The ART of Risk management

Alternative Risk Transfer, Capital Structure, and the Convergence of Insurance and Capital Markets

CHRISTOPHER L. CULP

John Wiley & Sons, Inc.
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Of course, the usual disclaimer applies. The views and positions expressed herein along with any remaining errors are mine alone and are not necessarily those of any institution with which I am affiliated, any clients of those institutions, or anyone thanked here.
Capital and insurance markets are converging in both product offerings and institutional participation. Consider some examples. At the product level, asset assurance can be obtained through either (re-)insurance guarantees or credit derivatives, and foreign exchange or commodity price hedging now can be done with futures, forwards, options, and swaps or with a multiline insurance contract. At the institutional level, investment banks like Goldman Sachs and Lehman Brothers now have licensed reinsurance subsidiaries, and reinsurers like Swiss Re now directly place the functional equivalent of new debt and equity with their corporate customers.

The recent trend toward convergence in insurance and capital markets is much more fundamental than just increasing product or institutional similarities. The real convergence is between corporation finance and risk management. No longer is it possible to consider seriously how a firm will manage its risk without simultaneously considering how that firm raises capital. And conversely.

At the center of this convergence maelstrom is alternative risk transfer (ART), or contracts, structures, and solutions provided by insurance and/or reinsurance companies that enable firms either to finance or to transfer some of the risks to which they are exposed in a nontraditional way, thereby functioning as synthetic debt or equity (or a hybrid) in a firm’s capital structure. In short, ART forms represent the foray of the (re-)insurance industry into the corporation financing and capital formation processes.

Today providers of risk control products like derivatives also are integrally involved in the capital formation process, although many participants in this area may not realize this. To discuss risk management in a corporate finance context is still considered odd by some. And yet, increasingly, to discuss one without considering the other is quite likely to lead to serious inefficiencies in either how a firm manages risk or how it raises funds—if not both.

A comprehensive approach to corporate finance must take into account both risk finance and risk transfer alternatives, both capital and insurance market solutions, and both risk management and classical treasury decision-making processes. Companies like Michelin, United Grain Growers, and
British Aerospace that have adopted this comprehensive approach to corporate finance have met with tremendous success and provide us with very useful examples of the kinds of efficiencies that can all too easily be left on the table when a more compartmentalized approach is adopted.

The objective of this book is to explore the theoretical foundations underlying a comprehensive approach to corporation finance and the practical solutions and structures available to corporate treasurers for turning this theory into practice.

TWO FACES OF RISK MANAGEMENT

Risk management remains a divided world. In one camp are the classical insurance types who speak using terms like “retrocessionaires” and “funded retentions” and “attachment points.” In another camp are the financial risk managers who focus on concepts like value at risk, credit limits, and hedge ratios. Despite the fundamental similarities between what members of the two camps are trying to do for their companies, often it is impossible to hold a conversation with both groups at the same time without a translator.

The difference is not simply one of vocabulary, although that is surely still a major source of disparity between the insurance and capital markets worlds. The disparate nature of the two worlds of risk management, however, is more fundamentally a difference in perspective. Derivatives and financial instruments are considered the domain of asset pricers and financial engineers. And insurance is widely regarded as the playground of actuaries and brokers bent on finding the right attachment points for the hundreds of perils and hazards they can identify. Not helping things, most college and graduate insurance texts today pay little more than cursory attention to financial products. And even worse are the best-selling financial instrument texts, in which insurance concepts are virtually never mentioned.

The rise of “enterprise-wide risk management” in the 1990s has helped heighten awareness to the basic similarities between the two risk management camps. As companies increasingly seek to identify, measure, monitor, and control their risks in a holistic, top-down, integrated, and comprehensive manner, the basic complementarities between the financial and insurance risk management worlds have become more obvious.

The common ground underlying a comprehensive and integrated risk management program is one of capital structure optimization—that is, how to maximize firm value by choosing the mixture of securities and risk management products and solutions that gives the company access to capital at the lowest possible weighted cost. The questions a corporate treasurer must ask today thus now go well beyond questions like “What should be our dividend policy?” and “Should we have a target leverage ratio?” The questions
today now include “How much excess capital should we hold for risk and signaling purposes?” and “What form should that capital take?”

We are taught, of course, that a firm’s financing decisions do not affect its value under certain assumptions. And even when those assumptions are violated, there is no single empirically valid theory that delivers any clear notion of “optimal capital structure.” Nevertheless, in some situations certain sources of capital simply make less sense for particular companies than others. And similarly, risk management products and solutions can impact the value of firms quite differently depending on the circumstances and business objectives surrounding those firms. The lack of any empirically supported theory of optimal capital structure thus does not appear to stop firms from searching for one, and in many cases value-enhancing decisions are the result. As such, there can be little doubt that the era of a comprehensive approach to corporation finance has arrived.

**TARGET AUDIENCE AND OUTLINE OF THE BOOK**

This book is aimed at participants in both the capital markets (derivatives and securities alike) and (re-)insurance industries as well as—if not more so—at corporate treasurers and financial officers responsible for deciding how their firms should finance themselves. Risk managers also should find the work relevant, as should university students seeking a graduate course on relations between risk management (both worlds) and corporate finance.

My 2001 book *The Risk Management Process: Business Strategy and Tactics* does have a few similarities to this book, but not many. That book was concerned principally with examining the organizational process of risk management, including risk identification, measurement, and control. This book, by contrast, focuses almost entirely on risk control, or the various products and solutions firms can use to maximize their value by closing gaps between actual risk exposures and the risk exposures security holders want their firms to have. With the exception of some overlap in Chapters 3, 9, and 10, the books are basically different.

Those familiar with my prior book will detect some similarities in the themes of Part I in each book, both of which seek to lay down a solid corporate finance foundation for what follows. Although similar in spirit, the actual groundwork laid is quite different. Part I of my 2001 book dealt mainly with how risk management can increase the value of the firm in a corporate finance framework. Part I here focuses much more on corporate finance itself and the process by which firms strive to find the holy grail of an optimal capital structure.

Specifically, Part I of this book begins by discussing the nature of capital (Chapter 1) and how the investment banking process enables firms to raise capital by issuing traditional securities (Chapter 2). We develop in these two
chapters two fundamental concepts that will be used throughout the book. The first is a perspective on capital structure that allows us to view different sources of capital through a common lens—the lens of options theory, through which similarities between securities, derivatives, and ART forms will be very easy to see. The second concept is the notion of an economic balance sheet, or a way of viewing a firm’s assets and liabilities from an economic perspective—without the constraining limitations of accounting rules.

Chapters 3 through 6 introduce the notion of optimal capital structure. We begin with a review of the assumptions under which a firm has no optimal capital structure—when its cost of capital and capital structure do not affect its investment decisions or value. In Chapters 4 and 5, we consider two competing theories of when and how a firm’s capital structure does affect its value. Chapter 6 provides a summary of the empirical evidence for and against these theories. In Chapters 7 and 8, we consider a world where investment and financing decisions are not independent of one another and how that world can lead firms to want to hold capital for nontraditional reasons. Chapter 7 explores the role of risk capital and signaling capital, and Chapter 8 reviews various issues concerning regulatory capital.

Part II relates the corporate financing and capital structure issues explored in Part I to a firm’s risk management decisions. The risks to which a firm may be subject through its primary business activities are reviewed in Chapter 9, and the process by which firms engage in the enterprise-wide management of those risks is summarized in Chapter 10. Chapter 11 explicitly explores the link between risk management and capital structure decisions.

In Part III, we review the traditional methods available to firms for controlling their risks and altering their effective economic balance sheet leverage in the process. Chapters 12 to 16 present an overview of the risk control and capital structure functions provided by banking products (Chapter 12), derivatives targeted at market and credit risk (Chapter 13), asset divestitures and securitizations (Chapter 14), insurance (Chapter 15), and reinsurance (Chapter 16).

Part IV examines the emerging market for ART forms based on their type and function. Chapter 17 introduces the ART world and distinguishes between two distinct parts of that world: risk finance and risk transfer. Chapters 18 and 19 review the major alternative risk financing structures, including funded self-insurance programs and captives (Chapter 18) and finite risk products (Chapter 19). Chapter 20 presents some recent developments in risk transfer products, including integrated risk management products that have emerged as a response to the heightened awareness of the benefits of enterprise-wide risk management. Multiline and multitrigger products are reviewed, especially in the context of some fairly prominent failures in the former category. Chapter 21 reviews contingent capital in the form of committed capital (i.e., synthetic debt) and guarantees (i.e., synthetic equity). Fi-
nally, Chapter 22 reviews some of the more important recent developments in alternative risk securitization and securitized products.

Part V presents some practical issues that potential users of ART products will want to take into consideration. To accomplish this, it made sense to seek out the advice of the experts themselves. Accordingly, the four chapters are written by guest contributors. In Chapter 23, Morton Lane presents a comparison of two catastrophic insurance structures to illustrate specifically some important distinctions between catastrophic insurance products and to show more generally the difference between catastrophic insurance derivatives and securitized products. In Chapter 24, J. B. Heaton provides some important background on the increasingly important role of patent law on financial innovations, relying on a number of specific ART examples to make his points. Chapter 25 by Andrea Kramer discusses the distinctions between derivatives and insurance in the area of weather risk management and presents some important issues for energy companies to take into account in choosing between these products. Part V concludes with an extensive review by Theodore Boundas and Teri Lee Ferro of the numerous ART forms available to facilitate corporate transactions such as mergers and acquisitions.
Having summarized the outline of the book, a few comments are now in order on how to read the book. Importantly, the book is written in a way to develop the theory before getting into the products and applications. All case studies, for example, appear in Parts IV and V of the book so that readers might have an understanding of the theory behind these cases before getting embroiled in their details.

For academics and students seeking an understanding of both the theory and practice of ART in the context of modern corporate finance, it probably makes sense to read the book from start to finish. Similarly, practitioners directly involved in this market who already know how ART forms work may find a sequential reading of the book most beneficial.

For those readers, however, whose main interest is on understanding ART as a type of product—how ART forms work and how they have been used—skipping directly to Parts IV and V (possibly with a review of existing risk management products in Part III) may make more sense than reading the book in order. Part I, in particular, admittedly requires a reasonable investment of time to get through, and it is not essential if your objective is just to get an overview of the market. If, having read about the mechanics of these products, readers want to learn about how ART fits into the theory and practice of corporate finance, returning to Parts I and II for a subsequent read is certainly still possible.
The Quest for Optimal Capital Structure
Many of the financial products offered by insurance and derivatives industry participants today are increasingly similar to one another. Commentators on this phenomenon call it “convergence.” The interesting question is not really whether convergence is occurring in these two markets—it is—but rather toward what are the markets converging?

The common theme underlying many of the new financial structures in insurance and capital markets is that of capital structure optimization. In short, insurance and capital market products are increasingly similar because they are increasingly designed to help firms reduce their cost of capital or to allocate their capital across business lines more efficiently on a risk-adjusted basis.

We thus must begin with a discussion of capital itself: What is the nature of capital? What is a firm’s capital structure, and how does it relate to a firm’s cost of capital? When and why can the capital structure of a firm affect the value of a firm? And how are capital structure, firm value, and risk management interrelated? These are the questions that are explored in Part I of this book.

This chapter tackles the first of these questions. An especially important part of our initial exploration of capital is the development of a common perspective we can use to evaluate different sources of capital and their costs. The perspective we adopt is to view capital, capital structure, and sources of capital from an options perspective. Specifically, we attempt in this chapter to provide answers to the following questions:

- What is capital, and, in particular, what is the difference between real capital and financial capital?
- How do firms utilize financial capital?
- What are the fundamental building blocks firms can use to create financial capital claims or claims on their real capital assets?
How can the fundamental building blocks of capital structure be viewed through an options framework?

How does the mixture of the types of claims issued by a firm define the company’s capital structure?

WHAT IS CAPITAL?

To define “capital” properly would involve a heavier dose of economic theory and philosophy than space or time permits here. Appendix 1-1 at the end of this chapter provides a brief survey of capital theory from an economic history perspective. For our purposes here, it is sufficient to draw a critical distinction between what we may call “real” and “financial” capital.

Specifically, what firms do is act as organic production transformation functions, turning capital into a sequence of goods. How firms finance that process is where the crucial distinction between what we shall call “real capital” versus “financial capital” comes into play.^{1}

In their classic work *The Theory of Finance* (1972), Fama and Miller define “total net investment” as “the value in money units of the net change in the stock of [real] capital,” thus providing us with a bridge to link real and financial capital. In short, real capital is what gives firms their productive role in the economy, but financial capital is what is required to fund the acquisition and maintenance of real capital.

The following equation expresses the relation between financial capital and real capital at any one point in time algebraically as follows:

\[
E_{t-1}(t) + \delta(t) + D_{t-1}(t) + \rho(t) = X(t) - I(t) + V(t) \tag{1.1}
\]

where
- \(E_{t-1}(t)\) = time \(t\) market value of the firm’s stock outstanding at time \(t-1\)
- \(D_{t-1}(t)\) = time \(t\) market value of the firm’s debt outstanding at time \(t-1\)
- \(\delta(t)\) = dividends paid at time \(t\) to stockholders
- \(\rho(t)\) = interest paid at time \(t\) to bondholders
- \(X(t)\) = time \(t\) earnings on prior investments in real capital
- \(I(t)\) = time \(t\) investments in new real capital
- \(V(t)\) = discounted expected present value of future net cash flows

The left-hand side of equation 1.1 above is the value of the financial capital of the firm, and the right-hand side is the value of its real capital expressed as current earnings, current investment spending, and the discounted future income the firm’s capital assets are expected to generate over time.

Modigliani and Miller (1958) showed, among other things, that the right rate to use in discounting the uncertain future input values and output values of a project is the cost to the investing firm of raising the investment capital—that is, the financial capital—required to support such a project.
Referring to the liabilities that firms issue to fund their acquisitions of real capital as another form of capital may seem a bit confusing. But there is good reason for this use of terminology. Namely, financial economists like to refer to financial capital assets such as stocks and bonds as “capital” because they are capital to investors. Indeed, the celebrated “capital asset pricing model” was developed not to explain how the value of televisions and drills are determined in equilibrium but rather how the value of stocks and bonds as claims on televisions and drills are determined in equilibrium. But if the model works for stocks and bonds, it should also work for plants and equipment—hence the use of the term “capital” to describe both.

To avoid confusion, however, when we subsequently refer to “capital” without any modifying adjectives, readers should assume that we are talking about financial capital. References to real or physical capital will be qualified accordingly. Similarly, terms like “capital structure” also are used here in the financial context—the structure of claims issued by a corporation to finance its net investment spending. This is at odds with the use of the same phrase in macroeconomics, where “capital structure” often refers to the relation between the productive real capital stock, other factors of production, and total output.2

CORPORATE UTILIZATION OF FINANCIAL CAPITAL

Financial capital can be defined quite broadly as the collection of contracts and claims that the firm needs to raise cash required for the operation of its business as an ongoing enterprise. Operating a business as an ongoing enterprise, however, often—if not usually—involves more than just raising money to pay employees and finance current investment expenditures. It also includes keeping the business going, and doing so efficiently.

Firms may need financial capital for at least five reasons, each of which is discussed briefly below. These sections are included mainly as a preview to the rest of Part I. We will return to all of the issues raised here later and in much more detail.

Investment Capital

In Chapters 2 through 5, we focus on the primary reason that firms are thought to need financial capital—to fund their investment activities. Accordingly, we call this investment capital.3

Fama and French (1999) find that an average of about 70 percent of all spending on new investments by publicly traded nonfinancial U.S. firms from 1951 to 1996 was financed out of those firms’ net cash earnings (i.e., retained earnings plus depreciation).4 Accordingly, a large bulk of most firms’ investment
capital comes in the form of internal funds—“internal” because the firm’s need not go to outsiders to raise the money.

Despite the dominance of internal finance as a source of investment capital, the 30 percent average shortfall of net cash earnings below investment spending had to come from somewhere. To generate the funds required to close such deficits between net cash earnings and investment, firms issue “claims.” In exchange for providing firms with current funds, “investors” in those financial capital claims receive certain rights to the cash flows arising from the firm’s investments. In other words, by issuing financial capital claims, corporations can fund their investments and get cash today by promising a repayment in the future that will depend on how the firm’s investments turn out. In this sense, financial capital claims issued by firms to generate investment capital are direct claims on the firm’s real capital.

Note that investment capital as we define it is actually not strictly limited to investments but also includes operating expenses such as salaries, rent, coffee for employees, jet fuel for the company plane, and the like. Unless specifically indicated otherwise, in this chapter all of those operating expenses are lumped into the term “investment spending.”

Ownership and Control

Financial capital claims also serve as a method by which the ownership of a firm—or, more specifically, ownership of the real capital assets that define the firm—can be transferred efficiently. In lieu of selling individual plants, machines, and employees, firms can sell claims on those real assets.

In turn, financial capital assets convey some form of control rights and governance responsibilities on the holders of those claims. By receiving a financial claim on the firm’s real capital, investors naturally want some say in how the firm uses that real capital—including its acquisition of new real capital through its investment decisions.

For the most part, we will not deal with the connections between the existence of financial capital claims sold to investors and the governance issues those claims create.

Risk Capital

As noted, Chapters 2 to 5 will focus on investment capital, because all firms need investment capital. Even if the financial capital used to fund investments is internal, all firms invest. Otherwise, they would not be engaged in production activities.

In Chapters 7 and 8, we explore three other reasons why firms might need financial capital. But unlike investment capital, these reasons do not hold true at all firms. The discussions in Chapters 4 and 5 lay the foun-
dation for us to see when firms also might need capital for reasons beyond investment.

The first reason, discussed in Chapter 7, is risk capital. In order to operate its business as a going concern, some firms must carefully avoid the dangerous territory known as financial distress. Especially if financial distress costs increase disproportionately as a firm gets closer to insolvency, the more likely it is that the firm may need to use financial capital as a buffer against incurring those distress costs. When some firms find it necessary to raise risk capital, this capital is virtually always capital held in excess of that required to finance investment in order to avoid going bust.

Although the basic concept of risk capital is developed in Chapter 7, we will revisit the notion of risk capital repeatedly throughout Parts II to IV. In particular, we will see that risk capital is capital held by firms either to absorb or to fund losses that the firm elects to retain. Risk capital also can be acquired “synthetically” when a firm decides not to retain all of its risks, but rather to transfer some of its risks to other capital market participants. Although we review in detail different methods by which firms can access such synthetic capital in Parts III and IV, a very early understanding of the distinction between capital used for risk financing and capital obtained directly or de facto through risk transfer is fundamental.

**Signaling Capital**

A second reason that some firms might wish to hold financial capital over and above that required to fund current operations and investments occurs when managers have better information about the true quality of their investment decisions and growth opportunities than external investors. In this situation, firms often have significant trouble communicating the value of their investment decisions and their financial integrity to public security holders—trouble that ultimately can prevent firms from undertaking all the investment projects they would otherwise choose to make if everyone had access to the same information. The nature of these sorts of problems is the subject of Chapter 5.

For many years, people have conjectured that firms can use their financial capital in order to signal certain things about the information managers possess than investors do not. Quite often the issuance of financial capital claims is itself a signal. The Miller and Rock (1985) model, for example, says that firms issue financial claims only when they have information that future profits will be lower than expected. Conversely, firms pay dividends only when they perceive higher future profits than investors expect. Consequently, the issuance of financial claims and the dividend payout policy of the firm are both signals of the firm’s future profits.

In the Miller and Rock world, issuing certain types of financial claims is a negative signal to the market about future profits. But especially in recent
years, some contend that the signal sent to the market by issuing a financial claim depends on what the claim is and who holds it. Issuing new stocks through seasoned equity offerings or exchange offerings is widely considered to signal bad news at a firm, whereas taking out a bank loan is usually a positive signal.

Apart from the signal sent by the issuance of new financial capital, some also believe that the funds generated by issuing new claims can have benefits that exceed the costs of obtaining additional external finance. As will be explained in Chapter 7, signaling capital can provide firms with a means of indirectly communicating the value of their investment decisions to market participants, thereby reducing the firm’s cost of raising new capital and, in particular, helping the firm to avoid situations in which positive net present value investment projects might have to be forgone because of an inability to convince investors that the investment makes sense.

**Regulatory Capital**

A final reason why some firms issue financial capital is because they have no choice if they wish to comply with the regulations to which they are subject. Banks, insurance companies, securities broker/dealers, savings institutions, and other firms are all subject to minimum capital requirements.

Unfortunately, regulation does not always define financial capital in the same way as corporate treasurers. Consequently, as we will see in Chapter 8, many firms are forced to issue specific kinds of financial capital in order to satisfy regulatory requirements. Regulatory capital is what we call the financial capital firms must hold for this reason.

**FUNDAMENTAL BUILDING BLOCKS OF INVESTMENT CAPITAL**

Investment capital is the financial capital that virtually every firm needs in order to do what firms do—“produce” something. As mentioned, the bulk of investment capital comes in the form of retained earnings and depreciation. But when firms need to go beyond these sources of funds to pay for current investment expenditures, they can offer two fundamental types of claims in exchange for cash:

1. Residual claims
2. Fixed claims

When a firm raises cash by promising investors a claim whose value rises as the net cash flows of the business rise, the firm has created a residual claim. When a firm raises cash today and promises to repay investors in the future a
specific amount of cash plus some “interest”—that is, an amount that does not increase when the firm’s cash flows or asset values increase—the firm has created a fixed claim. Both types of financial capital can be viewed by invoking some basic concepts of options theory.

Residual Claims

A residual claim gives its holder a claim on the net cash flows of a firm. As long as the firm remains in business, this claim represents a claim on the net cash flows on the firm’s assets (i.e., real capital investments). If the firm shuts down, the residual claim is a claim on the net cash flows obtained from the liquidation of the firm’s real capital assets. In return for this residual claim on the firm’s net cash flows, the holder of this claim gives the company cash that it can use to fund its assets, service its investments, and the like. Residual claims are more commonly known as equity.

Exhibit 1.1 depicts the economic balance sheet of a firm that issues only equity in order to fund its acquisition of some assets. Suppose the firm otherwise has no liabilities and no internal funds. At any time t, the assets have a market value of A(t). The market value of the firm’s equity, E(t), is thus exactly equal to the market value of its assets.

Suppose the firm whose balance sheet is depicted in Exhibit 1.1 liquidates its assets at time T for a total value of A(T). The time T value of the total distribution to equity holders of the firm would be equal to E(T). This liquidation payoff is shown in Exhibit 1.2 and varies dollar for dollar with the

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<tr>
<td>A(t)</td>
<td>Equity: E(t)</td>
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EXHIBIT 1.1 Economic Balance Sheet of a Firm with Only Equity Claims
liquidation value of the firm’s assets. Note that the figure assumes that equity holders have limited liability; equity holders can at worst have a claim worth zero and cannot be called upon to make an additional payment to the firm or its liquidator.

We can express the value of equity at time $T$ in an all-equity firm more formally as

$$E(T) = \max[A(T), 0]$$

At any given time, a corporation can fund the acquisition of new assets or the assumption of new investment projects by issuing new equity claims. If the value of new equities issued at any time $t$ is denoted $e(t)$ and the time $t$ market value of equity claims outstanding from prior period $t-1$ is now denoted $E_{t-1}(t)$, then the time $t$ value of the firm can be expressed as

$$V(t) = A(t) = E_{t-1}(t) + e(t) \quad (1.2)$$

Equity holders of a firm can earn income from their claims even if the firm does not liquidate its assets. Some equity holders can generate income by selling their claims to others and pocketing any capital gain that may have oc-
curred over the holding period. Other equity holders can obtain income through dividends, if the firm in question both has the cash flows to pay dividends and decides to do so.

A firm’s ability to pay dividends to its equity claimants is dictated by its “cash flow constraint.” (We shall return to the firm’s willingness to pay dividends later.) At time $t$, the firm earns a total gross cash inflow from its assets of $X(t)$ and may invest a total of $I(t)$ in new investment projects or assets. Recall also that we include in $I(t)$ operating expenses such as salary and overhead.

The sum of dividends paid to equity holders at time $t$, $\delta(t)$, can be no greater than the net cash flow of the firm plus the proceeds from any new security issues. Assuming the firm retains no net cash flows and distributes all excess cash flows to equity holders in the form of dividends, the following relation holds:

$$\delta(t) = X(t) - I(t) + e(t) \quad (1.3)$$

Substituting the firm’s cash flow constraint in equation 1.3 into the value of the firm given in equation 1.2 allows us to express the total wealth of all equity holders as follows:

$$E_{t-1}(t) + \delta(t) = X(t) - I(t) + V(t) \quad (1.4)$$

If the firm winds up its operations and liquidates its assets at some time $T$, the resulting distribution to equity holders can be viewed as a liquidating dividend, such that

$$E_{T-1}(T) = X(T) + A(T) \quad (1.5)$$

where the left-hand side of equation 1.5 is the liquidating dividend.

**Fixed Claims**

The second way that a firm can raise cash is by issuing claims whose maximum payoff does not rise as the net cash flows of the firm increase. The value of such claims still depends on the firm’s net cash flows because they must be adequate to make the promised payoff. But because that payoff is fixed and does not rise with the firm’s profitability, this second type of claim is called a fixed claim and is more commonly known as debt.

Exhibit 1.3 depicts the economic balance sheet of a firm that has both debt and equity in its capital structure. The market value of the firm is equal to the market value of its assets at any time $t$, which in turn is equal to the sum of the market values of the firm’s debt and equity, or
V(t) = A(t) = D(t) + E(t)

Suppose the total amount borrowed by the firm through the issuance of debt instruments is denoted FV, for the “face value” of all its fixed claims. Suppose further that the debt pays FV on some date T and nothing before then. If the firm liquidates its assets on that date T for A(T), debt holders will receive at most FV. If the liquidation value of assets exceeds the face value of debt, equity holders, in turn, receive the residual—that is, A(T) – FV. But if the liquidation of the firm’s assets generates insufficient cash to pay off debt holders, the creditors to the firm as a group will receive only A(T) < FV. Accordingly, the liquidation value of all debt claims issued by the firm at time T is equal to

D(T) = min[FV, A(T)]

This liquidation payoff is shown in Exhibit 1.4. When the market value of assets exceeds the promised debt repayment of FV, the payment to debt holders is constant at FV. When assets are below total debt liabilities, the payment to debt holders declines dollar for dollar with the liquidation value of the firm’s assets. As in Exhibit 1.2, we continue to assume limited liability so that debt holders can never be called on to make an additional payment to the firm or its liquidator.

The issuance of fixed claims by the firm also affects the payoff of residual claim holders, because, as the term “residual claim” implies, residual claimants

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<td>E(t)</td>
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**EXHIBIT 1.3** Economic Balance Sheet of a Firm Equity and Debt Claims

V(t) = A(t) = D(t) + E(t)