2025

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EXAM PART II

Credit Risk Measurement and Management

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Credit Risk Measurement and Management

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PREFACE

On behalf of GARP's Board of Trustees, the FRM advisory committee, and GARP's FRM professional certification program staff. I want to thank you for your interest in and support of the FRM program.

The program's first offering in 1997 saw just over 100 candidates sit for the exam. During the past 27 years, hundreds of thousands of professionals have studied for and taken the FRM exam, with it now being the world's leading financial certification program.

The dynamic nature of the FRM program's curriculum means that it regularly and quickly responds to changes in the global financial marketplace. This ensures that its content and reach always address the risks and challenges of a fast-changing, complex, and globally connected financial system.

For example, for 2025, after much discussion and consideration, the FRM advisory committee made material changes to the program's 2025 market risk measurement and management content. The result is that about half of the subject readings in Market Risk Measurement and Management were updated.

But maintaining a current and highly relevant curriculum is not the sole focus of GARP's professional staff. GARP has focused considerable time and resources during the past year developing tools to assist a candidate in his or her exam program preparation. In addition to providing current content, a primary objective of ours is to ensure as much as possible that a candidate is making the best use of his or her valuable time in preparing for the exam.

In this regard, GARP offers FRM Part I candidates an electronic platform called GARP Learning. GARP Learning is a streamlined digital learning program that can be accessed via a mobile phone, tablet, or desktop computer. GARP Learning allows an FRM candidate to engage meaningfully in a self-directed fashion with the full FRM Part I curriculum. It provides the ability to monitor performance, identify strengths and weaknesses, and assists in creating a personalized study plan.

Supplemental to the support offered by the learning platform, candidates can also utilize end-of-chapter questions to test their understanding of the chapter's content immediately; and, importantly, take a full-length FRM Part I Practice Exam to gain familiarity with how topics are tested and how to pace oneself on the exam to ensure completion in the allotted time.

As you can readily see, we are committed to ensuring the FRM program retains its global reputation as being of the highest quality, and covering the concepts, issues, and challenges that financial risk management professionals must know, and in many cases master.

As always, we wish you the very best as you study for the FRM exams, and much success in your career as a risk management professional.

Yours truly,

Richard Apostolik

President & CEO

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Evan Sekeris, Ph.D.
Head of Non-Financial Risk, MUFG

Sverrir Þorvaldsson, Ph.D., FRM
Senior Quant, SEB

1

Fundamentals of Credit Risk

Learning Objectives

After completing this reading, you should be able to:

- Define credit risk and explain how it arises using examples.
- Explain the differences between insolvency, default, and bankruptcy.
- Identify and describe transactions that generate credit risk.
- Describe the entities that are exposed to credit risk and explain circumstances under which exposure occurs.
- Discuss the motivations for managing or taking on credit risk.

Excerpt is Chapter 1 of The Handbook of Credit Risk Management: Originating, Assessing, and Managing Credit Exposures, *Second Edition, by Sylvain Bouteille and Diane Coogan-Pushner.*

WHAT IS CREDIT RISK?

Credit risk is the possibility of losing money due to the inability, unwillingness, or nontimeliness of a counterparty to honor a financial obligation. Whenever there is a chance that a counterparty will not pay an amount of money owed, live up to a financial commitment, or honor a claim, there is credit risk.

Counterparties that have the responsibility of making good on an obligation are called "obligors." The obligations themselves often represent a legal liability in the form of a contract between counterparties to pay or perform. Note, however, that, from a legal standpoint, a contract may not be limited to the written word. Contracts that are made orally can be legally binding.

We distinguish among three concepts associated with the inability to pay. First is insolvency, which describes the financial state of an obligor whose liabilities exceed its assets. Note that it is common to use insolvency as a synonym for bankruptcy but these are different events. Second is default, which is failure to meet a contractual obligation, such as through nonpayment. Default is usually—but not always—due either to insolvency or illiquidity. Third is bankruptcy, which occurs when a court steps in upon default after a company files for protection under either Chapter 11 or Chapter 7 of the bankruptcy laws (in the United States). The court reviews the financial situation of the defaulted entity and negotiates with its management, creditors, and sometimes equity owners. Whenever possible, the court tries to keep the entity in business by selling assets and/or renegotiating financing arrangements with lenders. Bankruptcy proceedings may end in either a restructuring of the obligor's business or in its dissolution if the business cannot be restructured.

In most cases, losses from credit risk involve an obligor's inability to pay a financial obligation. In a typical scenario, a company funds a rapid expansion plan by borrowing and later finds itself with insufficient cash flows from operations to repay the lender. Other common cases include businesses whose products or services become obsolete or whose revenues simply no longer cover operating and financing costs. When the scheduled payment becomes due and the company does not have enough funds available, it defaults and may generate a credit loss for the lenders and all other counterparties. There are also more and more cases where the inability to pay follows an unexpected and uninsured event that destroys an entity in a short time. Just think of all the small and medium-sized companies that disappeared in 2020 after the COVID-19 pandemic or the wildfires in California.

Credit losses can also stem from the unwillingness of an obligor to pay. This is less common, but can lead to the same consequences for the creditors. The most frequent cases are commercial disputes over the validity of a contract. In instances in which unwillingness is at issue, if the dispute ends up in litigation and the lender prevails, there is recovery of the amount owed, and ultimate losses are lessened or even avoided entirely because the borrower has the ability to pay.

Frequently, credit losses can arise in the form of timing. For example, if monies are not repaid on a timely basis, there can be either interest income foregone or working capital finance charges incurred by the lender or trade creditor, so time value of money is at stake.

Credit risk can be coupled with political risk. Obligors doing business in different countries may have both the ability and willingness to repay, but their governments may, without much warning, force currency conversion of foreign-currency denominated accounts. This happened in 2002 in Argentina with the "pesification," in which the government of Argentina forced banks to convert their dollar-denominated accounts and debts to Argentine pesos. Companies doing business in Argentina saw their U.S. dollar-denominated bank deposits shrink in value, and their loans and trade credits shrink even more, since the conversion rate was even more egregious for loans than deposits.

A common feature of all credit exposures is that the longer the term of a contract, the riskier that contract is, because every additional day increases the possibility of an obligor's inability, unwillingness, or nontimeliness of repayment or making good on an obligation. Time is risk, which is a concept that we will explore further throughout the book.

For each transaction generating credit risk, we will address three fundamental questions in the forthcoming chapters:

1. What is the amount of credit risk? How much can be lost or what is the total cost if the obligor fails to repay or perform?
2. What is the probability of default of the counterparty? What is the likelihood that the obligor fails to pay or perform?
3. How much can be recovered in case of bankruptcy? In the case of nonpayment or nonperformance, what is the remedy and how much can be recovered, in what time frame, and at what expense?

TYPES OF TRANSACTIONS THAT CREATE CREDIT RISK

Managing credit risk requires first identifying all situations that can lead to a financial loss due to the default of a counterparty.

Long gone are the days when it was an easy task. Today, there are many different types of financial transactions, sometimes very sophisticated, that generate credit risk.

Traditionally, credit risk was actively managed in bank lending and trade receivables transactions. A rule of thumb for identifying credit risk was to look for an exchange of cash or products at the beginning of a commercial agreement. The risk was that the money would not be repaid or the products not paid for. Recently, however, the development of modern banking products led to transactions generating large credit exposures without lending money or selling a product, as we explain in Chapter 5, which is dedicated to dynamic credit exposures mostly generated by derivatives transactions.

Credit risk is present in many types of transactions. Some are unique but some are rather common. In the following paragraphs, we will describe seven common business arrangements that generate credit risk.

Lending is the most obvious area. There is a cash outflow up front, from the lender to the borrower, with a promise of later repayment at a scheduled time. A second transaction type involves leases, when a piece of equipment or a building is made available by an entity (the lessor) to another entity (the lessee) that commits to make regular payments in the future. The lessor typically borrows money to finance the asset it is leasing and expects the future cash flow from the lessee to service the debt it contracted. The third type is the sale of a product or a service without immediate cash payment. The seller sends an invoice to the buyer after the product has been shipped or the service performed, and the buyer has a few weeks to pay. This is known as an account receivable.

Prepayment of goods and services is a fourth type of transaction that involves credit risk. Delivery is expected at a certain time and of a certain quality and/or performance, and the failure of the counterparty may lead to the loss of the advanced payments and also generates business interruption costs. A fifth type of transaction that creates credit risk involves a party's claim on an asset in the custody of or under the management of another party, such as a bank deposit. Most individuals choose their bank more for the services they offer or the proximity to their home rather than after a detailed analysis of its financial conditions. Large corporates think differently because they have large amounts of cash available. They worry that the banks with their deposits may default. Before trusting a financial institution, they review its creditworthiness. They also spread their assets among many banks to avoid a risk concentration, as the Federal Deposit Insurance Corporation's (FDIC) coverage limit of $250,000 per account is insufficient to cover most deposits of large corporations. The bankruptcy of MF Global in 2011 reminded many individuals and businesses to think twice about cash left in brokerage accounts and to carefully evaluate limits under the Securities Investor Protection Corporation (SIPC) or, outside the United States, its equivalent.

A sixth type of transaction is a special case of a claim on an asset—a contingent claim. The claim is contingent on certain events occurring, such as a loss covered by an insurance policy. At policy inception, the policyholder has no claim on the insurer. However, once the insured suffers a covered loss, the insured has a claim. If the insurer fails to pay the claim, this would constitute a credit loss. Another example of a contingent claim would be a pension fund that has a claim on the assets of its sponsor, should the fund's liabilities exceed its assets. Nothing has been prepaid and no funds were lent, but there is credit risk borne by the pension participants in the event that the sponsor cannot honor the fund's liabilities.

Finally, a seventh type of transaction involves not a direct exposure but a derivative exposure. It arises from derivatives transactions like interest rate swaps or foreign-exchange futures. Both parties commit to make future payments, the amounts of which are dependent on the market value of an underlying product, for example, the exchange rate between the U.S. dollar and the Japanese yen. In Chapter 5 we explain how to calculate the amount of credit risk in these types of transactions. Although there is no up-front cash outflow as there is in a loan, the counterparty's financial distress results in the same outcome—loss of money. Other examples of credit risk stemming from changes in the value of an underlying financial asset include repurchase agreements, options, and short-selling of shares.

These transactions groupings, as described in Table 1.1, are general categories. Further breakdowns are possible that map to particular credit instruments frequently used in these transactions. For example, loaned money can take the instrument form of a corporate bond, a bank loan, a consumer loan, asset-based lending, and commercial paper, among others.

Figure 1.1 displays credit risk exposure associated with borrowing instruments as of September 30, 2020, for the United States. The predominant source of credit exposure in the United States is corporate obligations. Although there is roughly $55.5 trillion of debt outstanding in U.S. debt markets, these include noncredit risky instruments such as U.S. Treasury obligations, government-sponsored enterprise (GSE, or "agency") obligations, and agency-backed mortgage obligations.

Table 1.1 Types of Transactions That Create Credit Risk

Credit Type	Losses Result From	Loss Type
Loaned money	Nonrepayment Slow repayment Dispute/ enforcement	Face amount, interest Time value of money Frictional costs
Lease obligation	Nonpayment	Recovery of asset, remarketing costs, difference in conditions
Receivables	Nonpayment of goods delivered or service performed	Face amount
Prepayment for goods or services	Nondelivery Performance on delivery not as contracted Slow delivery Dispute/ enforcement	Replacement cost Incremental operating cost Time value of money Frictional costs
Deposits	Nonrepayment	Face amount Time value of money
Claim or contingent claim on asset	Nonrepayment/Noncollection Slow repayment/Slow collection Dispute/ enforcement	Face amount Time value of money Frictional costs
Derivative	Default of third party	Replacement cost (mark-to-market value)

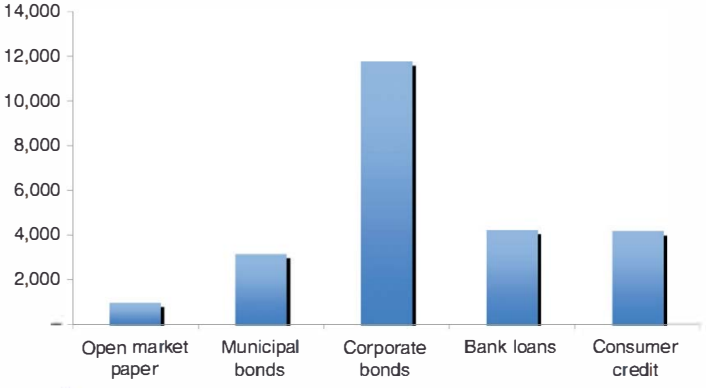

Figure 1.1 Sources of credit risk by instrument, USD Billions.

Source: Federal Reserve Board of Governors, "Z.1. Financial Accounts of the United States," September 30, 2020, Tables L.208, L.212, L.213, and L.214.

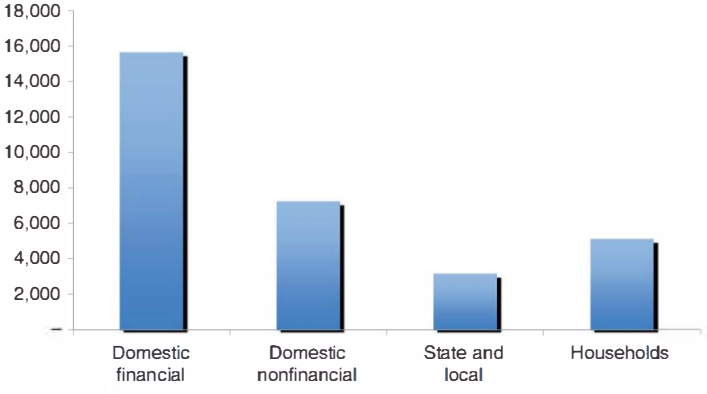

Figure 1.2 Sources of credit risk by entity type, USD Billions.

Source: Federal Reserve Board of Governors, "Z.1. Financial Accounts of the United States," September 30, 2020, Tables L.208, D.3., and B101.h. Note that deposits are not counted in the Federal Reserve's definition of credit market debt.

Of instruments that have credit risk, the majority is issued by the corporate sector in the form of corporate bonds, bank loans, and commercial paper.

Figure 1.2 displays the source of credit risk exposure by entity. Note that financial corporations are a far larger source of credit exposure than are both nonfinancial corporations and households. Again, we choose not to include federal government debt or household-mortgage debt (the majority of which is agency backed), since one could argue that these forms of borrowing have no associated credit risk exposure, a topic that we will explore further in Chapter 10, "Sovereign Credit Risk."

In the United States alone, over $5 trillion of trade receivables are on the books of all corporations, and this figure represents 89% percent of all trade receivables as of September 2020.[1]

Finally, the potential notional credit exposure arising from derivative transactions as of June 2020 is estimated to be in excess of $600 trillion on a global basis. Nearly all of this exposure arises from over-the-counter (OTC) interest-rate derivative contracts, with the remaining roughly $30 billion,

[1] U.S. Federal Reserve Board of Governors, "Flow of Funds," Table L.225, "Trade Credit."

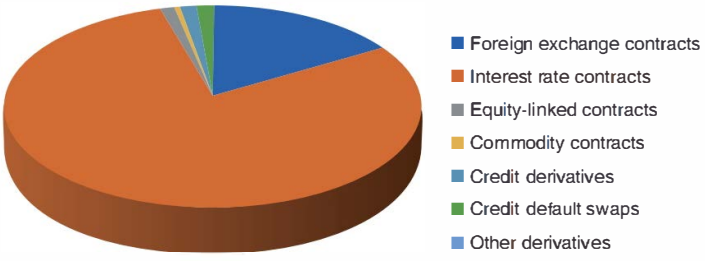

Figure 1.3 Notional value of counterparty credit risk exposure for OTC and exchange-traded derivatives, end-June 2020, USD Billions.

Source: Bank of International Settlements, Statistical Release, Tables D5.1 and D5.2, June 2020: "Notional Amounts Outstanding of Over-the-Counter (OTC) Derivatives."

trading on exchanges. Figure 1.3 shows the relative sizing of counterparty credit risk exposure by derivative type, based on the notional value of the contracts for OTC transactions. Note that the notional value corresponds to gross credit exposure, which we discuss in Chapter 4 and which is the most conservative measure of credit risk.

WHO IS EXPOSED TO CREDIT RISK?

All institutions and individuals are exposed to credit risk, either willingly or unwillingly. However, not all exposure to credit risk is inherently detrimental; banks and hedge funds exist and profit from their ability to originate and manage credit risk. Individuals choose to invest in fixed income bond funds to capture extra return relative to holding U.S. Treasury bonds. For others, like industrial corporations or service companies, because they sell goods or services without pre-payments, credit risk is a necessary by-product of their main activities.

In Figure 1.4, we can see who bears the exposure to debt securities issued by corporates and other entities. We see that financial institutions, including public and private pension funds, mutual funds, banks, insurance companies, and others, have the largest exposure, followed by households and nonprofits, foreign entities, and the government sector (federal, state, and local). Governments and nonfinancial corporations are not in business to invest in debt instruments or to assume credit risk as a primary business endeavor so it is reasonable that they have the smallest holdings.

Figure 1.5 shows the breakdown of the financial sector in terms of who holds the exposure to these debt instruments. Within the financial sector, depository institutions and mutual funds have the most exposure (almost $12 and $10 trillion,

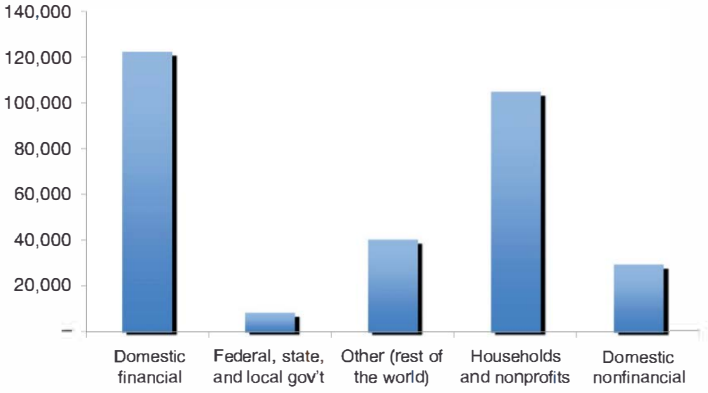

Figure 1.4 Exposure to credit market instruments by entity, USD Billions.

Source: Federal Reserve Board of Governors, "Z.1. Financial Accounts of the United States," September 30, 2020, Tables L.101, L.102, L.105, L.108, and L.133.

respectively), with insurers, pension plans, and finance companies each having about half as much. This figure paints a high-level picture of why some institutions, primarily financial institutions, employ large teams of credit risk managers, since so much is at stake.

Financial Institutions

Since financial institutions face the most credit risk exposure, we will naturally focus on these entities throughout this book. In the following subsections, we briefly describe how each of these financial institutions is exposed.

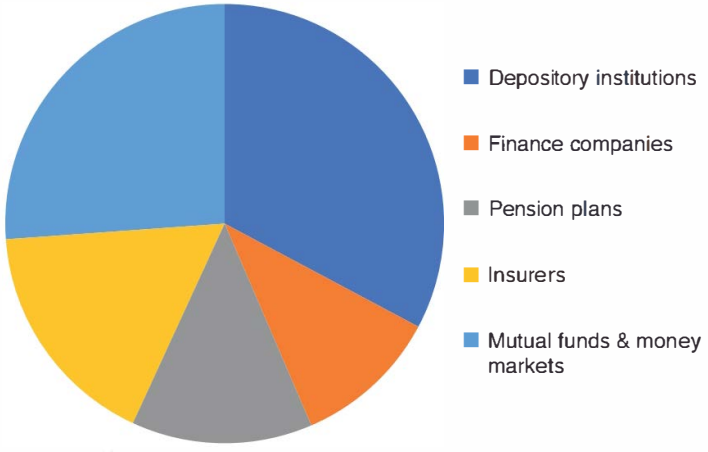

Figure 1.5 Financial institutions' exposure to credit market instruments, USD Billions.

Source: Federal Reserve Board of Governors, "Z.1. Financial Accounts of the United States," September 30, 2020, Tables L.208 and L.214.

Banks

Because they are in business to extend credit, banks have the largest credit portfolios and possess the most sophisticated risk management organizations. Interestingly enough, their appetite for credit risk has declined over the years, as margins are low and regulatory capital requirements high. The recent activities of regulators across the globe to strengthen the financial system will lead to further reluctance to take on credit risk.

The focus for large banks has shifted toward fee-generating services such as mergers-and-acquisitions advisory services or debt and equity issuance. However, loans and lines of credit still constitute the largest sources of credit risk for a bank. For corporate clients, they are offered as a way to develop a relationship, and often would not produce a sufficient return on capital on a stand-alone basis. However, because the loans and lines of credit represent the potential for large losses, banks employ teams of risk managers who do nothing but analyze the credit risk of borrowers and review the loans' legal documents. In order to further reduce the credit risk exposure that these loans present, banks are increasingly turning to the capital markets to hedge the exposure created in extending the credit.

Loans include asset-based lending like repurchase agreements ("repos") and securities lending. In short, banks lend money or securities against the provision of collateral such as Treasury bonds or equity. If the borrower cannot repay or give back the securities, the lender can sell the collateral, thus reducing or eliminating losses. In theory, the collateral held is sufficient to cover the amount of borrowed money or the value of the securities in case the counterparty defaults. When the financial markets are volatile, though, the value of the collateral can decline quickly, just at the time when the counterparty defaults. Banks, therefore, manage their exposures carefully. We introduce repos in more detail in Chapter 17.

After loans, the derivatives business generates the largest credit risk exposure for banks and comes from many directions. We will explain in Chapter 5 why derivatives generate a form of credit risk known as "derivative counterparty" exposure. For JPMorgan Chase & Co., the derivative receivables counterparty credit risk exposure on a fair-value basis at the end of 2020 was $707 billion, comprised of interest-rate contracts, followed by foreign exchange contracts, credit derivatives, equity contracts, and commodity contracts. Net of cash and liquid security collateral, the derivative receivables exposure was approximately $80 billion, which compares to its equity base of almost $280 billion. Although the ratio appears large, the exposure metric represents what would be lost if all counterparties defaulted on the exposure valuation date.

Most of the examples used in this book relate to banks' exposures.

Asset Managers

The asset management business consists of collecting money from individuals and institutions and investing it in order to meet the investors' risk and return objectives. For instance, cautious investors anxious to protect their principal prefer money-market funds, primarily invested in short-term and high-quality debt. Investors with more appetite for risk may favor mutual funds focusing on equities or emerging markets debt and equity.

Asset management is a huge business worldwide. In the United States, companies such as Blackrock or Vanguard Group manage more than $5 trillion of third-party money. The result is that asset managers, with huge amounts of money to invest, face credit risk exposures on behalf of their clients, whose management is integral to their business model. When managers select their investments, they pay very close attention to the creditworthiness of a corporate or of a sovereign borrower that has the potential to reduce the performance of their fund, including causing losses to their clients. Whereas portfolio managers may be tempted to make investments that promise high returns, the funds' risk managers will discourage the portfolio managers from doing so due to the real possibility that the money may not be repaid.

Hedge Funds

Hedge funds also have vast amounts of funds to invest daily and have a correspondingly large amount of credit exposure. Their investors have a greater risk appetite, but demand high returns to compensate for this risk. They are, therefore, more aggressive than typical investors, and they invest in riskier financial instruments, many of which traditional asset managers do not have access to. Their participation in financial markets has made many business transactions possible that otherwise would not have occurred by allowing risk to be transferred. For example, they may purchase distressed loans, sell protection against a decline in a borrower's creditworthiness, or assume the riskiest positions in commercial real estate financing, all of which allow for the necessary transfer of risk to make a transaction possible. In many corporate restructurings, hedge funds play a proactive role to maximize their recoveries, as a result of their investment in risky debt.

What is unique though is that some hedge funds also view the possibility of an entity defaulting as an opportunity to deploy capital. In contrast to traditional financial institutions that hire credit risk managers to avoid the default of their counterparties and protect shareholders' money, hedge funds employ

resources to identify entities that may default. They enter into transactions like short-selling or writing of options that make, not lose, money, in cases of financial distress.

Whereas a bank that has a credit exposure may want to hedge the exposure and collect if a credit loss occurs, a hedge fund may profit from the financial distress of an obligor even if it has no direct exposure to that obligor. The growth in derivatives products has made the execution of such strategy relatively easy. We describe in Chapter 20 how credit default swaps (CDSs) work and how they can be used to "short" credit, that is, to make money when the financial situation of a company or a country deteriorates.

CDS and short-selling transactions involve a lot of risk for both fundamental and technical reasons. On the fundamental side, a turnaround by a new management team may be successful. Or, on the technical side, the current supply and demand conditions in the market may lead to severe financial stress.

One example of financial distress caused by short-selling of shares is what happened to the hedge fund Melvin Capital in January 2021. Thinking that the financial situation of GameStop, a video game and consumer electronics retailer, would deteriorate and their share price decline, Melvin entered into short-selling transactions on a big scale: they borrowed shares from investors, with a promise to give them back at a scheduled time, and sold them to other investors at the prevailing market price, which was between $10 and $15. They expected that GameStop's share price would keep declining and that they would be able to buy shares in the open market, give them back to original investors, and make a profit. However, some individual investors realized that companies like Melvin would have to buy large amounts of shares to cover their borrowings and started purchasing shares. As a result, instead of declining, the share price increased. At one point, GameStop's shares reached close to $350. The bigger the increase, the higher the losses for Melvin. When they decided to close their positions, they paid a few hundred dollars per share and recorded a financial loss of several billion dollars. They had to be bailed out by two other hedge funds, Citadel and Point72, without which they would have likely defaulted.

Insurance Companies

Insurance companies are exposed to credit risk in three main areas: underwriting activities, the investment portfolio, and reinsurance recoverables.

Certain insurers offer to protect their clients' credit exposures with trade credit insurance on receivables and with surety bonds, which are reviewed in Chapter 19. As a consequence, insurers and reinsurers may suffer significant losses due to the default of a company they provide coverage on. One example is the bankruptcy of the British travel agency Thomas Cook in 2019, which cost the (re)insurance industry hundreds of millions of dollars.

The insurance business is similar to asset management in that the company has vast amounts of cash to invest. It collects premiums from policyholders, invests the money, and later pays claims when losses occur. It is not unusual for an insurance company to show losses on its core underwriting operations (i.e., claims paid plus operating expenses exceed premiums collected for a block of policies) yet record profits, thanks to the float on the assets they hold prior to paying claims. Every year, in his annual letter to Berkshire Hathaway shareholders, Warren Buffett, who owns several insurance companies including GEICO, spends pages explaining why he likes a business that provides him with cash flow and the means to do what he likes and does best: invest.

An insurance company's balance sheet is, therefore, characterized by large amounts of claims reserves and equity on the liability and equity side, respectively, and corresponding investment positions on the asset side. The liability reserves are established to pay policyholder claims. If all claims are satisfied, then any remaining assets belong to shareholders. One of the largest U.S. life insurance group, MetLife, Inc., has $480 billion of general account (reserves and equity) assets on its balance sheet as of the fourth quarter of 2020.

As a result, insurance companies are among the largest and most active institutional investors. With each dollar invested comes the possibility not to be paid back. In the insurer's strategic asset allocation process, one of the most important criteria is credit risk. Management of this risk is key since there is a trade-off between expected return, which favors shareholders, and maintaining a low risk profile, which favors policyholders (note that this dichotomy of interests is not present for a mutually owned insurer in which the company is owned by the policyholders). Their portfolio will include large proportions of safe Treasury bonds, which require little to no credit analysis, as well as riskier and higher returning debt issued by commercial real estate vehicles or even leveraged equity investments in hedge funds. Insurance companies have large dedicated teams of professionals in charge of managing all credit positions they hold, even when these positions are managed on a day-to-day basis by a third-party asset manager.

In addition, life insurance companies manage money on behalf of their policyholders in separate accounts. These assets will never belong to MetLife shareholders, even after all claims are paid. These funds are more akin to the assets of an asset manager who

has a fiduciary duty to their clients. For MetLife, separate account assets totaled an additional $162 billion in 2020. While in most instances MetLife's shareholders are not directly impacted by credit losses in separate accounts, the insurer may suffer damage to its reputation and jeopardize future business opportunities. Finally, the insurer may offer a product to its clients that guarantees minimum investment returns. In these instances, if credit losses are severe enough, the insurers may only be able to make good on its guarantee by depleting its own capital base, which could lead to insolvency.

The third area of credit risk faced by the insurer relates to their reinsurance activities. Insurers first originate policies that carry the risk of claims becoming far larger than premiums collected. If so, reserves set aside will be inadequate to cover losses, and insurers' capital would be tapped. Thus, behind the scenes, insurance companies all over the world transfer some of the risks they originate to reinsurers. The reinsurance business is dominated by a handful of large, primarily European companies like Swiss Re (Switzerland) or Munich Re (Germany).

The transfer of the risk from primary insurers to reinsurers happens via reinsurance contracts. The model is straightforward: Insurers who originate policies and collect policyholder premiums transfer part of the risk by buying a policy and paying a premium. Once a policyholder reports a claim to the insurer, the insurer reports part of this claim to the reinsurer. The insurer's claim then becomes a reinsurance receivable and it has to be paid within a few weeks. During this period, reinsurers verify and sometimes question the validity of the claims. For small and frequent losses, the credit risk stems essentially from this time lag. The amount of premium paid equates more or less to the amount of losses to be claimed, with the risk being that the reinsurer has disappeared in the intervening time period. For catastrophic losses, the credit risk is much larger. When an earthquake or a hurricane occurs, reinsurers may have inadequate resources to make payments. Thus, primary insurers must carefully choose their reinsurance partners and try to avoid "putting all their eggs in one basket"; that is, they distribute risks among many reinsurers, which is not an easy task because the industry is highly concentrated.

Another form of credit risk associated with reinsurance is the contingent claim that the insurer has on the reinsurer. In the preceding example for receivables, the primary insurer knows its losses and submits its claim to the reinsurer. However, in the case of some liability policies, there can be decades between collecting premiums and the policyholder's report and ultimate settlement of a claim. The insurer must estimate what these claims might be, and these estimates generate a contingent claim on the reinsurer, that is, an asset on its balance sheet contingent on the event that it ultimately pays those estimated losses to policyholders. This asset is called a reinsurance recoverable, and it represents an even larger item on an insurer's balance sheet than receivables on paid losses. For the typical insurer, it is usually the largest single item on the asset side of the balance sheet after invested assets.

The reinsurance business is more than 150 years old, and for a long time the only market participants were well-established reinsurance companies. However, in the past 20 years an alternative market developed, as investors appreciate the solid returns (absent natural catastrophes) and the absence of correlation with other investment asset classes. Out of $600 billion of capital deployed to the reinsurance industry, close to $100 billion was provided by alternative capital at the end of 2020. However, insurers do not want to take the credit risk of these investors so their participation is typically fully collateralized, which means that investors must provide cash in advance to the same amount of the maximum liability they accept in their reinsurance contracts. The credit risk is therefore eliminated.

Pension Funds

Similar to a life insurer that invests monies on behalf of a policyholder, a pension fund sponsor (e.g., corporate employer) invests funds on behalf of pension plan members. As of September 2020, corporations and the private sector had $3.5 trillion of defined benefit pension assets. For public plans under U.S. state and local government plans, sponsors had $9 trillion in assets, and those in U.S. federal government sponsored plans totaled $3.8 trillion.[2] A significant portion of these funds is invested in credit risky assets. Private pension funds must abide by ERISA (Employee Retirement Income Security Act of 1974) prudent-investor rules, and public funds have similar standards; as such, both must be active managers of credit risk even if the asset management of the funds is outsourced to third-party managers.

Corporates

Corporates do not like credit risk but cannot avoid it. It is a by-product of their operations, and their position is not enviable. Investors, rating agencies, and other stakeholders have little tolerance for credit losses, and yet credit risk management is outside of their core competency. To make matters worse, when the customer of a corporation files for bankruptcy, a list of the customer's creditors is published and often relayed by

[2] Federal Reserve Bank Flow of Funds Financial Accounts Z.1, tables L.118, L.119, and L.120.