

The ART of Risk  
**management**

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

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## Regulatory Capital

The M&M assumption of perfect capital markets can be violated by the existence of costly and/or distortionary taxes, subsidies, and regulations. Among those regulations that may affect the capital structure of a firm are the capital requirements imposed on certain types of firms by their regulators.

This chapter focuses mainly on capital requirements that affect the major suppliers of capital today, excluding individual and institutional (e.g., pension and mutual funds) investors in securities. Included are capital market intermediaries like securities broker/dealers and investment banks, over-the-counter derivatives dealers, and (re-)insurance companies.<sup>1</sup> At the end of the chapter we explore how demanders of capital can be affected by capital requirements imposed on suppliers of capital. Specifically, we address the following questions here in the order listed:

- To what kinds of capital requirements are commercial banks subject?
- To what kinds of capital requirements are securities broker/dealers subject?
- To what kinds of capital requirements and insurance and reinsurance companies subject?
- What is the impact of minimum capital requirements on a firm's value and its cost of capital?
- How do regulatory capital requirements on suppliers of capital affect the demanders of capital?

### **BANK CAPITAL REQUIREMENTS AND THE BASEL ACCORD**

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The Committee on Bank Supervision of the Bank for International Settlements (BIS) promulgated in 1988 the Basel Capital Accord (hereinafter accord or Basel I) primarily to strengthen bank safety and soundness and level the international playing field. Together with its five substantive amendments, the accord specifies minimum capital requirements for internationally active

banks in the Group of Ten (G10) industrialized countries. Some other countries also have adopted the Basel requirements, and, although it is aimed exclusively at internationally active banks, some national banking regulators have chosen to apply it to all banks in their jurisdiction.

The accord essentially requires that banks hold enough capital at all times to weather losses related to certain types of risk that they might assume. We discuss the accord in brief in terms of what risks it covers, how banks can satisfy their capital requirements for those risks, and what changes in the Basel framework lay on the horizon. Readers desiring a more detailed account of the Basel Accord should see Matten (2000) or Crouhy, Galai, and Mark (2001), or should visit the BIS website for a listing of the bank's own extensive library of resources and reports at *www.bis.org*.

### Scope of Basel I

In its current form, banks must hold enough capital to cover the risks of certain on- and off-balance-sheet assets and liabilities. Importantly, a bank's compliance with its capital requirements is aggregate, so that the bank either is or is not compliant at any given time. But compliance itself is determined by adding up the "risk weights" assigned to assets and liabilities with different risk characteristics.

#### On-Balance-Sheet Credit Risks

The main body of Basel I applies to the credit risk banks incur from their assets. The capital a bank must hold to cover its credit risk for most balance sheet assets is determined by multiplying the book value of the asset times by a predefined risk weight, where risk weights may be 0, 10, 20, 50, or 100 percent of the asset's value. Table 8.1 gives an example of the assignment of risk weights by asset type.

**TABLE 8.1** Credit Risk Weights for Major Balance Sheet Assets Under Basel I

Asset Type	Risk Weight
• Cash	0%
• Sovereign debt issued by OECD <sup>a</sup> countries	
• Claims on government-sponsored enterprises	10%
• Claims on banks located in OECD countries	20%
• Claims on OECD securities firms with bank-like capital requirements	
• Claims on non-OECD banks with less than a year to maturity	
• Residential mortgages	50%
• All private nonbank lending	100%
• All claims on non-OECD banks with more than a year to maturity	
• All other assets	

<sup>a</sup>OECD = Organization for Economic Cooperation and Development

On-balance-sheet assets and liabilities sometimes can be netted for the purpose of calculating capital requirements, provided the netting is backed by a legal opinion concluding that netting is very likely to be legally enforceable. In addition, the maturity of the liability (e.g., term deposit) must be no less than the maturity of the asset (e.g., loan) against which it is netted, and the positions to be offset have the same currency denomination. Finally, the bank must manage the “net” position on a consolidated basis.

### Off-Balance-Sheet Credit Risks

The credit risk of off-balance-sheet assets are also covered by Basel I. Such assets usually fall into one of two categories: contingent claims or derivatives. Contingent claims, such as those discussed at the end of Chapter 2, usually are assigned a risk weight based on their asset-equivalent position. To arrive at an asset equivalency, the BIS specifies “conversion factors” that amount to assumptions about how much of the contingent facility is presumed to be fully drawn. A conversion requirement of 100 percent for a letter of credit, for example, means that the bank must treat the LOC as if it were an existing loan. An undrawn standby credit facility made to a firm to support its trading operations, by contrast, has a 20 percent conversion requirement, which means that a \$1 million contingent facility would be assessed the capital charge for the underlying loan but only on a \$200,000 principal amount.

Table 8.2 summarizes the conversion weights used to transform some of the most popular contingent claims into asset equivalents.

Derivatives are assigned credit risk capital requirements based on current exposure of the transaction plus an add-on for potential exposure (reflecting maturity and type). If the transaction is out of the money, there is no credit exposure. But if it is in the money, the BIS requires a conversion of the position to an asset equivalent by adding the current market value (i.e., current re-

**TABLE 8.2** Conversion Weights for Contingent Claims Under Basel I

Asset Type	Conversion
• Guarantees	100%
• Standby facilities and LOCs	
• Repurchase agreements	
• Forward agreements	
• Performance bonds	50%
• Transaction-specific contingencies	
• Note issuance facilities	
• Documentary credits	20%
• Standby facilities for trading with maturities over one year	
• Standby facilities for trading with maturities less than one year that may be canceled prior to drawdown	0%

placement cost in the event of a default today) and an add-on. The add-on reflects the potential exposure of the deal or the possibility that the asset may become a bigger asset in default at some point over its remaining life. The add-on amount is based on the notional size of the transaction and the add-on factors listed in Table 8.3.

After the asset-equivalent amount has been calculated as current exposure plus the add-on, the normal asset risk factor is used to compute the capital required on the deal. A six-month interest rate swap with a notional principal of \$200 million and a current exposure of \$100,000, for example, has a zero add-on and an asset-equivalent exposure of \$100,000. An otherwise identical two-year swap is asset equivalent to \$1.1 million (i.e., \$100,000 current exposure plus  $0.5\% \times \$200,000,000$ ). If the swap is with a non-OECD bank, the risk weight of 100 percent is applied the asset-equivalent amount to derive the total capital charge.

Some limited netting is allowed for derivatives following a 1995 amendment to the accord.

### Market Risk

Apart from these capital requirements for credit risk, the “market risk amendments” to the accord of 1996 also require banks to hold additional capital against the risk of market price fluctuations in the values of certain assets, such as equities or derivatives. Banks can choose among several different methods to determine these risk weights.

Of particular significance in the market risk amendments was the decision by the BIS to let banks opt to use their own internal models to calculate their capital charges for market risk. The BIS still specifies the basic methodology, but its acknowledgment that internal models could be used for capital requirement calculations was a major step forward in modernizing the accord.

### Compliance with Basel I

Bank capital is classified into three categories, or “tiers,” by the BIS for the purpose of assessing capital adequacy. *Tier I* capital includes mainly fully

**TABLE 8.3** Potential Exposure Add-On Factors for the Credit Risk of Derivatives

	≤ 1 year	> 1 year and ≤ 5 years	> 5 years
Interest rate	0%	0.5%	1.5%
Exchange rate and gold	1%	5%	7.5%
Equity	6%	8%	10%
Precious metals (not gold)	7%	7%	8%
Other commodities	10%	12%	15%

paid-up and issued equity, noncumulative perpetual preferred stock, disclosed reserves, and minority equity interests in subsidiaries that are consolidated on the bank holding company's balance sheet.<sup>2</sup> *Tier II* capital includes undisclosed and revaluation reserves, general loan-loss reserves, hybrid securities, and subordinated debt. Finally, *Tier III* capital includes debt with original maturities of at least two years that contains lock-in provisions allowing the bank to suspend interest and/or principal payments if its total capital falls below its required minimum.

A bank's total regulatory capital must equal at least 8 percent of the sum of its risk-weighted assets at all times (i.e., the sum of 8 percent of the values of the bank's assets), where risk weights are determined in the manner described earlier. At least 50 percent of the ratio of the bank's total regulatory capital to the sum of its risk-weighted assets—that is, the *total capital ratio*—must be in the form of Tier I capital. In addition, subordinated debt cannot exceed more than 50 percent of the Tier I capital amount. Tier III capital can be used only to meet the market risk requirement, and may not exceed 250 percent of the Tier I capital that is allocated to market risk.

### **Basel II<sup>3</sup>**

International banking regulators announced in 1999 a plan to revise the accord, often referred to as Basel II. The proposed revision contains three “pillars,” the first of which is risk-based capital requirements. The planned revision of the accord is a recognition of several major shortcomings with the original accord. Among other things, Basel II contemplates tightening the link between the credit risk of bank assets and the capital regulators require internationally active banks to hold against those assets. In particular, the current “standard model” for capital charges does little to distinguish between differences in credit quality. Capital held against corporate loans, for example, barely depends on the creditworthiness of the borrower; the distinction between OECD and non-OECD is widely regarded as excessively coarse.

Acknowledging the limitations of the accord, the BIS considered three alternative capital adequacy schemes in its concept release. The first, ultimately favored by the BIS, ties capital requirements when possible to ratings published by external credit assessment institutions or bodies like export insurance agencies. Transactions with relatively good credits generally will require less capital than before, and conversely for high-risk borrowers. Loans to corporations, for example, have a lower capital charge if the borrower is rated AAA to AA– and a higher charge if the borrower is rated below B–.

The second alternative would link capital charges to banks' internal credit ratings. A capital scheme based on banks' internal ratings would rely on information that banks themselves collect about borrower credit risk.

Banks always have been acknowledged to have comparative advantage in the acquisition and analysis of credit information about their own customers. Because external ratings tend to lag more than lead firms' actual financial conditions, an internal ratings approach thus may be preferable for promoting bank safety and soundness. Relying on internal ratings for capital charge calculations, moreover, would not penalize banks for dealing with firms that have chosen to remain unrated by external credit assessment institutions.

Internal ratings do not, however, allow banks to take into consideration portfolio effects arising from multiple credit exposures. Thus the BIS explored a third alternative that would allow banks to use internal portfolio-based credit evaluation models for capital measurement in the same spirit as the 1996 market risk amendments. Although only a handful of sophisticated banks would find this alternative palatable in the short run, those banks could benefit greatly from an internal model-driven approach.

Basel II also goes well beyond simply making marginal changes to the capital banks must hold against credit risk. Indeed, Basel II is intended to create a "whole capital charge" that reflects all the major risks facing banks, including the interest rate risk of the banking book and operational risk as well as the usual credit and market risk. Operational risk, in particular, has been contentiously debated—that is, little agreement exists on how the BIS should require firms to allocate capital to operational risks. Some argue for a "loss distributions" approach based on actual operational loss data, whereas others argue for more of a "basic indicators" approach or an "internal rating" approach. As of this writing, the implementation date for Basel II thus remains unspecified, having already been postponed once.

The second and third pillars of Basel II—apart from the first pillar of revised risk-based capital requirements—are "supervisory review" and "market discipline," respectively. The supervisory review pillar emphasizes the importance of examiner discretion in assessing a bank's total capital requirements. The market discipline pillar emphasizes the importance of enhanced risk disclosures and transparency by banks.

## **CAPITAL REQUIREMENTS FOR SECURITIES BROKER/DEALERS**

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The capital requirements to which international securities firms are subject are a bit different from the BIS risk-based capital standards for banks. The Basel Accord is concerned primarily with ensuring that banks have enough capital to absorb losses and remain in business, in large part to ensure that the failure of a major bank does not threaten "systemic stability." Capital requirements imposed on securities participants like broker/dealers take a very different approach and are intended not to prevent a failure, but rather to protect customers in the event of a failure. These requirements specify capital

the firm must hold to ensure that it can be liquidated in an orderly and nondisruptive manner if the need arises.

### **Securities and Exchange Commission Net Capital Rule**

Capital requirements imposed on securities firms are exemplified by the U.S. Securities and Exchange Commission “net capital rule” of 1975.<sup>4</sup> Under the net capital rule, firms are required to hold enough regulatory capital so that they can be liquidated in an orderly manner if they fall below minimum capital levels. Importantly and quite differently from the capital requirements imposed on banks, the net capital rule can be satisfied only with liquid capital, and the required minimum level is thus also aimed only at firms’ liquid capital assets.

The actual minimum liquid asset requirement imposed on a broker/dealer depends on many factors—the size of the firm, whether it manages customer funds and/or issues securities, the other activities of the firm, and the like.

Despite the heterogeneity of the minimum capital requirement, the way that firms satisfy these requirements is the same across all firms. Specifically, to calculate minimum capital levels, securities firms take the market values of their current securities holdings and multiply them by asset-specific risk factors that are set by the SEC to reflect the credit, market, and liquidity risk of the securities. The resulting “haircuts” then are subtracted from the net worth of the institution for comparison to the firm’s minimum capital level.

#### **“Haircuts”**

For equity securities, U.S. firms may choose between the “basic standard” and “alternative standard” approaches. The former specifies a 30 percent haircut and a requirement that aggregate indebtedness cannot exceed 15 times net capital. The latter requires firms to hold a capital cushion equal to 2 percent of customer and customer-related receivables and imposes a 15 percent haircut with some added complications. Almost all large firms today opt for the alternative standard method.

Under the alternative standard method, the net capital rule specifies a haircut based on the following calculation:

$$\text{Haircut} = 0.15\max[L,S] + 0.15\max\{0, \min[L,S] - 0.25\max[L,S]\}$$

where L and S denote the market values of the broker’s long and short positions, respectively. This is confusing, so let us take an example. Suppose a broker/dealer has long positions in the common stock of Firm Dracula worth \$200,000 and short positions in the same common stock worth \$15,000. The long exposure is the greater of the two, so the haircut is



$$\text{Haircut} = 0.15(\$200,000) + 0.15\max\{0, \$15,000 - 0.25(\$200,000)\}$$

The last term is negative and thus vanishes, so the broker/dealer's haircut on its Dracula holdings is

$$\text{Haircut} = 0.15(\$200,000) = \$30,000$$

Now suppose the long positions of the firm are worth \$200,000 and the short positions worth \$250,000. The short positions now represent the maximum exposure, and the haircut is now

$$\begin{aligned} \text{Haircut} &= 0.15(\$250,000) + 0.15\max\{0, \$200,000 - 0.25(\$250,000)\} \\ &= \$37,500 + 0.15\max\{0, \$200,000 - \$62,500\} = \$37,500 \\ &\quad + 0.15(\$137,500) \\ &= \$37,500 + \$20,625 = \$58,125 \end{aligned}$$

In other words, if both positions are big enough, both enter the haircut calculation. The 25 percent multiplier in the last term reflects the fact that netting is only partially credited in this calculation—but that is still more than in the basic standard method.

Haircuts on debt securities are based on the credit quality of their issuer and the maturity of the claim, both of which materially impact the volatility of the security. Table 8.4 shows the current haircut amounts by issuer and maturity.

### **Derivatives Policy Group Voluntary Reporting Framework**

In March 1995, the six largest U.S. securities participants in over-the-counter derivatives activity—Goldman Sachs, Crédit Suisse First Boston, Merrill Lynch, Morgan Stanley, Salomon Brothers, and Lehman Brothers—released a *Framework for Voluntary Oversight* intended to provide guidance for capital allocation to the risks of derivatives. Known as the Derivatives Policy Group (DPG), these six firms agreed to report their activities in derivatives to the SEC voluntarily.

In addition, the DPG members agreed to use proprietary statistical models to measure the capital at risk on their derivatives activities using a mutually agreed-on reporting framework.<sup>5</sup> The DPG participants calculate the risks of their interest rate, equity, foreign exchange, and commodity swaps, over-the-counter options, and foreign exchange forwards under two different scenarios—a large shock of a size to be determined by the member firms and a shock to several predefined “core risk factors” specified by the SEC.

The DPG participants report these results to the SEC but may not use these calculations as a substitute for the regular net capital requirements. The SEC appears to use the information mainly to monitor how a correlated shock to major risk factors would affect all firms at the same time.

**TABLE 8.4** Haircuts for Debt Instruments Under the SEC Net Capital Rule

Issuer:	Government <sup>a</sup>	Municipal <sup>b</sup>	High-Grade Debt <sup>c</sup>	Others (Liquid) <sup>d</sup>	Others (Illiquid) <sup>e</sup>
Maturity:					
0-1 months	0%	0%			
1-3 months		1/8%			
3-6 months	0.50%	1%	1/4%	2%	
6-9 months	0.75%		3/8%		
9-12 months	1%		1/2%		
			3/4%		
1-2 years	1.50%	2%		3%	30% (15%) <sup>f</sup>
			1%		
2-3 years	2%	3%		5%	
3-5 years	3%	4%		6%	
5-7 years	4%	5%		7%	
7-10 years		5.5%			
10-15 years	4.50%	6%		7.5%	
15-20 years	5%	6.5%		8%	
20-25 years	5.50%	7%		8.5%	
Over 25 years	6%			9%	

<sup>a</sup>Includes securities issued or guaranteed by the U.S. government, government-sponsored enterprises, or the Canadian government.

<sup>b</sup>The second column applies to municipal securities with less than 732 days to maturity at issue, and the first column applies to all other municipal securities.

<sup>c</sup>The debt must be nonconvertible and have a rating in one of the top four rating categories of a recognized rating agency.

<sup>d</sup>Three or more market makers.

<sup>e</sup>One or two market makers.

<sup>f</sup>Alternate method in parentheses.

### Internal Models

The SEC has shown much greater reluctance than the BIS in allowing firms to use their own internal models for capital requirement calculation purposes. In February 1997 the SEC took its first step in this direction by agreeing to let broker/dealers calculate the haircut on their listed equity, equity index, and currency options positions using models.

Broker/dealers must report their positions to a "third-party source" that maintains generally accepted option pricing models and that is subject to supervision by a Designated Examining Authority. The third party revalues the broker's options under 10 specified valuation scenarios. The broker then downloads the change in option values under these scenarios and applies these changes to its own proprietary and market maker positions. The maximum loss at each of the 10 scenarios is the haircut.

The SEC is currently considering an approach more similar to the one

embodied in Basel II, especially with respect to allowing large derivatives participants to rely on internal models for the calculation of their haircuts.

### **International Guidance**

Securities regulation can differ quite a lot across international borders. The International Organisation of Securities Commissions (IOSCO) has attempted to promulgate some cross-border uniformity, and one area of particular interest to IOSCO has been the harmonization of international minimum capital requirements on securities broker/dealers. The Technical Committee of IOSCO worked on a document articulating its views on minimum capital requirements from July 1987 to June 1989.

The resulting *Capital Adequacy Standards for Securities Firms* sets forth a framework that is broadly similar to the SEC's net capital rule. Firms are expected to have sufficient liquid assets to meet their obligations given the risks to which they are subject. The liquid capital of broker/dealers is expected to exceed the sum of risk-based requirements imposed on assets in a manner analogous to SEC haircuts.

### **CAPITAL REQUIREMENTS FOR INSURERS AND REINSURERS**

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The regulation of insurance and reinsurance suppliers is complicated and disparate. Some countries are much more lenient than others, and some countries—including the United States—leave regulation to individual state insurance commissions and chartering agents.

Nevertheless, most countries do specify minimum capital requirements for insurance underwriters and sometimes for reinsurers. Some examples of these capital requirements are detailed below, but readers should keep in mind that, unlike the BIS, which applies to all internationally active G10 banks, insurance capital requirements can vary widely by jurisdiction.

### **Risk-Based Capital Standards for Insurers**

Although American states ultimately are allowed a large amount of discretion in their implementation of minimum capital requirements, the National Association of Insurance Commissioners (NAIC) has developed a set of risk-based capital (RBC) standards in an effort to promote conformity. The NAIC RBC standards attempt to require insurers to hold an amount of capital deemed adequate to cover most of their major risks. Like the Basel Accord, risk weights are defined for all risky assets, liabilities, and premium writings. The size of the exposure is adjusted with a risk weighting factor, and the aggregate weighted risk exposure defines an insurer's authorized control level (ACL).

The total adjusted capital (TAC) of insurers is then compared to their ACLs to determine capital adequacy. Insurers may satisfy their TAC requirement with statutory capital, voluntary reserves, and certain premium surpluses. Companies with a TAC-to-ACL ratio of 200 percent or more typically are left alone. Insurers with a TAC-ACL ratio of between 150 percent and 200 percent often must submit a RBC Plan to their home state regulators proposing the corrective actions they will take to move their ratio in the right direction. Table 8.5 summarizes the usual implications for insurance writers based on their TAC-ACL ratios.

### Solvency Margins in the European Union for Insurers

In the European Union (EU), capital requirements for insurance underwriters usually are based on a *solvency margin*, defined broadly as the minimum relation required between capital (called surplus) and premiums written and either claims incurred (non-life) or mathematical reserves (life). As early as 1946, for example, the United Kingdom required that the total assets of a nonlife insurer should exceed total liabilities by 20 percent of the premiums written.<sup>6</sup>

Note that we encounter here for the first time an important industry distinction that will arise repeatedly later in the book—the distinction between life and nonlife insurance lines. Nonlife may include property and casualty, professional indemnity, directors and officers, and other types of insurance. The two types of insurance lines have been separated by historical convention for many years, because the nature of the liabilities and the actuarial models required to manage the liabilities are inherently different. Most specifically, nonlife policies may never result in claims, whereas life policies always will because everyone dies eventually.

An EU directive sets forth minimum solvency margins based on the general type of insurance line. Nonlife lines, for example, must have capital that is equal to the greater of (1) 18 percent of written premiums, or (2) 26 percent

**TABLE 8.5** NAIC RBC TAC-ACL Minimum Capital Ratio Triggers

Ratio of TAC to ACL	Action
≥ 200%	No action
≥ 150% and < 200%	RBC Plan must be submitted to state proposing specific corrective actions
≥ 100% and < 150%	RBC Plan as above <i>plus</i> regulatory agency-mandated corrective actions
≥ 70% and < 100%	Discretionary seizure of firm <i>allowed</i>
< 70%	Closure and seizure of firm <i>required</i>

of average net claims paid over the prior three to seven years. Adjustments are allowed in both cases for reinsurance.

### **Capital Requirements for Reinsurers<sup>7</sup>**

As is the case with insurance companies, capital requirements on reinsurers can vary widely across countries and legal jurisdictions. Unlike insurers, however, solvency concerns with reinsurers are widely regarded as less of a “public policy” problem for the simple reason that insurers deal directly with members of the public and reinsurers do not. Accordingly, the solvency of a reinsurer typically is regarded as a concern only to the extent that it might affect the solvency of an insurer.

Reinsurance capital requirements may target companies’ technical reserves and/or solvency margins. In the United States, for example, reinsurers must maintain the same technical reserves as insurers for similar lines. Other countries, such as the United Kingdom, rely on surplus margins in excess of reserves instead of just absolute reserves.

Whether credit is given to primary insurers for reinsurance in the calculation of their own capital and reserve requirements depends in part on how the reinsurers are regulated. In the United States and within Lloyd’s, for example, there is no real distinction between insurers and reinsurers, and any firm purchasing insurance from another firm can deduct that cover from its own capital requirement. In France, by contrast, no reserve requirement is imposed on reinsurers, but primary insurers are not allowed to deduct reinsurance from their own technical reserve requirements. In other words, France enforces a “gross reserving” environment in which reinsurers are essentially unregulated, but insurers are not allowed to show the benefits of reinsurance in their own capital regulations.

### **IMPLICATIONS FOR CAPITAL STRUCTURE AND THE COST OF CAPITAL**

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What practical implication do capital requirements have on the capital structure and cost of capital of a firm? There are two possibilities. First, capital requirements can reduce a firm’s expected cash flows owing to the costs of the regulation itself. Such costs can include the costs of compliance and reporting, the costs of administration (including any new personnel costs arising as a direct result of regulation), and ancillary expenditures (e.g., costs of systems required to facilitate compliance).

The second avenue—and, as we know from Chapter 3, the only other means by which the value of the firm can be affected—is a higher cost of capital. In this context, capital requirements can affect a firm’s cost of capital both directly and indirectly.

The direct increase in costs occurs if capital requirements force firms to hold “too much capital.” The cost associated with forcing a firm to hold excess capital, however, is probably not that high for several reasons. First, most of the industries discussed here—especially banking—already hold well above their minimum required levels. Second, the rationales for holding excess capital discussed in Chapter 7 may apply to the firms in question, in which case they might hold excess capital anyway. Nevertheless, for some firms, regulatory capital requirements may increase their cost of capital by simply forcing them to hold “too much” relative to their optimum.

The indirect upward pressure that capital regulations can put on a firm’s cost of capital occurs not because of the requirements that firms hold a certain amount of capital but instead because of the specific claims firms often must use to meet capital requirements. In other words, to the extent that regulation forces firms to hold a mixture of claims that causes them to depart from their optimal capital structure, their cost of capital may be increased as a direct result of the regulatory distortion in the capital structure optimum.

Under the M&M assumptions in which capital structure is irrelevant, regulations that affect the relative distribution of claims should not impact the value of the firm. But when one or more M&M assumptions are violated, even firms with excess capital can experience distortions in their decisions about optimal capital structure.

By defining regulatory capital in a manner different from how firms define their own capital, companies may be induced to hold different types of capital that departs from what they might otherwise define as a private optimum. Recall, for example, that Basel I requires that banks hold at least 50 percent of their required capital in Tier I capital and further requires that of the remaining amount of Tier II capital, no more than 50 percent of the Tier I amount can be held as subordinated debt.

Consider a firm that has a required minimum capital level of \$100 million that it can satisfy solely with external claims. The accord requires that the firm satisfy this requirement with at least \$50 million of equity and, consequently, no more than \$25 million of subordinated debt. The firm in question, however, might be a pecking order firm and thus prefer to raise significantly less of this capital with equity. If the firm has excess capital or retained earnings, there is no problem. But if the firm is forced to meet this requirement through public security issues, the capital requirements could force the firm to bear disproportionately higher adverse selection costs than necessary.

Apart from creating distortionary incentives that can impose costs on a firm by pulling it away from an optimal capital structure, capital requirements also can encourage firms to spend often-significant resources to engage in regulatory capital “arbitrage.” The benefits of successful regulatory arbitrage often are reduced costs of capital or reduced distortions in the relative

capital structure. But at the margin, a firm may spend up to its entire savings on just getting the arbitrage done.

Matten (2000) describes three types of regulatory capital arbitrage that occur specifically under the Basel Accord, all of which also can apply to many insurance regimes, as well. First, the accord may induce cherry picking, in which firms simply avoid exposures that may be positive NPV projects but that receive a higher capital charge. Consider, for example, a bank that considers a loan to an OECD bank and a non-OECD bank, and suppose the NPV of the loan to the latter is slightly higher. But further suppose the higher risk weight on the non-OECD bank is actually enough to tip the bank away from its pecking order capital structure optimum. If the costs of deviating from the pecking order optimum exceed the amount by which the NPV of the non-OECD loan exceeds the OECD loan, the bank may opt for the lower-NPV project. Other types of cherry picking are discussed in later chapters—see especially Chapter 22 on securitization.

The Accord also can prod banks to engage in asset transformation and risk transfer transactions purely to convert on-balance-sheet assets or liabilities to off-balance-sheet claims. As we shall see in Chapters 13, 14, and 22, securitized product vehicles, certain ART forms, and some credit derivatives can be used for this purpose.

Finally, the accord allows banks greater flexibility in assessing the capital they must hold against assets in their trading portfolio than assets associated with their traditional commercial banking operations. Specifically, the classical risk weights approach is required for banking book assets, whereas banks are already allowed to use the “internal models” approach for many capital issues arising in the trading book. As a result of banks’ preference for the latter, transactions like “bistro swaps” and “zigzag securitizations” have arisen to exploit the regulatory arbitrage opportunity. See Chapter 22 for a more complete discussion of these types of deals.

## **CAPITAL REQUIREMENTS AND THE SUPPLY OF CAPITAL**

In most cases, the institutions demanding risk management products on which we focus in this book are nonfinancial corporations and some smaller financial institutions. Although some small financial institutions may be subject to minimum capital regulations, most nonfinancial corporations are not. Nevertheless, this does not mean that capital requirements are irrelevant to such firms. On the contrary, capital requirements on suppliers of capital can also adversely affect demanders of capital.

The type of capital regulation to which suppliers of financial capital may be subject can influence the availability, type, and price of the financial capital they are willing to supply. An insurance company required to hold capital against a classical insurance product, for example, may not be required to

hold capital against an undrawn contingent capital facility, thereby increasing the insurance company's capacity to write the latter kind of capital product lines. Alternatively, a bank that assists a firm by providing a credit enhancement to an SPV that issues securitized products may face a lower capital requirement than if it engaged in a credit derivatives transaction of fundamentally the same nature.

We have not really discussed any of these products yet, nor how some of them can even be viewed as capital or substitutes for capital. Nevertheless, it is important to explain the regulatory distortions that can influence the supply of capital. We will return to particulars as cases warrant later.

## NOTES

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1. Henceforth we use the term "(re-)insurance" to refer to insurance and reinsurance companies in the same group.
2. Disclosed reserves must meet certain criteria for their inclusion. In addition, Tier I capital also requires the deduction by the bank of "unamortized goodwill," such as the goodwill capital created for some U.S. banks during the savings and loan crisis of the 1980s.
3. This section is based largely on Culp (1999).
4. 17 C.F.R. 240.15c3-1 (U.S. Code)
5. The methodology was value at risk with a 99 percent confidence level and two-week risk horizon. See Chapter 10 for a further discussion of value at risk, as well as Culp (2001).
6. See Skipper (1998).
7. See Kiln (1991).