Chapter 2 How Do Firms Manage Financial Risk

Version 1.0

Introduction

Before deciding how to manage financial risk, a firm must answer several questions:

- Does managing risk make sense from the firm owner's perspective?
- What exactly is the goal of a risk management strategy?
- How much risk should the firm retain? What risks should be managed? What instruments and strategies should be applied?

Risk management is an iterative process. Once a firm understands the costs and complexities of risk management for a certain business unit, it may reconsider whether it should be involved in that risk-generating business activity in the first place.

Figure 2.1 from the curriculum provides a road map for risk management.

1. Identify risk appetite.
   - Identify key corporate goals and risks.
   - Should we manage risk?
   - Which risks should we manage?
   - Create a risk appetite statement (broad terms).
2. Map risks, make choices.
   - Map risks.
   - Assess or measure risk/impact.
   - Perform risk/reward analysis of risk management strategy (RAROC etc.)
     - Prepare comparative cost/benefit of risk management tactics.
   - Choose basic strategy/tactics.
   - Create a risk appetite statement (detailed terms).
3. Operationalize risk appetite.
   - Express risk appetite in operational terms.
   - Assess risk policies.
   - Set risk limit framework.
   - *Rightsize* risk management team.
     - Resources, expertise, infrastructure
     - Incentives and independence
4. Implement.
   - Choose tactics/instruments.
   - Make day-to-day decisions.
   - Establish oversight.
5. Re-evaluate regularly to capture changes in:
   - Risk appetite/risk understandings/stakeholder viewpoints,
   - Business activity and risk environment (remapping), and
   - New tools, tactics, cost-benefit analyses.

1. Background: The Modern Imperative to Manage Risk

Firms have always managed their core business risks. However, they have not managed financial risk with the same intensity.

Today, financial risk management has gained importance because of a powerful combination of need and opportunity.

- Need: The need to manage financial risk grew significantly from the 1970s as markets liberalized, price volatilities increased, and the global economy gained traction.
- Opportunity: Increased market volatility aided the emergence of a wide variety of financial risk management instruments in the 1980s and 1990s. These instruments provided firms many more opportunities to manage their risk profiles.

Risks from Using Risk Management Instruments

Risk management instruments allow firms to hedge economic exposures; however, they can also have unintended negative consequences. These consequences may not be immediately apparent.

For example, a firm that is exposed to variable interest rates may use a complex instrument to mitigate that exposure, as long as interest rates remain within certain bounds. However, if interest rates break these bounds, the same instrument may increase the firm's financial risk exposure. From this perspective, the strategy looks more like a bet than actual risk management.

Hedging Philosophy

Just because a risk *can* be hedged does not mean that it *should* be hedged. Hedging is simply a tool, and like other tools, it has limitations:

- Hedging can only stabilize earnings during a short time horizon of a few years.
- Hedging has costs that are transparent (e.g. option premium) and opaque (e.g. rogue trading under the pretext of hedging).
- Equity investors argue that from their perspective hedging does not add much value. In a large portfolio, any risks specific to the firm are diversified away. Therefore, a firm that uses hedging tactics to reduce firm-specific volatility is of little benefit to investors.

However, there are also several arguments that support hedging:

- Hedging reduces the chance of financial distress, which consists of both direct costs (e.g. bankruptcy costs) and major opportunity costs.
- Improved revenue stability sends an important message to the company's potential creditors, key customers, and suppliers.

- Hedging can be useful to equity investors if it is used as a tool to increase the firm's cash flows. For example, through hedging companies can offer stable pricing to their customers which can increase customer demand.
- Hedging allows managers to plan company operations better.
- Equity investors are not the only stakeholders. Other stakeholders such as managers, employees, regulators etc. may want the firm to use hedging to be financially sound and protected from sudden mishaps.

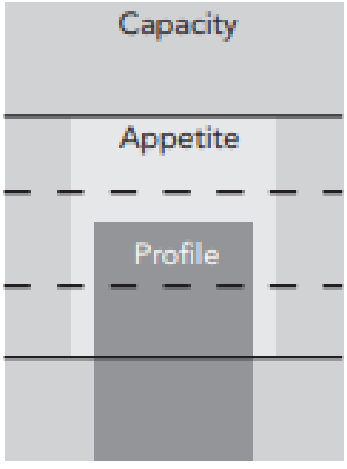
2. Risk Appetite – What is it?

Risk appetite describes the amount and types of risk a firm is willing to accept. In contrast, risk capacity describes the maximum amount of risk a firm can absorb.

In practical terms, risk appetite is two things:

1. A statement about the firm's willingness to take risk in pursuit of its business goals. The detailed risk appetite statement is usually an internal document that is subject to board approval. However, attenuated versions can appear in some annual corporate reports.
2. The sum of the mechanisms linking this top-level statement to the firm's day-to-day risk management operations. These mechanisms include the firm's detailed risk policy, business specific risk statements, and the framework of limits for key risk areas.

The risk appetite is set well below the firm's total risk bearing capacity, and above the amount of risk the firm is exposed to currently (i.e. the firm's risk profile). Figure 2.3 from the curriculum illustrates this concept. The dotted lines represent the upper and lower trigger points for reporting purposes. It lets the board know if the firm is currently taking too much or too little risk.



3. Risk Mapping

After a firm creates a risk appetite statement, it should map out its key risks at the cash flow level and assess its size and timing over particular time horizons.

For example, a manufacturing company may be exposed to the price risk of a commodity (e.g. copper). To map this risk, a risk manager has to find the answers to the following questions: What amount of copper will be required? When will it need the metal, and where will it need to be delivered? Which local price benchmark most closely represents this risk?

Another example is of a firm exposed to foreign exchange risk. Here the risk manager needs to map out existing positions as well as contracts and other upcoming transactions. The firm should develop a hedging policy that dictates which exposures should be hedged (e.g. should sales that are probable but not yet certain be hedged?). The firm should also set down the timing of the various cash flows and understand the assets and liabilities exposed to exchange rates. There may also be some netting potential and some of the cash flows may cancel each other out. All these details are needed in the risk mapping process.

4. Strategy Selection: Accept, Avoid, Mitigate, Transfer

Once a risk manager understands the firm's risk appetite and has mapped key risks, then he can decide how to best handle each risk.

The risk manager can select from four broad risk management strategies:

- **Retain**: Firms may want to accept some risks. For example, a goal mining company may choose to retain gold price risk because its investors desire such an exposure. A manufacturing company may want to retain an input price risk because it can be priced into the product and passed on to customers.
- **Avoid**: Firms may want to avoid risks that are not a natural part of their business. This could sometimes mean stopping a subsidiary business activity completely if it jeopardizes the firm's core business.
- **Mitigate**: Some risks can be mitigated through various strategies. For example, a bank can ask for additional collateral to mitigate a credit risk; an airline may invest in a more efficient aircraft to mitigate its exposure to jet fuel price risk.
- **Transfer**: Some risks can be transferred to third parties at a cost. For example, insurance contracts, options contracts etc.

The senior management and the board will finally be responsible for selecting risk management strategies for larger risks. However, the risk manager can help them choose among the various options.

A cost benefit analysis should be conducted before selecting the right risk management strategy. For example, firms may need to estimate the size of a cyber risk loss through worst case analysis, and then compare this to the mitigation offered by a costly data system

upgrade, and the cost of cyber insurance. A strategy that allows the firm to stay within its risk appetite in the most efficient manner should be chosen.

5. Rightsizing Risk Management

To properly develop and execute its risk management approach, a firm needs to *rightsize* its risk management. For example, a static hedging strategy would involve transferring a well-understood risk through a one-off market hedge or the purchase of annual insurance. Static hedging is relatively simple. However, a sophisticated dynamic hedging strategy that requires continual readjustments in the markets is much more complex.

Dynamic strategies can reduce costs, but they require a much bigger investment in systems and trader expertise. The firm may be required to build complex models and apply sophisticated metrics such as VaR. The firm will also have to separate out its trading function from the back-office and risk oversight functions.

If rightsized teams are not in place, firms adopting sophisticated risk management tools and strategies may become overly reliant on suppliers such as investment banks. For example, they may not be able to independently price an instrument and may require an investment bank's help to do so.

Firms also need to ensure that the risk management function has a clear accounting treatment in terms of whether it operates as a cost center or a profit center. At many non-financial firms, risk management is regarded as a cost center, while some banks adopt a profit center approach to risk management.

Figure 2.5 from the curriculum lists the various risk limits used in the context of dynamic hedging and the nature and weakness of each limit.

Limit	Nature	Example Weakness
Stop Loss Limits	Loss threshold and associated action (e.g., close out, escalation)	Will not prevent future exposure, only limit realized losses
Notional Limits	Notional size of exposure	Notional amount may not be strongly related to economic risk of derivative instruments, especially options.
Risk Specific Limits	Limits referencing some special feature of risk in question (e.g., liquidity ratios for liquidity risk)	These limits are difficult to aggregate; may require specialized knowledge to interpret.
Maturity/Gap Limits	Limit amount of transactions that mature or reset/ reprice in each time period	These limits reduce the risk that a large volume of transactions will need to be dealt with in a given time frame, with all the operational and liquidity risks this can bring. But they do not speak directly to price risk.
Concentration Limits	Limits of concentrations of various kinds (e.g., to individual counterparties, or product type)	These limits must be set with the understanding of correlation risks. They may not capture correlation risks in stressed markets.
Greek Limits	Option positions need to be limited in terms of their unique risk characteristics (e.g., delta, gamma, vega risk)	These limits suffer from all the classic model risks and calculation may be compromised at trading desk level without the right controls and independence.
Value-at-Risk (VaR)	Aggregate statistical number	VaR suffers from all the classic model risks and may be misinterpreted by senior management. Specifically, VaR does not indicate how bad a loss might get in an unusually stressed market.
Stress, Sensitivity, and Scenario Analysis	These limits are based on exploring how bad things could get in a plausible worst-case scenario. Stress tests look at specific stresses. Sensitivity tests look at the sensitivity of a position or portfolio to changes in key variables. Scenario modeling looks at given real-world scenarios (hypothetical or historical).	Varies in sophistication. Dependent on deep knowledge of the firm's exposures and market behavior. Difficult to be sure that all the bases are covered (e.g., there are endless possible scenarios).

6. Risk Transfer Toolbox

If a risk manager decides to transfer a portion of a financial risk, he can do so using a variety of hedging instruments. These hedging instruments can be broadly classified into swaps, futures, forwards, and options. Each instrument has a different capability, like different tools in a toolbox. Figure 2.6 from the curriculum lists the commonly used hedging instruments.

Instrument Type	Defining Features
Forwards	It is a tailored agreement to exchange an agreed upon quantity of an asset at a pre-agreed price at some future settlement date. The asset may be delivered physically, or the contract may stipulate a cash settlement (i.e., the difference between the agreed upon price and some specified spot or current price).
Futures	It is an exchange-listed forward with standardized terms, subject to margining.
Swap	It is an over-the-counter (OTC) agreement to swap the cash flows (or value) associated with two different economic positions until (or at) the maturity of the contract. For example, one side to an interest rate swap might agree to pay a fixed interest rate on an agreed upon notional amount for an agreed upon period, while the other agrees to pay the variable rate. Swaps take different forms depending on the underlying market.
Call Option	The purchaser of a call option has the right, but not the obligation, to *buy* the underlying asset at an agreed upon strike price, either at the maturity date (European option) or at any point during an agreed upon period (American option).
Put Option	The purchaser of a put option has the right, but not the obligation, to *sell* the underlying asset at the agreed upon strike price at the maturity date (European option) or at any point during an agreed upon period (American option).
Exotic Option	There are many different options beyond the standard or plain vanilla puts and calls. These include Asian (or average price) options and basket options (based on a basket of prices).
Swaption	It is the right, but not the obligation, to enter a swap at some future date at pre-agreed terms.

The choice of which instrument to use depends on the specific needs of the firm. For example, a forward contract provides price stability, but not much flexibility (because the transaction must occur at a specified time). A call option, on the other hand, provides both price stability and flexibility, but it comes with an added cost (the option premium).

Exchange traded vs OTC derivatives

Exchange traded derivatives are appealing to investors seeking liquidity, low transaction costs, and decreased counterparty risk. However, because they are standardized, they may not precisely match a risk manager's requirement in terms of underlying security, timing or delivery location. This mismatch is called basis risk.

Derivative contracts issued through OTC channels, on the other hand, can be highly customized and can eliminate basis risk. However, they tend to be less liquid, more expensive, and involve significant counterparty risk.

Airline Risk Management: Turbulence Ahead

The curriculum presents the example of the airlines industry which is heavily exposed to volatility in jet fuel prices. Because the industry is fiercely competitive, airlines cannot easily raise passenger ticket prices in response to spike in oil prices.

There are very few futures contracts available for jet fuel, so airlines instead use widely available crude oil contracts to manage their price risk. However, this introduces basis risk, and airlines also need to manage the spread between crude oil and jet fuel. As an alternative, many airlines use OTC instruments to tailor their hedging to jet fuel prices and to their specific delivery requirement.

Delta Airlines, one of the world's largest airlines, tried a different approach using vertical integration. It bought its own oil refinery in 2012 as part of its fuel management strategy. This allowed them to control jet fuel prices, but the refinery has its owns ups and downs and exposes the airline to other risks inherent in oil refining.

Interest Rate Risk and Foreign Exchange Risk Management

The goal of hedging interest rate risk is to control the firm's net exposure to unfavorable interest rate fluctuations. Interest rate swaps are a common instrument used to hedge interest rate risk.

The goal of hedging foreign currency risk is to control exposure to exchange rate fluctuations. Currency put options and currency forwards are common instruments used to hedge foreign currency risk.

7. What Can Go Wrong in Corporate Hedging?

A lot can go wrong in corporate hedging. The curriculum presents an example of MGRM, the energy trading US subsidiary of Metallgesellschaft AG. MGRM had promised to supply end users with 150 million barrels of gasoline and heating oil over ten years at fixed prices. This

long-term price risk was hedged with a supersized rolling program of short-dated futures and OTC swaps.

If the hedging strategy had been pursued to the end, it could have worked well. However, due to changes in the underlying oil market, the strategy triggered massive margin calls, resulting in a significant and unanticipated cash drain.

As a result, MGRM had to liquidate the hedges at a significant loss. The market then flipped and went against the now unhedged MGRM, resulting in even higher losses on its original customer commitments.

Essentially MGRM lost twice:

- First, when it unwound the hedges at a loss due to the cash drain from the margin calls, and
- Second, when the market moved against the original contracts (which were by then unhedged).

Summary

LO: Compare different strategies a firm can use to manage its risk exposures and explain situations in which a firm would want to use each strategy.

Different risk management strategies available to a firm are:

- Retain the risk
- Avoid the risk
- Mitigate the risk
- Transfer the risk

A cost benefit analysis should be conducted before selecting the right risk management strategy. A strategy that allows the firm to stay within its risk appetite in the most efficient manner should be chosen.

LO: Explain the relationship between risk appetite and a firm's risk management decisions.

In practical terms, risk appetite is two things:

1. A statement about the firm's willingness to take risk in pursuit of its business goals. The detailed risk appetite statement is usually an internal document that is subject to board approval. However, attenuated versions can appear in some annual corporate reports.
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The risk appetite is set well below the firm's total risk bearing capacity, and above the amount of risk the firm is exposed to currently (i.e. the firm's risk profile).

LO: Evaluate some advantages and disadvantages of hedging risk exposures and explain challenges that can arise when implementing a hedging strategy.

Just because a risk *can* be hedged does not mean that it *should* be hedged. Hedging is simply a tool, and like other tools, it has limitations:

- Hedging can only stabilize earnings during a short time horizon of a few years.
- Hedging has costs that are transparent (e.g. option premium) and opaque (e.g. rogue trading under the pretext of hedging).
- Equity investors argue that from their perspective hedging does not add much value. In a large portfolio, any risks specific to the firm are diversified away. Therefore, a firm

that uses hedging tactics to reduce firm-specific volatility is of little benefit to investors.

However, there are also several arguments that support hedging:

- Hedging reduces the chance of financial distress, which consists of both direct costs (e.g. bankruptcy costs) and major opportunity costs.
- Improved revenue stability sends an important message to the company's potential creditors, key customers, and suppliers.
- Hedging can be useful to equity investors if it is used as a tool to increase the firm's cash flows. For example, through hedging companies can offer stable pricing to their customers which can increase customer demand.
- Hedging allows managers to plan company operations better.
- Equity investors are not the only stakeholders. Other stakeholders such as managers, employees, regulators etc. may want the firm to use hedging to be financially sound and protected from sudden mishaps.

LO: Apply appropriate methods to hedge operational and financial risks, including pricing, foreign currency, and interest rate risk.

To properly develop and execute its risk management approach, a firm needs to *rightsize* its risk management. A static hedging strategy is relatively simple. Dynamic strategies can reduce costs, but they require a much bigger investment in systems and trader expertise.

The goal of hedging interest rate risk is to control the firm's net exposure to unfavorable interest rate fluctuations. Interest rate swaps are a common instrument used to hedge interest rate risk.

The goal of hedging foreign currency risk is to control exposure to exchange rate fluctuations. Currency put options and currency forwards are common instruments used to hedge foreign currency risk.

LO: Assess the impact of risk management tools and instruments, including risk limits and derivatives.

Commonly used risk management tools and instruments are:

- Forwards
- Futures
- Swaps
- Call options
- Put options
- Exotic options
- Swaptions

Commonly used risk limits are:

- Stop loss limits
- Notional limits
- Risk specific limits
- Maturity/Gap limits
- Concentration limits
- Greek limits
- Value-at-Risk (VaR)
- Stress, Sensitivity, and Scenario Analysis

