transforming the performance** of the underlying asset.



Forward commitments

A forward commitment is a legally binding agreement between two parties to perform certain actions in the future. The buyer of the contract agrees to purchase and the seller of the contract to sell an underlying asset at a specific time in the future at a price specified in the contract.

Examples of forward commitments:

- forwards,
- futures,
- swaps.

Contingent claims

A contingent claim is a claim that depends on a specific event that occurs in the future.

Because contingent claims are not symmetrical, as one party gets a right and the other gets an obligation, the party enjoying the right has to pay for it.

In a nutshell, at the time of entering into a transaction, contingent claims have a certain value, whereas forward commitments have no value, i.e. their value equals zero.

Examples of contingent claims:

- options.



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Risk shifting in practice:**Example 1**

If you have a long net position in a well-diversified portfolio of stocks and want to hedge against a decrease in stock prices, you can buy put options on an index. If stock prices drop, the loss on stocks will be covered by the gain on the long puts. Of course, there is a cost associated with this risk shifting strategy. → You'll have to spend money on puts, which means that your overall potential gain will be lower compared to the situation when you do not buy these options. To sum up, by using long puts the distribution of risk outcomes changes (lower potential losses & lower potential gains compared to the no-hedge scenario).

Example 2

Your company has a net short exposure to call options on SP500 expiring next month. To hedge against an increase in the index value (that will result in a loss on short calls), you can for example buy futures on SP500. In such a case, the loss on short calls will be covered by the profit on long futures. However, as in Example 1, there is a cost associated with this strategy. If the index value decreases, you'll incur a loss on long futures. To sum up, by using long futures the distribution of risk outcomes changes (lower potential losses & lower potential gains compared to the no-hedge scenario).

Risk shifting – parties involved

HEDGER \leftrightarrow SPECULATOR

OR

HEDGER \leftrightarrow DEALER (intermediary) \leftrightarrow SPECULATOR



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Summarizing key concepts:

☐ Risk-related definitions

My summary:

☐ Risk management framework

My summary:



☐ Financial risks vs Non-financial risks

My summary:

☐ Risk metrics

My summary:

☐ Risk modification

My summary:



Keeping myself accountable:

TABLE 1 | STUDY

When you sit down to study, you may want to **try the Pomodoro Technique** to handle your study sessions: study for 25 minutes, then take a 5-minute break. Repeat this 25+5 study-break sequence all throughout your daily study session.



Tick off as you proceed.

POMODORO TIMETABLE: study-break sequences (25' + 5')													
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TABLE 2 | REVIEW

Never ever neglect revision! Though it's not the most popular thing among CFA candidates, regular revision is what makes the difference. If you want to pass your exam, **schedule & do your review sessions**.

REVIEW TIMETABLE: When did I review this Reading?													
date		date		date		date		date		date		date	
date		date		date		date		date		date		date	