CHAPTER 15

Financial Regulation

Like most industries, financial services operate in a legal and regulatory framework that privileges some activities and constrains others. The regulatory framework has an enormous impact on financial firms' risk management and on overall financial stability.

As we saw in Chapter 1, the financial services industry has been regulated in recent decades in a less overtly intrusive way than a half-century ago. Certain interest rates were subject to ceilings, fees and commissions for intermediating many financial transactions were set by law or by semipublic authorities, and different types of financial firms were limited in the range of activities permitted to them. In recent decades, and up until the subprime crisis, the trend was away from specific controls and prohibitions. The major regulatory initiatives, rather, focused on setting risk capital standards for banks and other intermediaries.

Public discussion of the subprime crisis has been channeled largely through the topic of financial regulation. Many observers have identified inadequate or faulty regulation as the major cause or enabling factor of the crisis. As a result, the regulatory landscape is in a state of greater flux than at any time in living memory. In the United States, a major legislative bill, the Dodd-Frank Wall Street Reform and Consumer Protection Act (H.R.4173, "Dodd-Frank") was passed in July 2010.

Dodd-Frank left the institutional framework of U.S. regulation largely intact, but ordained major changes in its scope, from consumer protection, to financial stability and *systemic risk*, to the way specific types of financial services are authorized and supervised. But rule making based on Dodd-Frank—and the many technical studies intended to inform rule-making—which will to a large extent determine its impact, will take a number of years to complete: By one estimate, Dodd-Frank mandates 387 new rules. Similar, if less sweeping, legislation and regulatory changes are being carried out in other developed economies. Revisions to capital and liquidity standards by both national and international regulators are slowly taking shape.

Any detailed description of the specifics of regulation of different types of firms in different countries would be a long text, and likely obsolete by the time of publication. We focus in this chapter, rather, on the major issues for firm risk and public policy raised by financial regulation.

15.1 SCOPE AND STRUCTURE OF REGULATION

We begin in this section by summarizing the goals claimed for regulation, and sketch its contemporary institutional framework, in other words, the why and the who of regulation.

15.1.1 The Rationale of Regulation

In Chapter 6, we reviewed the effects, such as moral hazard and risk-shifting, of information and transactions costs on market participants' incentives and on the design and enforcement of credit contracts. These phenomena are also an important but complex part of the rationale for regulation, since regulation can ameliorate as well as amplify these problems. Moreover, the relationship between regulators and the intermediaries they oversee is in some respects similar to that between creditors and borrowers. For example, later in this chapter we discuss deposit insurance, the lender of last resort function, and other ways in which the government or central bank may lend to intermediaries or guarantee certain of their liabilities, either as a matter of course or under certain circumstances.

As we see in this chapter, the intended consequences of regulation are often different from the actual consequences, and the ostensible motivation of regulation often differs from the authentic motivation. With this caveat in mind, broadly speaking, there are three types of rationale or goal for most regulatory measures.

Consumer Protection Individuals consume financial services directly as borrowers and investors. By far the largest part of borrowing by U.S. households is in the form of first- and second-lien mortgages and home equity loans secured by their primary residences, totaling, according to Federal Reserve data, $10.1 trillion at the end of 2010. Other important forms of household borrowing are credit-card debt, auto loans, and student loans; U.S. households' nonmortgage debt totaled $2.4 trillion at end-2010. Households also contract directly with financial intermediaries as retail investors in securities and investment funds, and as clients of financial advisors.

As investors, individuals and households own a large fraction of deposits and money market mutual fund (MMMF) shares; retail accounts owned about one-third of the $2.8 trillion in MMMF assets in early 2011. *Deposit*

insurance was created in most countries in large part to protect depositors from loss, as well as to protect the stability of the banking system.

Much regulation is concerned with protecting consumers of financial services. Financial intermediaries are viewed by many as having better information and more market power than individuals, and frequently perpetrating fraud. In addition to these arguments from asymmetric information and market power, behavioral finance has identified certain psychological predispositions that interfere with rational maximizing choice, to the detriment of consumers. Regulation is intended to level the playing field and protect consumers from exploitation rooted in asymmetric information or fraud, or because of their difficulty framing decisions rationally.

Since the onset of the subprime crisis, the prevalence of fraud and deceptive practices by mortgage originators has been debated. A certain type of residential mortgage, the *option adjustable rate mortgage* (ARM), illustrates both the fraud and behavioral-finance consumer-protection rationales for regulation. An option ARM has a below-market initial interest rate that resets to a market-level interest rate after a contractually specified period. The initial interest payments can be so low that there is *negative amortization*; that is, the loan balance increases during the low-rate period. Such mortgages are said to be inappropriate for most households, since they may be unable to stay current on their payments after the initial period if the market-adjusted rate is higher and brings with it a payment shock that the household cannot easily withstand. Option ARMs are, however, well-suited to investors seeking gains from house price appreciation, since they can be refinanced prior to reset.

Regulation might prohibit lenders from offering option ARMs, restrict the terms of such contracts, or require them to provide certain disclosures and explanations. On June 29, 2007, U.S. bank regulators provided guidance on mortgage-lending practices that discouraged banks from offering option ARMs.

A related thread is the protection of retail investors in their interaction with financial advisors, who provide planning services and may recommend investments, and with brokers, who conduct securities transactions with customers. The concern is to protect investors from fraud and conflicts of interest. A key focus of regulatory policy in this area is the standard of care imposed upon financial service providers to retail investors. Dodd-Frank orders the Securities and Exchange Commission (SEC) to study the question of whether brokers, currently subject to a "suitability" or appropriateness standard, should be held to the more stringent *fiduciary responsibility* standard governing advisors. Doing so would oblige brokers to "act solely in the client's interest." The issue is important, apart from the putative beneficiaries, to an array of industry and consumer interest groups, and state

and federal regulatory bodies, and remains open. Although insurance agents carry out similar functions, they have not figured in these discussions.

Financial Stability Another chief concern of financial regulation is financial stability. Much of Chapters 12 and 14 have been devoted to a discussion of the fragility of financial intermediaries. The risk of a financial crisis is important to firms' risk management directly, hence the focus on stress testing by risk managers and regulators. It is now all the more important because averting crises is the overt rationale of many major provisions of Dodd-Frank. Much of the concern with stability focuses on the fragility of financial intermediaries discussed in Chapter 12 and the negative externalities in financial services identified in Chapter 14. Distress of one financial institution can have destabilizing effects on others. At the extreme of these phenomena is systemic risk, the risk of financial crises. In this rationale for regulation, fragility and interconnectedness of financial firms requires the public sector to monitor and restrict their activities, and to provide some form of backstop or support in the event of distress.

The stability rationale intersects with other rationales for regulation, such as consumer protection. For example, the option ARM mortgages we described just above had a potentially destabilizing effect on the financial system: A rise in interest rates might trigger a large increase in the number of households delinquent on their mortgage payments, potentially leading to large losses for lenders and residential mortgage-backed securities (RMBS), as well as to direct negative effects on the economy. In the event, low interest rates during the subprime crisis limited the number of resets.

The stability function has two aspects, which in some countries at some times have been entrusted to separate regulatory bodies. The first, and more traditional, aspect of stability regulation is *safety and soundness* or *prudential supervision*, the responsibility for authorizing and supervising specific financial institutions. The second, newer, aspect is overall monitoring and preservation of financial stability and systemic risk, occasionally described as *macroprudential supervision*. Dodd-Frank ordained the creation of a *Financial Stability Oversight Council* (FSOC), drawn from regulatory authorities and the Federal Reserve, to identify crisis risks and guide systemic risk policy. These two aspects are closely related: Systemic risk is related to the extent and interaction of risk taking by individual market participants, while the perils to any specific firm can only be correctly identified in the context of the externalities generated by the behavior of other intermediaries. A major challenge in financial stability policies, however, is the lack to date of a clear definition of systemic risk, with different approaches emphasizing the possibility of large shocks, the web of credit relationships, or contagion.

Efficiency and Growth Financial services present substantial economies of scale and scope. In consequence, intermediaries themselves, payment and clearing systems, and securities and derivatives exchanges are often large firms or organizations. This raises issues of the microeconomic efficiency of the financial system similar to those raised by public utilities such as the antitrust and competitive implications of natural monopolies or oligopolies. Competitive issues also arise with regard to international capital standards, and were in fact the main initial impetus, in the 1970s, to their formulation. They remain a source of contention today.

Economic growth is not a primary motivation for regulation, but is often a background consideration, and sometimes a constraint. Regulation is often at odds with economic efficiency, or framed as being so. An example from the ongoing debates on financial reform also arises in the context of regulatory capital standards. The banking industry, and at least some public officials and economists, have put forward the view that higher capital requirements raise the cost of capital to banks, and that this higher cost finds its way into loan rates and constrains "credit availability." We return to this highly charged debate later in this chapter.

15.1.2 Regulatory Authorities

The organization of regulatory authority has important consequences for the financial system. In the United States, the regulatory framework is highly fragmented along functional, industry, and regional dimensions. Major changes in the distribution of responsibility are taking place in the wake of the subprime crisis, though not in the direction of simplicity of regulatory structure.

International and National Authorities In a world of highly integrated capital markets, shocks to domestic financial stability can arise in other jurisdictions. Therefore, while only the national and provincial authorities of a country can impose regulations with legal teeth, in key areas, such as capital, risk management, and accounting standards, they do so under heavy guidance from international organizations. Increasing efforts have been made since the late 1970s to coordinate or "harmonize" financial regulation internationally, particularly capital requirements, because the competitive implications are so immediate. But a number of other important cross-border issues became prominent during the subprime crisis. Two examples are:

- Financial intermediaries domiciled in a foreign country can have local subsidiaries or branches, and dense interconnectedness with domestic financial institutions. Domestic financial authorities may then feel obliged

to provide various forms of support for the foreign intermediary, even though some part of the benefit goes to its foreign owners, counterparties, and lenders. These benefits are both direct and akin to subsidies, and indirect, via enhanced financial stability.

- Domestic governments are ultimately responsible for the obligations of deposit insurance schemes to depositors at banks in their jurisdictions, but many of the depositors may be foreign nationals. We look at one extreme episode of this kind, the Icelandic banking crisis, later in this chapter.

Several international organizations have an important, if not legally binding, role in formulating regulatory policy in developed countries. Examples include:

Bank for International Settlements. The BIS, founded in 1930, and located in Basel, is the most important. It carries out banking functions for central banks and provides support for the Basel Committee on Banking Supervision, which has over the past 35 years developed the framework for bank regulation, and particularly regulatory capital standards, adopted by developed countries. The BIS hosts the Financial Stability Board (FSB), an assembly of central bank and finance ministries focusing on a range of institutional and supervisory issues. The Senior Supervisors Group (2009b), cited in Chapters 12 and 14, is organized by the FSB.

International Organization of Securities Commissions (IOSCO) plays a similar role to the BIS for securities regulators. It issues recommendations and standards for the supervision of securities markets and firms.

European Banking Authority (EBA) coordinates activities among European bank regulators. It was established in 2010 as the successor to the Committee of European Banking Supervisors (CEBS) to harmonize banking regulation within the European Union (EU). It has, among other activities, coordinated the EU supervisory stress tests carried out in 2010 and 2011.

Type of Responsibility In some countries, prudential supervision of banks is carried out by the central bank, while in others, it is entrusted to a separate regulatory body. The reasons for the institutional arrangements in specific countries are largely historical. In the United States, prudential supervision is carried out by both the Federal Reserve and a range of federal and state regulators, depending on the type of intermediary. In the United Kingdom, responsibility for bank supervision was separated from the central bank and

placed with a newly created body, the Financial Services Authority (FSA), in 1997. Under current legislation, bank supervision, but not consumer protection responsibilities, will return to the Bank of England in 2012.

An argument advanced for separating prudential supervision from both monetary policy and overall systemic risk monitoring is the potential for conflicts of interest. Central banks, it is said, are overly inclined to provide liquidity or capital support, or to exercise *regulatory forbearance* with respect to large but weak institutions. An important argument in favor of combining these functions in the central bank is that timely and complete supervisory information is required to effectively carry out both the central bank's overall systemic risk monitoring and monetary policy.

Consumer protection has in most industrial countries been part of the overall responsibilities of the bank and securities regulators. In the wake of the subprime crisis, the trend is to separate these functions. In the United States, Dodd-Frank places it, as well as oversight of retail financial products, with a newly created Consumer Financial Protection Bureau (CFPB), though supervision of investment services to retail customers remains in large part with the SEC. A similar separation of responsibility is to take place in the United Kingdom alongside the return of bank supervision responsibility to the central bank.

Type of Firm Supervised Banks, broker-dealers, investment companies, insurance companies, securities exchanges, financial advisors, mortgage lenders, credit card companies, and other consumer lenders have different regulatory authorities in most countries, and most firms have several regulators.

For historical reasons, the U.S. regulatory system distinguishes more deeply between banks and other financial institutions than other national systems do. But a number of other countries have a distinct regulatory authority for broker-dealers similar to the SEC in the United States, and insurance is generally regulated separately. Contrary to expectations, Dodd-Frank did not appreciably simplify the U.S. regulatory structure. Even just in one country, the United States, and for one type of firm, banks, there are several important distinctions that determine which of many regulators have responsibility for a particular firm:

Charter or form of authorization. There has rarely been free entry into the banking industry. Banks must have a charter, an archaic word for license, that permits them to conduct banking business, in particular taking deposits from the general public. *State banks* are chartered by a state banking authority. *National banks* are chartered by the Office of the Comptroller of the Currency (OCC), an agency of the U.S. Treasury.

Form of organization. Banks can be standalone institutions, but large and midsize banks are likely to be subsidiaries of *bank holding companies* (BHCs), which can own one or several banks. Since 1999, under the Gramm-Leach-Bliley Act, financial firms have been able to organize themselves into *financial holding companies* (FHC), which can own brokerage and insurance subsidiaries. Most very large U.S.-domiciled banks are subsidiaries of FHCs.

Federal Reserve membership. Member banks of the Federal Reserve system are required to hold a certain level of reserves in the form of deposits with a Fed district bank. Until the subprime crisis, these reserves did not earn interest. In return, member banks are able to borrow from the Federal Reserve. National banks are all members. State banks become members if they choose and are eligible to do so.

Primary regulator. The OCC is the main regulator of the national banks. State banks are regulated by the state banking authority under which they are chartered. The Federal Reserve is the main regulator for all bank and financial holding companies. Most banks are regulated by several entities. U.S. subsidiaries of foreign banks may, in addition, be regulated by their home-country bank regulator, and vice versa.

Securities markets and securities firms. Apart from the SEC, securities markets have a system of self-regulation through certain quasi-public bodies, most important of which is the National Association of Securities Dealers (NASD).

Some regulation governs firms, regulated by opening their activities and records to inspection, restricting their activities, or obliging them to take certain actions as a condition of doing business. But much regulation governs securities or markets and the process of issuing or trading them. Such regulation is also concerned with market functioning, the ability of markets to clear through smooth price adjustment and without disruption. An important example of regulations on issuance are disclosure requirements for securities to be offered to the general public, discussed in Chapter 1. An example of regulation of trading is the so-called *uptick rule*, which permits short sales of an equity only after an increase in its price has been observed.

The historical accident of dispersion of regulatory authority among different supervisors is frequently criticized. Many critics call for *functional supervision*, which would see a single regulator responsible for supervision of a given set of activities. For example, securities activities would be supervised by the same public body, regardless of whether carried out by banks, broker-dealer, or insurance company. Under Dodd-Frank, the Federal Reserve is charged with regulating so-called Systemically Important Financial

Institutions (SIFIs), regardless of whether they are banks, introducing an additional element of functional regulation into the U.S. framework.

In the United States, some regulatory bodies, such as the Commodities Futures Trading Commission (CFTC), are primarily concerned with the regulation of trading, rather than specific firms. The Securities Exchange Commission (SEC) regulates certain types of firms, for example, broker-dealers and investment companies, but also securities issuance, dealing, and markets. Some supervision is carried out by private-sector firms and organizations, called self-regulatory organization (SROs). Examples include securities exchanges and the supervision of smaller brokers and advisors. The Federal Reserve is responsible mainly for regulating banks, but also for regulating markets, such as those for government securities, which are crucial to the safety and soundness of banks, to monetary and foreign exchange operations, or to its banking services for the U.S. government. In its market and bank regulatory capacity, the Federal Reserve has become involved in issues such as bank liquidity and capital standards, the oversight of CDS markets, and tri-party repo.

15.2 METHODS OF REGULATION

There are several regulatory approaches to mitigating risks to financial institutions. We will discuss these techniques in two parts. In this section, we summarize regulation in normal times, while in the next, we review policies to promote financial stability, and to avert or combat crises when they occur. The first, a more well-established toolkit sometimes referred to as *safety and soundness regulation*, focuses on individual financial firms. The techniques are also sometimes termed *microprudential supervision*, to distinguish it from macroprudential supervision, which focuses on the stability of the financial system as a whole. The second set encompasses tools that are deployed far less frequently, and are the subject of intense debate in the wake of the subprime crisis.

The two sets of tools have the same policy goals outlined earlier, the preservation or restoration of financial stability and market functioning, and they are closely related. Microprudential policy can have a large impact on the likelihood of crises and how they unfold, for example, by keeping supervisors informed about financial firms' vulnerabilities, by inhibiting panic. Public policy actions in crises can influence the behavior of intermediaries in normal times, for example through its impact on policy credibility, or by increasing moral hazard. There is, finally, a close relationship between the conduct of regulatory and monetary policies.

15.2.1 Deposit Insurance

Public deposit insurance is a guarantee by the government that bank deposits, up to some maximum amount, can be redeemed at par. Federal deposit insurance was introduced in the United States in 1933 and is administered by the Federal Deposit Insurance Corporation (FDIC). The key rationales for deposit insurance are, first, to prevent bank runs, and second, to provide a safe investment vehicle to small savers, who are presumed unable to identify prudently-run banks and may be enticed by high interest rates. In its first, financial stability motivation, deposit insurance operates by eliminating the "first-come first-served" incentive; if depositors do not have reason to fear that they will lose part or all of their deposits by delaying redemption, the panic will likely not begin at all.

Deposit insurance, however, also has certain drawbacks:

- Deposits and short-term debt generally can strengthen the monitoring and discipline over borrowers exercised by banks. Deposit insurance reduces due diligence by depositors. If depositors will be made whole by the public insurance fund, they have less incentive to monitor.
- Deposit insurance increases moral hazard by, in essence, writing a put option on the bank's investments. As a result, bankers have an incentive to increase the riskiness of investments, since the losses are borne in part by the public.

  The utility of bank deposits is increased by the insurance, reducing the interest rate that must be offered in order to attract a given volume of deposits. The lower interest rate required on insured deposits increases the net interest margin banks can earn on investments made with insured deposits, increasing the value of the deposit insurance put.

Deposit insurance thus presents a policy tradeoff. If banks' ability to attract insured deposits is not restricted, they may take in a large volume of insured deposits, generating the potential for crises if losses are realized that exhaust banks' capital. The U.S. savings and loan crisis of the mid-1980s is a case in point. The roots of the S&L crisis dated back to the 1960s and 1970s, when changes in interest rates and deposit interest-rate ceilings generated both losses and a decline in business volume. In the early 1980s, deposit rate ceilings (as described in Chapter 1), were lifted, deposit insurance limits were increased, attracting wholesale deposits to S&Ls, and regulatory restrictions on permissible investments were loosened. These changes, together with a thinned-out capital base, created a near-the-money call option-like payoff profile for S&L owners, well-characterized by the Merton model described in Chapter 6. S&Ls were thus provided with incentives to engage in riskier

investments, with the owners positioned to reap the gains and the deposit insurance fund bearing much of the risk of loss.

Another example of the pitfalls of deposit insurance is the collapse of the Icelandic banking system in October 2008 as the subprime crisis grew in severity. Landsbanki, an Icelandic bank, operated an Internet banking subsidiary called Icesave, which gathered insured deposits domestically and in other European countries by offering above-market interest rates. The deposit rates it offered were still lower than the rates it would have had to pay in the capital markets. Since not only Landesbanki, but most other Icelandic banks failed simultaneously, the deposit insurance fund was inadequate to meet its obligations to depositors. It remains in dispute whether the Icelandic government alone or also the governments of the depositors' home countries will be obliged to make up any eventual shortfall. This episode illustrates both the incentives to risk taking generated by deposit insurance and the difficulties of international coordination of financial regulation.

To mitigate these risks, deposit insurance can be limited in several ways:

- The amount of deposits insured can be capped by bank account, by household, or by depository institution. U.S. deposit insurance is limited by account, following an increase mandated by Dodd-Frank, to $250,000. Households can, however, own an unlimited amount of insured deposits by holding multiple accounts at different depository institutions. There is, moreover, a tendency for depositors in failed banks to be repaid above the statutory limit, so it is possible that the limits are not perceived as economically meaningful. For example, the increased Dodd-Frank limit was made retroactive so as to apply to depositors of IndyMac and other banks that had failed earlier in the subprime crisis.
- Fees can be assessed on deposit insurance. FDIC-insured banks are assessed a fee related to the volume of insured deposits and to the size of a reserve, out of which insured depositors in failed banks are made whole. A disadvantage of this approach is that fee assessments rise during crises, when the deposit insurance fund is depleted, but banks are weaker and ill-positioned for a fee increase. While fees themselves may reduce incentives to risk-shifting, collecting these fees in an insurance reserve fund may increase them.
- The deposit insurance fee can be related to the risk of the depository institution. The U.S. deposit insurance scheme charges differential fees to participating banks depending on their supervisory risk ratings (see below). Leverage and capital have been among the key criteria used to determine how risky a bank is and therefore how high a fee it will be charged for deposit insurance. Recently, as mandated by the Dodd-Frank Act, the fee has been related more directly to risk by making it a

function of banks' total assets less common equity, rather than of just one form of debt, deposits.

A fee related only to the banks' own risks, however, does not address the externalities in banks' risk-taking that we identified in Chapters 12 and 14. Deposit insurance fees that exceed expected losses have therefore been proposed. Economically, such charges are tantamount to systemic risk charges, to be discussed below.

- It has been argued that in the presence of deposit insurance, some bank activities must be restricted or prohibited outright, particularly *proprietary trading*, or trading by intermediaries with their own capital and for their own account. Such rules can be difficult to implement, since proprietary trades can be difficult to distinguish from market making and from trades on behalf of customers, and because banks routinely hold investment positions as part of their liquidity risk management. Dodd-Frank places new limits on banks' proprietary trading and on their involvement with hedge funds as a share of a bank's capital. These provisions, under the rubric "Volcker Rule," like many other parts of the law, are as yet unspecified and are to be implemented via rule-making. A simple alternative that has been proposed in the past is to require depository institutions to match insured deposits with a dedicated asset position consisting of an equal amount of risk-free bonds.

If, on the other hand, deposit insurance is restricted by these and other methods, disintermediation may reduce the size of the bank sector and accelerate non-bank intermediation, particularly if non-bank intermediaries such as money-market mutual funds (MMMFs) are viewed as enjoying implicit guarantees. Policy makers have generally been uncomfortable with a potential further shift in the center of gravity of intermediation away from banks on financial stability grounds.

15.2.2 Capital Standards

Like deposit insurance, regulatory capital standards are an element of both microprudential and macroprudential supervision. The rationale for regulatory capital standards is that market discipline is inadequate to prevent individual banks and the banking system from taking excessive risk and leverage. The fragility of banking and "information intensiveness," the opaqueness of the quality of a bank's loans and of its skill in monitoring loans and collecting payments, in this view, require regulatory standards for the amount and composition of bank capital. This need is particularly urgent in the presence of deposit insurance and other mechanisms to inhibit bank runs that generate moral hazard, leading to riskier assets and higher leverage. Capital

standards are therefore closely related to other elements, and pitfalls, of the regulatory regime.

Capital adequacy of financial intermediaries has come into the forefront of regulatory policy since the formation in 1974 of the Basel Committee on Banking Supervision. Its initial focus was on the international harmonization of capital standards, and grew out of concern that, as the cross-border activities of larger banks grew, national supervisors would come under pressure to impose weak capital standards on—and thus provide a competitive advantage to—their own banks. Thus the effort that eventually culminated in the Basel Capital Accord (1988) has had both an efficiency and a prudential regulation aspect. Basel's focus has been on guaranteeing adequacy of the equity and equity-like capital of banks. The international competitive issues that drove the Basel process at its initiation remain important, as countries whose banks are relatively well-capitalized tend to seek higher capital standards, and countries whose banks are dependent on particular forms of financing seek to have them recognized as regulatory capital.

The original Basel Accord has been amended frequently. The Basel Committee's practice has been to carry out its work in the public eye, publishing consultative and technical papers and absorbing comment on potential capital regulations well in advance of any major changes. A major overhaul called Basel II was announced in 2004, though most of its elements were presented in detail as they were developed over the preceding years. Partly in response to the subprime crisis, another major revision, Basel III, is well advanced, and will substantially increase regulatory capital requirements. A regulatory "leverage ratio," a simple measure based on the size of a bank's balance sheet, putting a floor under regulatory capital ratios, is also under discussion. Finally, regulatory liquidity ratios, which would go beyond capital standards, are contemplated.[1]

The Basel Committee sets standards, but national legislation and regulation put them into legal effect. The Basel I capital standards have been adopted by the U.S. banking authorities and are enshrined in the appendices to Title 12, ¶3 and ¶225 of the Code of Federal Regulations. In jurisdictions within the European Union, all banks have been following Basel II since the beginning of 2008. In the United States, rule-making and other efforts to move to Basel II are underway. Dodd-Frank also contains provisions calling for higher minimum capital ratios, and affecting the use of securities other than common equity as capital.

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[1]The current proposal was announced in September 2010. The press release outlining it is available at http://www.bis.org/press/p100912.pdf. References to the detailed proposals are at the end of this chapter.

The current Basel Committee framework requires three elements, referred to as "pillars":

1. Minimum capital requirements
2. Supervision of banks
3. Disclosure, leading to stronger market discipline

The most important of these from the risk management standpoint are regulatory capital requirements, which encompass

Definition of capital. The notion of capital underpinning regulatory capital standards, as a buffer against insolvency, is similar to the risk capital concept of Chapter 13. While capital can take a plethora of forms, including common equity, accounting reserves, and other, more debt-like liabilities, common equity is recognized as the most effective loss buffer, but is also the highest-cost type of capital within a given capital structure. Supervisors only want to recognize lower-cost debt as regulatory capital if it is hard to withdraw and is likely to actually take a loss before more senior debt, so Basel III and emerging national standards will restrict the role of certain forms of debt in the regulatory capital mix.

Minimum capital requirements had been set by Basel II at 8 percent of assets (corresponding to leverage of 12.5) in most cases. In the late 1980s, this represented a large increase for most banks in G-10 countries. This level is now seen as inadequate by most observers and will be substantially increased under the new Basel III standard. Some national standards may increase capital ratios further. It has been noted that at one time, bank capital ratios were far higher than the sub-10 percent levels generally seen today, so that even a drastic increase can be viewed as a return to normalcy. U.S. and U.K. banks had capital ratios on the order of 50 percent in the mid-nineteenth century. Capital ratios declined steadily, to about their current levels, up to the end of World War II. The subsequent gentle rise is a but small fluctuation against the longer-term historical decline.

Risk haircuts for assets determine the answer to the question, 8 percent of what? In the Basel approach, regulatory minimum capital is set as a fraction of *risk-weighted assets*, rather than of gross balance sheet assets. Assets with higher risk, such as lending to riskier borrowers, have higher weights, while assets with putatively low risk, such as developed-country bonds, have lower weights. The capital charge is then applied to the total. This has been among the more technically

complex parts of the effort. As a simple example, if a bank has $1 billion in assets with a risk weight of 50 percent and $1 billion in assets with a risk weight of 100 percent, its total risk-weighted assets are $1.5 billion. A capital charge of 8 percent of risk-weighted assets would require it to hold a regulatory minimum of $120 million of capital.

Accurate assignment of risk weights is crucial if the capital standards are to provide meaningful constraints on risk-taking. There have been fewer changes under Basel III to the risk-weighting element of the capital standards than to the composition of capital. As we see later in this chapter, the definition of risk-weighted assets played a role in encouraging the development of SIVs and ABCP conduits that proved so damaging during the subprime crisis. Moreover, international differences in the way risk-weighted assets are computed may render international comparisons of banks' capital ratios more difficult.

The Accord permits two approaches to determining the risk haircuts for each of the three risk types, market, credit and operational risk:

- *The standard approach* applies a fixed risk-based haircut to each security type to arrive at total risk-weighted assets.
- *The internal model approach* permits a bank to compute its risk capital using its own models, such as Value-at-Risk (VaR), providing greater recognition of the portfolio context. The bank supervisor is then responsible for vetting the quality of the models. The internal models approach is very different for credit, counterparty credit, and market risk, as we will see in a moment. There are also gradations within the internal model approach, permitting reliance on internal models for fewer or more elements of the risk analysis, depending on the modeling capacity of the bank.

The Accord focuses on three major risk categories:

1. *Credit risk* is considered by regulators to be the quantitatively most important type of risk, and was first to be covered by Basel I. It includes traditional business lending, portfolios of securities, and counterparty risk.
2. *Market risk* includes risk from fluctuations in generic risk factors and "specific" or idiosyncratic risk. As we have seen in Chapter 1, at one time banks were involved primarily in business and real estate lending, and were little exposed to market risk. The emphasis on market risk has grown along with banks' trading activities, and Basel I coverage

was first introduced as a 1993 "Amendment" to the credit risk-focused original Accord of 1988.

3. *Operational risk* is concerned primarily with technology and internal processes in banks. Required capital to support operational risk was introduced as part of Basel II.

Composition of Regulatory Capital Capital standards have two sides, like a bank's balance sheet. The asset side of the bank's balance sheet determines how much capital a bank is required to hold. The liability side reflects what type of capital the bank holds. Banks can be undercapitalized even if they hold enough capital in aggregate, if too much of that capital is of the debt-like, "weak" types. The Basel II capital standards stipulate that, of the 8 percent minimum capital, at least 4 percent must be of stronger types such as common equity. This stronger portion of capital is called *Tier I capital*, while the weaker portion is called *Tier II capital*. Because Tier I is expected to absorb losses as long as the firm is solvent, it is also called *going-concern capital*, while Tier II is expected to buffer losses to bondholders in the event of insolvency, hence the term *gone-concern capital*. Basel III shifts the composition toward Tier I, and within Tier I, toward the stronger types of capital.

The main components of the higher-quality Tier I capital are common equity, noncumulative perpetual preferred shares, and retained earnings, all of which are directly exposed to losses in asset value, in that they are junior to all other forms of capital. Common and preferred dividends can be suspended without triggering default.

Even within Tier I, however, there are gradations, with *core capital*, which includes common equity and retained earnings, the strongest form. Much effort has gone into ascertaining whether a particular type of security has enough equity-like characteristics to merit inclusion in Tier I capital. It must share in the essential property of equity, that it absorb losses before and thus genuinely stand in front of other liability-side positions when the firm has losses. *Trust preferred securities*, which permit bank holding companies (BHCs) to issue an equity-like security, but with tax-deductible dividends, are an example of a form of Tier I capital whose loss absorbency has been called into question and whose role will therefore be reduced under Dodd-Frank (the so-called "Collins Amendment") as well as Basel III.

During the subprime crisis, both the market and supervisors began to regard the Tier I capital concept with wariness. Concerns were raised about whether certain components, such as deferred tax assets, goodwill—the value of an acquired firm in excess of its book value—and preferred shares provided a buffer against loss that creditors could rely on. Deferred tax assets, for example, can't be used unless there are profits against which they can

be offset. They focused attention instead on a narrower capital concept, *tangible common equity* (TCE), equal to the value of common equity, excluding such intangible items, but including retained earnings. In early 2009, some banks sought to convert preferred into common stock in order to increase TCE with no impact on Tier I. The U.S.-conducted "stress tests," discussed in Chapter 11, also focused on TCE as a measure of capital adequacy.

These events represented both an evolution in the definition of regulatory capital and a sharper distinction by market participants between economic and regulatory capital than they had typically made in normal times. The Basel III standards are to set the minimum for Tier I capital to 6 percent of risk-weighted assets. Within Tier I, Basel III defines Common Equity Tier I, a similar concept to TCE in its exclusion of goodwill and other intangibles, and sets its regulatory minimum to 4.5 percent.

Tier II is a more heterogenous category than Tier I. Its main components are loan loss reserves, cumulative nonperpetual preferred shares, subordinated debt and *hybrid capital*, or securities possessing characteristics of both equity and debt. They are debt-like in paying dividends at a fixed rate, but equity-like in that the dividends can be deferred indefinitely.

The impact of different types of bank capital instruments on market discipline has been an important aspect of the debate about the composition of regulatory capital. The issue has grown more acute with the perception that public policy has introduced additional moral hazard into the banking system. In particular, the market discipline exercised by creditors is weakened if they view a bank as systemically important or too-big-to-fail, terms of art for institutions that are likely to receive liquidity and possibly even capital support in a financial crisis. If the banks are felt to be exposed primarily to systematic rather than idiosyncratic risk, it is then rational for creditors to lend to them at a credit spread that doesn't fully reflect the bank's expected default loss. It has been argued that requiring a bank's capital structure to include subordinated debt helps enforce market discipline on banks. More generally, the heterogeneity of Tier I and II under Basel II proved problematic during the subrime crisis. As we'll see in our discussion of the use of subordinated debt to enhance market discipline, there was some confusion and ambiguity in the market as to where supervisors would draw the line between liabilities to be protected against loss and those to be written down, and the line did not always appear to coincide with the regulatory definition of capital. Tier II was meant to cease paying dividends, absorb losses and behave like equity during a period of financial stress. In many cases, however, supervisors concerned about provoking panic among banks' bondholders treated Tier II securities more like debt and shielded them from loss. Basel III attempts to address the problem of the heterogeneity of capital, particularly across countries.

Regulatory Capital for Credit Risk The original Basel I capital standards put forward a simple approach to computing risk-weighted assets. It encompassed only a standard approach, in which five categories of risk were defined. The categories imposed haircuts between zero, for cash and developed-country sovereign debt, and 100 percent, for most unsecured commercial and real estate loans. The challenge of off-balance-sheet items was recognized even at this early stage. Undrawn but longer-term commitments such as revolving loans and guarantees had a risk weight of 50 percent.

Basel II permits banks to use internal models rather than the fixed-weight standard approach, and introduced rules covering a wider range of financial instruments, in far more detail. It uses credit rating agencies' ratings as a criterion for establishing risk weights. The framework has been left largely intact by Basel III, apart from the treatment of counterparty risk, as we will see in a moment.

The broad conceptual framework of the internal model approach for credit risk is similar to that of the single-factor model we applied to credit portfolios in Chapter 8. The overall level of risk capital is set by imposing a confidence level of 99.9 percent, equivalent, in the single-factor model, to setting the market risk factor to −3.09. It permits banks to estimate using internal models, or otherwise identify, four key parameters of credit risk for each exposure:

1. The probability of default
2. The size of the exposure at the time of default
3. Loss given default
4. The maturity of the exposure

The internal model approach also contains guidelines for taking portfolio effects, that is, default correlation, into account, by relating them to the probability of default. Higher default probabilities are associated with lower correlations, consistent with the Gaussian approach we laid out in Chapters 8, 9, and 11. The approach is subject to some of the same criticisms cited in those chapters, particularly that portfolio credit risk estimates using the model are highly sensitive to a default correlation that is very difficult to estimate.

An innovation of Basel II was to recognize credit-risk mitigants such as credit default swaps and other derivatives. This, however, introduced the necessity of accounting for counterparty risk, treated in Basel II under the rubric "double-default risk." Some banks had material losses when marking to market hedges provided by firms experiencing spread widening or downgrades. Basel III considerably tightens the standards for capitalizing counterparty risk by introducing a capital charge for mark-to-market fluctuation in the counterparty valuation adjustment (CVA), discussed in

Chapter 6. It also encourages banks to use centralized clearing—in essence, exchange-traded CDS—by excluding them from the CVA capital charge. This affects banks that hedge counterparty risk using derivatives or other securities subject to market risk, for example, a bank hedging an exposure to structured credit products by buying CDS protection on the bonds as well as CDS protection on the counterparty in the structured product CDS. If the hedge evidences "wrong-way risk," that is, a high correlation between credit losses on the structured product and the protection seller, the capital charge is increased.

Finally, Basel II contained detailed provisions for securitization and other mechanisms for removing assets from bank balance sheets while retaining an economic interest in the performance of the assets. Some effects of Basel II, such as favorable treatment for securitized credit products with investment-grade ratings, have been highlighted by the subprime crisis; Basel III has increased capital requirements for these securities.

Regulatory Capital for Market Risk Trading risk as well as traditional lending risk need to be supported by risk capital. The Basel approach requires banks to divide exposures into two portfolios:

1. *The trading book* includes relatively liquid exposures held for a relatively short time. These exposures are covered by the Market Risk Amendment. For the most part, they generate lower capital charges, but it is expected that they will be marked-to-market.

   The trading book consists predominantly of securities, foreign exchange, listed equities, exchange-traded derivatives, and more standard OTC derivatives such as forwards and swaps. The Basel approach makes it possible to apply VaR in measuring trading book capital charges.

   This category roughly coincides with the accounting classification of securities as *trading securities* or as *available-for-sale securities*. These two classes, under U.S. accounting standards, must be marked-to-market on the financial intermediary's balance sheet.
2. *The banking book* includes exposures that are expected to be held to maturity. For the most part, banking book exposures receive higher capital charges, but it is not expected that they will be marked-to-market. Banking book exposures are generally not subject to a market risk capital charge, but under Basel III, certain exposures, particularly securitizations, cannot be subject to lower capital charges in the banking book than in the trading book. These changes are part of Basel III's effort to eradicate regulatory arbitrage between trading and banking book capital treatment, or the "trading book loophole."

   The banking book consists mainly of whole loans to individuals and businesses. As long as the loans are performing, that is, principal and

interest are being paid on time, there is generally no requirement to alter their balance sheet valuation to reflect market conditions, or possible changes in their creditworthiness. The banking book, to the extent that it consists of securities rather than loans, roughly coincides with the accounting classification of securities as *held-to-maturity securities*.

Banks may be permitted to use VaR as the basis for calculating required capital for the trading book. This internal model approach is open to banks that can meet criteria related both to model accuracy and the firm's organizational ability to prudently run a model-oriented risk management process. The user-defined parameters (see Chapter 3) are set at

- Confidence level: 99 percent
- Time horizon: 10 days

Banks can choose any mode of computation for VaR, parametric, Monte Carlo, or historical simulation, but must use a minimum of one year of market data in generating simulations or estimating parameters. The data set must be updated at least quarterly.

The VaR measure used for determining regulatory capital is the higher of the average of the past 60 days' VaR estimate, or the prior day's. If the bank uses the average internally computed VaR, it is multiplied by a scalar k between 3 and 4 that depends on the backtest accuracy of the VaR model (see Chapter 11).

If the bank's internal VaR model does not capture specific risk, an additional risk capital requirement is imposed. "Specific risk" is a term Basel uses to cover idiosyncratic, event, default, and other short-term risks of large returns that are not well-captured by generic risk factors. Basel III has also added an *incremental risk capital charge* to cover such issues as tail risk, credit migration risk, and liquidity, and has increased required capital for securitization positions in the trading book.

Under Basel III, the VaR calculation is to incorporate a stress testing element by including a VaR calculation based (in general) on a historical stress period. This *stressed VaR* is to be added to the "normal" VaR and the specific risk charge to compute the minimum required capital for market risk. The overall formula is:

$$\begin{aligned}&\text{market risk capital}_t\\ &= \max\left[k\frac{1}{60}\sum_{t=1}^{60}\text{VaR}_{t-\tau}\left(0.99, \frac{10}{252}\right)(x_\tau), \text{VaR}_t\left(0.99, \frac{10}{252}\right)(x_t)\right]\\ &\quad + \text{stressed VaR}_t + \text{charge for specific risk}_t\end{aligned}$$

Procyclicality of Capital Standards Capital requirements are meant to enhance bank stability. But they may have a perverse unintended effect if capital requirements tend to be low during expansionary periods and high during contractions and crises. The potential for capital requirements to decline and leverage to increase during booms and vice versa is called procyclicality, the same term used in current discussions to describe the propensity of the entire financial system toward boom and bust cycles. The phenomenon is similar to the potential for VaR estimates to increase with higher volatility, one of the self-reinforcing mechanisms in crises described in Chapter 14. The effects are also similar: Capital may act as an additional constraint on bank lending at times when banks are already seeking to reduce leverage and increase liquidity, because they fear higher loan losses and greater difficulty rolling over short-term funding.

The current Basel III proposal calls for a countercyclical capital charge of up to 2.5 percent, to be composed entirely of common equity. The magnitude of the charge is to be determined by the national banking authorities within each country based on their assessment of whether credit expansion is excessive and systemic risks are building up. Internationally active banks are subject to a countercyclical capital charge that is a weighted average of the charges in the jurisdictions in which they operate. In addition, Basel III calls for a *capital conservation buffer*, an additional 2.5 percent capital requirement over the minimum. When capital falls below the minimum plus the buffer, banks are not required to raise capital immediately, but are obliged to restrict dividends and retain earnings to rebuild the buffer over time.

A particular security type, *contingent capital* (or "CoCos"), has been proposed as a means of introducing greater market discipline into bank capital structures. Contingent capital is a form of subordinated debt that converts into equity or hybrid capital when a certain trigger, such as a Tier I capital ratio, is breached. The appeal of this type of security to regulators is that requiring contingent capital to be issued imposes a market test on the issuer at the time of issuance, and sustains capital ratios automatically in times of stress. It is anticyclical, since it would increase capital and decrease debt in a downturn. Contingent capital's appeal to issuers is that it might have a lower cost of capital than common equity, and would retain the tax advantages of debt. Some national authorities, for example Switzerland's, are contemplating its use as part of an aggressive countercyclical capital charge that goes beyond that of Basel III.

Difficulties arise, however, in designing a security that has clear and unambiguously defined triggers. Ex ante uncertainty about the conversion to common stock reduces the effectiveness of the security. Also, in a way not dissimilar to the effect of hedging strategies on asset prices discussed

in the previous chapter, investors could sell a bank's equity short to hedge the risk of conversion if the trigger is approached. By making the trigger event likelier, hedging would generate volatility and thus act pro-, rather than anticyclically. These uncertainties could rob contingent capital of any potential funding cost advantage over common equity. Critics of the proposal also note that, while conversion would add to the buffer against loss, it does not infuse any additional cash into the firm. Later in this chapter, we will discuss another type of security, subordinated debt, that some observers have proposed making a mandatory element of banks' capital structures.

Capital Standards and Reserve Requirements Regulatory capital standards are one way in which regulation directly imposes certain ratios on banks' balance sheets. Another important set of rules are *reserve requirements*. They are similar to regulatory capital rules in that they impose limits on the asset side of the bank's balance sheet relative to certain liability-side accounts, but are more narrowly focused. Reserve requirements oblige banks to hold reserves, in the form of deposits with the central bank or other form of central bank money such as vault cash, in a minimum ratio to deposits. Reserve requirements serve two main functions:

1. They are imposed in order to control the money supply, of which the public's deposit accounts with commercial banks are the largest component, and thus play a role in monetary policy.
2. They also play a role in the regulation of risk-taking by banks. They protect insured deposits and limit banks' risk-taking activities.

The rationale for reserve requirements has evolved and their importance has diminished in most advanced countries over time. Early in the twentieth century—the Federal Reserve System was established in 1913—reserve requirements were viewed as a safeguard of bank liquidity and a means of preventing bank runs. It could be thought of as a form of asset-liability management (ALM), aligning the maturities of at least part of the bank's balance sheet with the short maturities of its deposits. In more recent decades, however, the rationale for reserve requirements has been primarily as a monetary policy tool. Even this function has become less crucial, as, up until the subprime crisis, central banks relied on control of short-term interest rates rather than control of monetary aggregates to implement monetary stance.

Capital requirements, in contrast, oblige banks to limit their risky assets, including not only loans, but also other risky investments, relative to their equity capital. At any point in time, at least one of these constraints is binding. In economic downturns and crises, it is more likely to be capital

requirements that bind, as illustrated during the subprime crisis by the large excess reserves held by U.S. banks. Within limits, additional capital or liquidity reserves reduce both solvency and liquidity risk.

The debate on capital standards has become enmeshed with one over the cost, both to individual banks and to society, of higher equity capital requirements. Bankers, some academics, and public officials in countries with relatively highly leveraged banks have pointed out that equity capital must generally be raised at a higher prospective rate of return than debt. It is therefore to be expected that higher equity capital requirements will increase the cost of capital and thus the borrowing rates charged to customers. The result will be to restrict lending and inhibit overall economic growth. The counterarguments are that, while equity is more expensive funding than debt for any given capital structure, increasing equity lowers its risk and increases the buffer below debt liabilities, permitting banks to borrow at lower spreads, so the overall cost of bank capital will not rise. Proponents of higher bank equity have also pointed out that the higher cost of equity is due in substantial part to public subsidies to debt via the tax code, which in many countries permits banks to expense interest, but not dividends. The tax subsidy is a distortion that generates a negative externality by increasing leverage throughout the financial system.

15.2.3 Bank Examinations and Resolution

Apart from capital standards, regulators employ a wide range of tools to promote safety and soundness. A key example are bank examinations. In addition to bank examinations by a state or national supervisor such as the OCC or Federal Reserve, the Federal Reserve inspects bank and financial holding companies.

In the United States, the scope and standards of bank examinations have to some extent been harmonized across regulatory bodies through *CAMELS ratings*, so-called because they focus on

- Capital adequacy
- Asset quality
- Management and administrative ability
- Earnings level and quality
- Liquidity level
- Sensitivity to market risk

The ratings are disclosed only to the bank's management and play an important role in determining what, if any, action a bank will be required

to take to address deficiencies. Regulators have various tools for addressing serious safety and soundness issues at regulated institutions. In milder cases, these are referred to as *prompt corrective action*, and can include payment of fines or imposition of cease-and-desist orders. At the extreme is a process called *resolution*, the seizure and orderly liquidation of an institution that has failed or is likely to fail, with the goal of closing the weak institution with minimal loss and risk of damage to others.

Resolution is a difficult issue that touches on a number of others, some of which we will return to in our discussion of the Dodd-Frank approach to systemic risk below:

- Regulators can, instead or resolution, infuse capital into a failing bank temporarily if there is a material probability the firm can work through problems and survive, or can eventually be acquired by a healthier competitor. But there is considerable evidence that this route is more costly than prompt resolution.[2] Since 1991, the FDIC is mandated to pursue "least-cost resolution," that is, resolving failed banks in a way that minimizes the cost to the taxpayer.
- There is debate on the form in which the temporary continuation of the institution takes place. This stage is sometimes called a *bridge bank*, and is contemplated under Dodd-Frank, which calls for the establishment of a process by which the Treasury and the FDIC can liquidate banks and other financial companies deemed insolvent.
- Resolution can occur in ordinary bankruptcy, or as part of a special regime used only for financial institutions. At issue is whether the conventional bankruptcy process can be used for large financial firms, or is too fraught with systemic risk to be used. Uncertainty around the possibility of safely unwinding a failed bank can generate moral hazard by making regulators hesitate to shut it down. The bankruptcy of Lehman has provided arguments in favor of both bankruptcy and resolution. Dodd-Frank maintains the distinction between the financial company resolution and the bankruptcy processes.
- An alternative approach is to require systemically important intermediaries to draw up a *living will*, that is, a plan for the rapid unwinding and resolution of the firm.
- Moral hazard issues arise if creditors and/or shareholders in the failed institution do not suffer losses. This issue is related, of course, to other "safety net" issues, and to the bankruptcy regime.

[2]See U.S. Congressional Budget Office (1992) and Gupta and Misra (1999).

A similar tool of safety and soundness regulation to on-site examinations is assessment of the quality of the investment portfolios of supervised intermediaries. Since the 1930s, federal and state regulators have used credit ratings as the basis of this assessment, imposing ratings standards on the portfolios of institutional investors, such as pension funds, mutual funds, MMMFs, insurance companies, banks, broker-dealers, and others. Entry into the ratings business is restricted, in the United States and other countries, to a small number of firms. From 1975 on, the SEC has recognized the ratings of a small group of firms, called Nationally Recognized Statistical Rating Organizations (NRSROs), as acceptable for assessing the quality of credit portfolios. There were only three NRSROs—the major ratings firms—until 2003, when the SEC began to recognize new entrants; as of 2011, there are 10. Dodd-Frank calls for eradicating dependence on ratings of the federal regulatory system.

15.3 PUBLIC POLICY TOWARD FINANCIAL CRISES

The increased frequency and intensity of financial crises in the past few decades, culminating in the subprime crisis, was a surprise to many policy makers, and has led to discussion of new policy approaches to promote financial stability. In Chapter 12, we discussed the fragility of fractional-reserve banking, of intermediaries carrying out liquidity and maturity transformation, and of leveraged intermediaries. Chapter 14 discussed the channels by which crises unfold and gave a number of examples of systemic risk events. Deposit insurance, capital requirements, and other mitigants of the risks arising from the fragility of banking are not foolproof, and have risk-amplifying consequences of their own, for example by increasing moral hazard or risk-shifting. There is therefore a need to take account of financial stability and systemic risk in regulatory as well as monetary and other economic policies, through specific measures as well as a general orientation. The aim of a macroprudential policy orientation is to prevent crises, panics, failures of credit markets to function, and widespread failures of financial institutions from occurring in the first place. An additional, much less frequently applied set of policies, the *lender of last resort* function, is designed to address panics and crises once they have begun.

15.3.1 Financial Stability Policies

Financial stability policies in advance of crises is an evolving discipline that is not yet well defined. A formal mandate to pursue financial stability is

(or is on course to become) part of the legal charter of some central banks, such as the Bank of England and the European Central Bank, but not of others. As noted, these policies occupy a zone encompassing macroeconomic as well as regulatory policies.

Asset-Price Targeting One potential, but controversial, element of macroprudential policy is *asset-price targeting*. In most developed countries, monetary policies are intended in part or entirely to maintain price stability. The Federal Reserve has a dual mandate, under the Humphrey-Hawkins Full Employment Act of 1946, to maintain both high employment and price stability. In some countries, the central bank pursues formal *inflation targeting*, in which explicit goals are set for price stability, but not necessarily also for employment or economic growth. Typically, inflation targets are set in terms of the consumer price or some other broad index of final-goods prices. Like the Taylor Rule, discussed in Chapter 14, inflation targeting requires the central bank to tighten monetary policy if it believes inflation is above its desired range.

However, overly accommodative monetary policy or excessive credit creation may not always lead quickly to rising general price levels. Financial imbalances that undermine financial stability can arise without being signaled by higher inflation, as evidenced by the experience of the decade preceding the subprime crisis. Increases in asset prices, particularly long-lived ones that are more dependent on interest rates, may provide an earlier sign of excessive accommodation than rising general price levels. Monetary authorities, in addition to their existing responsibilities for macroeconomic and price stability, have therefore been asked to adopt asset-price targeting, a policy of tightening money to "pop bubbles" when asset prices generally or a specific set of asset prices increases "too fast."

Housing finance played a key role in the credit expansion preceding the subprime crisis. A frequently cited example of an asset-price bubble that might usefully have been thwarted by tighter monetary policy is therefore house prices in the United States during the prior decade. Figure 15.1 displays house prices for U.S. cities as a whole and for one particularly robust market, Las Vegas. The price peak in May 2006 can be considered one of the earliest clear warning signals of the subprime crisis. By that time, the overall index had nearly tripled over the previous 10 years. Prices in Las Vegas had risen even more rapidly during the last few years of the housing boom and were 65 percent higher in April 2006 than at the end of 2003. The increase in house prices coincided with a rapid increase in homeownership rates, a longstanding government objective. Homeownership rates rose from 64 to 69 percent between 1994 and 2006.

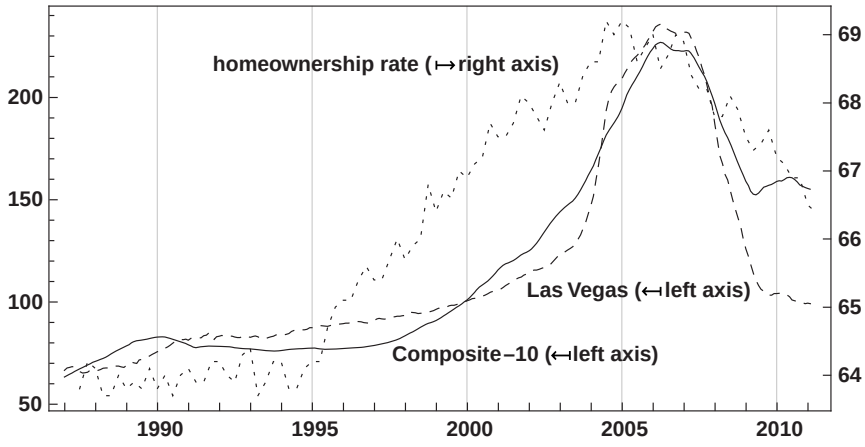

FIGURE 15.1 U.S. House Prices and Homeownership 1987–2011
The solid line plots the S&P/Case-Shiller 10-City Composite Home Price Index, a paired-sale index of house prices in 10 large U.S. Metropolitan Statistical Areas (MSAs). The dotted line plots the S&P/Case-Shiller Home Price Index for one particular MSA, Las Vegas. The dashed line (right axis) plots the U.S. Census Bureau's estimate of U.S. homeownership rates. House price data are monthly from January 1987 to February 2011; homeownership rates are quarterly from 1987 through Q1 2011.

The argument that housing prices were driven in substantial part by low interest rates, and that higher rates would have been an effective tool in addressing housing prices focuses on the incentives to leveraged housing investment. In Example 12.3 and in the discussion of the risk-taking channel of monetary policy in Chapter 14, we saw that for a given expected rate of increase in home prices, lower interest rates increase prospective returns to housing investors. Return prospects with high leverage—low down payments—are particularly attractive because of their option-like character; in most U.S. jurisdictions, the so-called non-recourse states, a homebuyer's exposure is limited to the down payment. House prices were supported by three necessary conditions: Wider availability of credit to homebuyers on increasingly generous terms, the expectation of rising home prices, and low interest rates. As long as prices continued to rise, and refinancing was available, homeowners could capture high capital gains on homes. Once prices stopped rising, returns became negative, and refinancing was no longer possible, making default more likely. There is evidence that a high proportion

of terminated but nondefaulting subprime loans were refinanced rather than repaid prior to 2007.[3]

The case against asset-price targeting is that it is difficult to identify bubbles accurately in advance. After a sharp decline in asset values, a bubble may seem blindingly obvious and the skeptics in retrospect to have been prophets. But even after some historical bubbles have burst, it has not always been clear that they were unwarranted by ex ante information on fundamentals. Central banks are therefore not well situated to determine what asset-price increases are excessive.

A second argument against asset-price targeting is that monetary policy will become less accurate and effective, and on balance too tight, if central banks lean against asset-price increases. This argument is often made in the context of formal models of optimal monetary policy. In the risk-management paradigm, discussed in the previous chapter, the central bank in considering its monetary stance against a backdrop of rising asset prices should consider the potential growth and employment costs of a sufficiently tight monetary stance to curtail the asset price rise. The alternative is letting the asset price rise run its course and addressing negative consequences if and when they materialize. The latter approach is referred to as asymmetric monetary policy, and the alternatives sometimes characterized as the "lean or clean" choice. The costs of monetary tightening are high, since it may cause a recession, and likely, if tightening would not otherwise be called for. The costs of letting a putative bubble play itself out are at best speculative.

The discussion of asset-price targeting is often rather narrowly framed, as a shift of "optimal" monetary policy stance in response to a set of specific asset prices being "too high." The crucial symptoms may rather be assets, risk spreads and options that are generally "priced for perfection," and the appropriate monetary policy response, the "lean" prescription, is a bias toward tightness within the range of parameters that are consistent with rule-oriented policy.

Countercyclical Policy Orientation The arguments against specific targets or policies around asset prices don't therefore vitiate the more general argument for a financial stability orientation of macroeconomic and regulatory policy. As with systemic risk and financial stability, there is no crisp definition of macroprudential supervision, or of countercyclical policy.

The regulatory tools discussed in the last section, such as capital standards, minimum liquidity and leverage ratios, and resolution regimes, also have a macroprudential policy purpose. Some relatively new tools, such

[3]See Demyanyk (2009).

as regulatory intervention in the compensation policies of financial firms, have also been proposed. Other tools, such as systemic risk charges, are extensions of risk capital requirements, an existing regulatory method. The discussion has included these elements:

Countercyclical monetary policy. Interest rate and monetary policy can be attentive to general financial conditions and wary of deviations from credit norms without adopting a formal scheme of asset-price targeting, and while retaining a primary orientation toward employment and the price level. This would provide a counterweight to formal and informal inflation targeting, which deemphasize financial and credit conditions. The macroeconomic models used by many central banks to guide monetary policy give only a limited role to financial conditions, posing a challenge to research on the tradeoffs and synergies of macroprudential and macroeconomic policies.

Indicators of financial stability. A countercyclical policy orientation, even if not necessarily targeting specific measures of asset prices, would be required to monitor them, as well as leverage, volatility, and risk premiums. As we saw in Chapters 12 and 14, measuring leverage, particularly the overall degree of leverage in the financial system, and identifying useful indicators of potential financial stress events in asset prices, are difficult topics of ongoing research, and far from solved. Leverage measures would ideally capture economic, rather than more evident balance-sheet leverage, and thus include the collateral markets, off-balance-sheet and derivatives-induced leverage as well. Leverage by sectors, such as households, different types of intermediaries, and nonfinancial corporations, can help identify excessive credit creation. Low volatility, measured by implied as well as realized volatility, and low risk premiums, may provide evidence that risk appetites are high, and that some market participants may be coming under "search for yield" pressure to achieve return targets.

A related potential risk to financial stability that is difficult to define, let alone measure, is that of "crowded trades," or trades attracting large amounts of capital from investors such as hedge funds that can use leverage and can readily change their portfolios. Concern has been raised about the potential for volatility if investors withdraw from "crowded trades" rapidly and has spurred interest in identifying and measuring them as part of financial stability monitoring.

Collecting and aggregating leverage and other data relevant to financial stability in a way that is meaningful for policy makers is challenging, and estimating risk premiums reliably is extraordinarily difficult. In the United States, the Financial Stability Oversight Council (FSOC) established by Dodd-Frank has been tasked with collecting data and carrying out research pertinent to financial stability.

Small items of data can be telling. Consider, for example, the observation that median loan-to-value ratios for subprime mortgage loans extended for the initial purchase of a home that became part of residential mortgage-based securities (RMBS) pools were 100 percent—that is, the homeowner had no equity in the home—in each of the years 2005, 2006, and 2007.[4]

A systemic risk regulator is tasked with overall responsibility for identifying risks to financial stability and coordinating responses among public sector entities. An agency focusing exclusively on the prevention of financial crises, working to that end with other parts of the sprawling regulatory apparatus, is intended to complement the traditional focus of bank supervision on the financial health of specific intermediaries, rather than on the stability of the system as a whole.

Identifying "systemically important" financial firms, or SIFIs, is a major focus of the post-subprime crisis regulatory restructuring effort. In the United States, it is a key task of the FSOC. In the United Kingdom, a Financial Policy Committee of the Bank of England will have overall responsibility for financial regulation and a specific focus on financial stability and macroprudential supervision, and will oversee the microprudential supervisor, the Prudential Regulatory Authority (see HM Treasury, 2011). A proposal has been adopted by the European Union for a European Systemic Risk Board with similar functions.

Systemic risk charges imposed on SIFIs are among the key financial stability policy tools currently under consideration. A variety of systemic risk charges have been proposed, generally designed as taxes, as part of the deposit insurance funding system, as an addition to minimum capital requirements, or as a time-varying addition to capital charges determined in part by overall financial conditions rather than that of the individual bank.Such charges might also vary by the

[4]See Mayer, Pence, and Sherlund (2009).

size or composition of balance sheets. The imposition of systemic risk charges is consistent with the idea that systemic risk arises from negative externalities, that is, that an intermediary taking excessive risk does not bear the full cost of its behavior. The costs can be internalized through systemic risk charges, which thereby also act as a counter to moral hazard and the too-big-to-fail problem.

Basel III incorporates a number of elements that can be considered systemic risk charges, most importantly the capital conservation buffer and countercyclical capital charge.

Macroprudential supervision is the idea, noted above, that supervision of banks and other intermediaries should take account not only of the condition of each firm in isolation, but should be carried out with regard to firms' impact on financial stability. An example is attention not only to the exposures of a particular intermediary, but also of the extent to which several intermediaries have the same type of position, which would indicate higher potential for asset price volatility, and could result in losses across firms if they attempted to exit positions simultaneously. Macroprudential supervision is closely related to the proposal for a systemic risk regulator.

As mentioned earlier in this chapter, two new tools, the leverage and liquidity ratios, have been introduced as part of the Basel III capital accord. As with capital adequacy regulation, these new rules have a microprudential function. But are also part of the macroprudential policy response to the lessons of the subprime crisis. There are two liquidity ratios:

- The *liquidity coverage ratio* requires a bank to hold unpledged liquid assets equal to a conservative estimate of the potential 30-day runoff of its short-term funding. Some controversy has been generated by the ratio, particularly by the Basel Committee's blanket acceptance of government bonds as liquid assets.
- The *net stable funding ratio* requires the bank to obtain longer-term funding for relatively illiquid assets.

The Basel III leverage ratio, finally, sets a minimum 2 percent ratio of Tier I regulatory capital to a simplified (compared to the elaborate computation of risk-weighted assets) measure of on- and off-balance sheet exposure.

While the terminology of anticyclical policy and macroprudential supervision is relatively new, the idea is not. As we saw in Chapter 14, during the Great Depression, some observers, such as Irving Fisher, were calling attention to the stability consequences of excessive credit creation. What

was new in recent decades is the disparity between the rapid pace of credit creation and its minimal effect on consumer inflation rates, and the ability of market participants to put on leverage in hard-to-discern ways.

Henry Simons, a contemporary of Fisher's who more than shared his aversion for leverage, and particularly for short-term debt, went a step further, proposing policies to gradually extinguish the use of all non-equity financing of private firms, and all non-money financing of government. His prescription is one yardstick by which to measure proposals for macroprudential supervision.

> *The danger of pervasive, synchronous, cumulative maladjustments would be minimized if there were no fixed money contracts at all—if all property were held in a residual-equity or common-stock form. With such a financial structure, no one would be in a position either to create effective money-substitutes (whether for circulation or for hoarding) or to force enterprises into wholesale efforts at liquidation. Hoarding and dishoarding (changes in velocity) would, to be sure, still occur; but the dangers of cumulative maladjustment would be minimized . . . [T]he economy becomes exposed to catastrophic disturbances as soon as short-term borrowing develops on a large scale. No real stability of production and employment is possible when short-term lenders are continuously in a position to demand conversion of their investments, amounting in the aggregate to a large multiple of the total available circulating media, into such media.*[5]
>
> *[A]n economy where all private property consisted in pure assets, pure money, and nothing else . . . is the financial good-society.*[6]

15.3.2 Lender of Last Resort

The most important policy tool, once a crisis or systemic shock has actually occurred, is the readiness of a large financial institution to act as a *lender of last resort*. In modern times, that institution is typically the central bank, though historically large private intermediaries have also carried out this function. The beginning of most crises is a liquidity crunch, as Simons hints at in the passage just cited. Market participants rapidly change behavior, suddenly seeking to preserve and acquire the largest possible reserves of liquid assets. It is at this point, when liquidity premiums rise rapidly, and

[5]Simons (1936, pp. 6–9).
[6]Simons (1946, p. 30).

asset fire sales may already have begun, or are at least anticipated, that the lender of last resort is potentially most effective in containing the crisis.

Standing Lending Facilities We begin by describing facilities maintained by central banks to offer temporary funding to qualified, and not necessarily distressed, individual firms. In normal times, even an appropriately reserved and capitalized financial intermediary can face extraordinary short-term funding needs. A century ago, in an economy still substantially focused on farming, banks faced large seasonal fluctuations in deposits as a result of the agricultural cycle; rural banks typically faced cash shortages in the planting season and surpluses after crops were marketed. Today, seasonal fluctuations are much milder, and banks facing such temporary funding needs can generally borrow in the interbank markets.

Nonetheless, a number of central banks, at least for historical reasons, maintain *standing lending facilities*, geared towards both normal and stress needs of eligible borrowers. U.S. banks that are members of the Federal Reserve System can borrow, against adequate collateral, at the *discount window*. The window serves three main purposes.

1. While U.S. monetary policy is carried out mainly via *open-market operations*, as in most developed countries, the discount window provides an additional mechanism by which unexpected shortages of monetary reserves in the financial system as a whole can be addressed.
2. The discount window provides a channel in addition to the money markets by which individual banks in sound condition, but experiencing unexpected shortages of cash, can borrow. Such shortages typically arise late in a trading day and must be addressed quickly. These first two uses are called the *primary credit facility*.
3. Finally, distressed depository institutions can borrow from the discount window, for a short time and under close monitoring, either to help bridge the institution to soundness, or as part of its resolution and unwinding.

The discount window can be seen as a precursor form of the lender of last resort function, addressing temporary urgent borrowing needs that fall short of distress. With predictable, short-term agricultural seasonality now a historical episode, the discount window has a dual role as both an emergency lending facility for individual distressed institutions in normal times, and a lender of last resort facility during periods of financial distress.

Central Bank Policy During Panics During a financial crisis, or in the presence of bank runs, the function of the lender of last resort is to replace

liquidity abruptly draining from the financial intermediation system. The ultimate goal is to prevent immediate and severe harm to the real economy, which is dependent on credit availability, specifically, on the structure of maturity and liquidity transformation that is in place at the moment. Since the payment and credit systems are closely intertwined, a severe disruption of credit intermediation can also impact payments systems, for example, by the collapse of an intermediary that is also an operator of or a large participant in a key component of the payment system. As noted in Chapter 12, the tri-party repo system, in which a large volume of instantly revocable credit is granted during trading hours by a small number of large banks, is perhaps the most important example.

The term "lender of last resort" was first used by the banker Francis Baring in 1797. Referring to the Bank of England's role during a crisis in which credit intermediation had suddenly been interrupted on news of war between Britain and France: "In such cases the Bank are not an intermediary body, or power; there is no resource on their refusal, for they are the *dernier resort*."[7] The role of a lender of last resort in a crisis was classically formulated by Henry Thornton in 1802, and by Walter Bagehot in Chapter 7 of his 1873 *Lombard Street: A Description of the Money Market*: "[A]dvances in time of panic ... are necessary, and must be made by someone." This responsibility falls to the central bank:

> *By painful events and incessant discussions, men of business have now been trained to see that a large banking reserve is necessary, and to understand that, in the curious constitution of the English banking world, the Bank of England is the only body which could effectually keep it* [p. 180]... [T]*he Bank of England... is simply in the position of a Bank keeping the Banking reserve of the country*... [I]*n time of panic it must advance freely and vigorously to the public out of the reserve* [p. 196].

He then puts forth what has come to be known as *Bagehot's Rule*, the two principles by which central bank reserves are to be deployed in a financial crisis, the application of a penalty rate of interest on the loans and the requirement that loans be secured:

> *The end is to stay the panic; and the advances should, if possible, stay the panic. And for this purpose there are two rules: First. That these loans should only be made at a very high rate of interest.*

[7]Cited in Wood (2000), p. 203.

> *This will operate as a heavy fine on unreasonable timidity, and will prevent the greatest number of applications by persons who do not require it. The rate should be raised early in the panic, so that the fine may be paid early; that no one may borrow out of idle precaution without paying well for it; that the Banking reserve may be protected as far as possible.*
>
> *Secondly. That at this rate these advances should be made on all good banking securities, and as largely as the public ask for them. . . . If it is known that the Bank of England is freely advancing on what in ordinary times is reckoned a good security—on what is then commonly pledged and easily convertible—the alarm of the solvent merchants and bankers will be stayed. But if securities, really good and usually convertible, are refused by the Bank, the alarm will not abate, the other loans made will fail in obtaining their end, and the panic will become worse and worse* [pp. 197–198].

The lender of last resort function is to be carried out on the largest possible scale, and the policy of doing so is to be clearly announced during normal times, in advance of any crisis. Preannouncement will stabilize expectations, reduce endogenous liquidity risk, and thus make a crisis less likely.

Bagehot asserts that the central bank—and thus the taxpayer—is unlikely, once the crisis has subsided, to have incurred losses in carrying out its lender of last resort function, but is safe from loss only if it lends massively enough to avert a full-scale crisis:

> *The* amount *of the advance is the main consideration for the Bank of England, and not the nature of the security on which the advance is made, always assuming the security to be good. . . . In ordinary times the Bank is only one of many lenders, whereas in a panic it is the sole lender, and we want, as far as we can, to bring back the unusual state of a time of panic to the common state of ordinary times* . . . [p. 205].
>
> *No advances indeed need be made by which the Bank will ultimately lose. The amount of bad business in commercial countries is an infinitesimally small fraction of the whole business. . . . The only safe plan for the Bank is the brave plan, to lend in a panic on every kind of current security, or every sort on which money is ordinarily and usually lent* [p. 198].

In this classic formulation, Bagehot touches on most of the key issues in the debate on the lender of last resort function of central banks. One aspect

of the lender of last resort that Bagehot does not address is the term to maturity of loans. Typically, most of a central bank's monetary operations are conducted via short-term loans. But in a crisis, it may see a need to satisfy the desire for longer-term loans, potentially constraining future monetary operations and thus departing from pure liquidity support, in order to ease a panic.

Rationale and Scope of a Lender of Last Resort Several competing arguments have been voiced for—and against—recognizing the lender of last resort as a legitimate function of central banks. Each argument brings with it a different definition of its scope, that is, when to exercise it.

In the classical view of Bagehot and his successors, the lender of last resort function is necessary and has no substitute in financial panics. The lender of last resort should, however, be exercised only to avert a general panic in financial markets or in some other way respond to the threat or actuality of a systemic risk event. In particular, there must be a genuine threat to the real economy overall, that is, aggregate output, growth, and employment, rather than just to one or several financial firms, or even a branch of the financial industry. An opposing view holds that reducing the deadweight cost of individual bank failures justifies liquidity or even capital support.

In the Bagehot formulation, the central bank should provide liquidity support only, to avert an collapse of velocity and the money supply. Loans must be secured by collateral to the satisfaction of the central bank, and are short-term. In this view, only public treasuries and not central banks should provide credit support or recapitalize banks.

One argument for going beyond pure liquidity support is uncertainty about the solvency of the borrowers. Hemingway described bankruptcy as occurring "gradually and then suddenly," and financial crises typically develop the same two ways, with bewildering phases in which events move rapidly and it is unclear just what is happening. It is difficult then to discriminate between merely illiquid and insolvent financial firms. As we saw in Chapter 14, much of the disfunction in money markets during the subprime crisis was due to uncertainty about the solvency of many banks. Though only a handful were thought insolvent, no one knew for certain which ones.

Moreover, in the early stages of panic, when it is not yet clear how great the dangers to the real economy are, the political cost but also the public benefit of rapid action on a large scale are at their maximum. There is therefore an argument for the central bank at least taking the risk of lending to a possibly, but not probably, insolvent firm. The lender of last resort would in any event be secured by collateral.

A very different view is that the central bank *qua* central bank, as sole issuer of high-powered money, never carries out a distinct lender of last resort function. Rather, the central bank, in seeing to it that the money

stock does not collapse in the face of an increase in liquidity preference, hoarding, and depositor withdrawals, is merely conducting stabilizing monetary policy. In crises, it is an appropriate policy for the central bank to offset the sudden increase in the desire for liquidity by providing as much liquidity as the market needs. But it doesn't need any special policy tools to confront an "internal drain"; its ordinary monetary policy instruments, such as the discount window and open-market operations, are sufficient. Only the massive scale of the liquidity operations will be different in a crisis. The liquidity infusion need not be directed to specific intermediaries: Provided only that enough liquidity is provided, the money market will distribute it as needed.

The counterargument is that much of the problem in a crisis is that the distribution mechanism for liquidity becomes impaired. In situations like those described in Chapters 12 and 14, in which banks cease lending to one another, the central bank must concern itself with the distribution of reserves as well as its volume. It may be necessary to lend to borrowers that are atypical for the central bank, as the normal counterparties, the large banks and dealers, will otherwise themselves hoard the proceeds because of the perceived risk of lending to others. Related questions raised in this debate are whether the lender of last resort should accept any credit risk under any circumstances, and whether a panic is essentially a collapse of credit intermediation or a collapse of monetary aggregates.

Issues in the Lender of Last Resort Function Aside from the major controversies just outlined, a number of other important issues surround the lender of last resort function:

Terms of support. Bagehot emphasized the penalty rate charged to banks benefitting directly from emergency liquidity support. The penalty rate is defined as a rate substantially higher than that which would prevail in the absence of a panic, rather than a rate higher than realized during the panic, when it is elevated by risk and liquidity premiums. The penalty rate is a mechanism for reducing the moral hazard of access to emergency liquidity support and for encouraging early repayment of the loans as the panic subsides.

Some have argued that a fee should be paid in advance, and as a condition of access to emergency support. This is the mechanism used by clearinghouses, which then support only their members in difficulty, and then only if solvency criteria are met. In a panic, however, the externalities generated by liquidity problems of institutions that have not paid an access fee in advance may dominate, and the lender of last resort may feel obliged to provide support nonetheless.

A related debate surrounds the quality of the collateral accepted against loans by the lender of last resort. One school of thought holds that the central bank should accept only securities of high credit quality, while another holds that even low-quality collateral is acceptable, provided haircuts high enough to minimize the lender's credit risk are imposed.

Who should provide support? Private support is an alternative to central banks as lender of last resort. For example, we noted the role of clearinghouses in mitigating counterparty risk in futures markets in Chapter 6. There is evidence that, while by no means foolproof, such mechanisms also helped contain and avert banking panics in the late nineteenth and early twentieth centuries. The countervailing view is that private support may be difficult to mobilize because of collective action problems.

Financial innovation and disintermediation. The lender of last resort function may need to be adapted as the financial system evolves. The doctrine was originally formulated for a bank-centered financial system. Market-based intermediation raised new challenges both to the rationale and implementation of lender of last resort policy, requiring operations to provide liquidity support to markets rather than specific intermediaries. An example is the Federal Reserve's Term Asset-Backed Securities Lending Facility (TALF), which was in operation from March 2009 to June 2010. It aimed to preserve the securitization intermediation channel in the face of large liquidity premiums (see Figure 14.14) and the dissolution of an entire investing clientele, by lending broadly to new investors in investment-grade securitization products.

These interpretations of the lender of last resort function as going beyond averting the collapse of the money supply, to maintaining the integrity of the credit intermediation system, have been referred to as "market maker of last resort" (Buiter and Sibert, 2007, and Buiter, 2007) or "dealer of last resort" (Mehrling, 2011). These terms emphasize the recommendation that the central bank act to prevent market-based intermediation from instantaneous collapse. The argument is foreshadowed in Calomiris (1994), a chronicle of the Penn Central bankruptcy, showing that discount window lending to banks averted a credit crunch that would otherwise have been induced by a shutdown of the commercial paper market.

Stigma. A depository institution that accesses the discount window may fear that doing so signals that it is in financial distress. It may thereby cut off its own access to interbank markets. The stigma

problem became an issue early in the subprime crisis when it appeared that banks were reluctant to make use of the primary credit facility for fear that they would be stigmatized and become unable to borrow in the private interbank market. One way to mitigate stigma is the use of auctions, rather than standing facilities, for example the Federal Reserve's Term Auction Facility, in operation from December 2007 to March 2010.

Moral hazard. The existence of a lender of last resort increases moral hazard, particularly since the policy, in the classical doctrine, is to be preannounced and thus well-known to market participants. There is a trade-off between the negative effect on financial stability of moral hazard and the higher incentive to risk-taking, and the positive effect on financial stability of reducing endogenous liquidity risk. The moral hazard problem here is closely related to the problem of too-big-to-fail, to be discussed below.

Support for evidently or potentially insolvent institutions increases moral hazard. As noted, the deadweight cost of supporting firms that ultimately fail can be considerable. For these reasons, the liquidity-oriented lender of last resort function, best carried out by central banks, is carefully distinguished from that of capital support, best carried out by finance ministries.

All these issues have played a role in central banks' exercise of the lender of last resort function during the subprime crisis. Due to the extraordinary extent of leverage and short-term borrowing via market-based channels, the crisis presented a sharp challenge to central banks' existing framework for provision of emergency liquidity support to the financial system. The Federal Reserve in particular introduced a number of newly designed mechanisms for carrying out the lender of last resort function, and extended the range of its counterparties, the term to maturity of the loans, and the types of collateral accepted.

15.4 PITFALLS IN REGULATION

The rationale and techniques of regulation we've presented rest primarily on efficiency arguments, that is, flaws in the ability of market mechanisms to achieve either a desirable allocation of credit, or to do so without inducing avoidable disruptions in credit. There are, however, a number of pitfalls in putting regulatory solutions into practice. Many are not unique to finance, but rather apply generally to public policy vis-à-vis markets.

In Chapter 6, we described contracting and transactions cost issues that arise in credit. These issues affect private parties and their incentives in contractual relationships. We've had occasion to refer to these costs in describing, for example, the difficulties of aligning incentives in securitization and bank deposit contracts. But the same issues concerning incentives also create difficulties in designing regulations capable of meeting the goals set for them.

15.4.1 Moral Hazard and Risk Shifting

In regulatory policy, moral hazard describes a situation in which individuals or firms benefit from government guarantees and therefore have reduced incentives to avoid losses. The guarantees may not be expected to be fulfilled with certainty. Moral hazard enables its beneficiaries to borrow more cheaply, and leverage permits market participants to create convex, option-like payoff profiles. As in the insurance case, key elements enabling moral hazard are asymmetrical information; that is, the person or firm enjoying the guarantee has better information about the risk mitigants available than does the provider of the guarantee, and risk shifting, that is, the capacity to impose greater risk of loss on a counterparty after contracting.

Moral Hazard and the Financial Safety Net Some examples of moral hazard in financial regulation include

Deposit insurance and other explicit investor guarantees reduce the incentives of depositors to scrutinize the efficacy with which the bank carries out its loan monitoring and collection, and other contractual obligations. This problem is one of the key arguments, as noted, in favor of regulatory capital standards.

Too-big-to-fail doctrine, under which systemically important financial institutions are to be supported by public lending rather than be unwound or permitted to file for bankruptcy protection.[8] The term was introduced in 1984 in response to testimony by the Comptroller of the Currency in the aftermath of the Continental Illinois bailout. The policy creates an option-like payoff profile for too-big-to-fail firms, in which the public sector bears some of the risk of loss, while the firms' employees, shareholders, and creditors receive positive returns, thus generating moral hazard.

[8]See Tim Carrington, "Won't let 11 biggest banks in nation fail—testimony by Comptroller at House hearing is first policy acknowledgement," *Wall Street Journal*, September 20, 1984.

Too-big-too-fail reduces the incentive for counterparties to manage the risks of their exposures to large intermediaries, except to the extent there is doubt about the policy or whether it applies to a specific firm, thus shoring up if not creating what has been referred to as the "counterparty system" (Einhorn, 2008). Too-big-to-fail similarly enabled large banks under its umbrella to credibly extend their own implicit guarantees to the off-balance sheet vehicles they sponsored.

Too-big-to-fail would be more fairly described as a practice than as a doctrine; a pattern has emerged over several decades from rescues of creditors of large institutions. It may have been fostered also by the shift in corporate governance from shareholder to managerial power over these same decades. Greater imperviousness to outside challenge, together with the ability to borrow at low credit spreads, may have increased the convexity/option value of the payoff profile of too-big-too-fail firms and contributed to moral hazard.

Dodd-Frank attempts to counteract too-big-to-fail by allowing regulators, particularly Treasury and the FDIC, to liquidate such firms. As noted above, the FDIC is charged with developing a process for doing so. Such a process must be credible, as we will see in a moment, in order to weaken too-big-too-fail.

The extent of the moral hazard depends on the nature of the expected bailout. If the policy is perceived, for example, as being particularly protective of creditors, the firms' credit risk premium will be tight and will lower their funding costs compared to competitors that are not too big too fail.

Too-big-to-fail is related, but not identical, to central banks' lender of last resort function. The rationale for rescuing large financial firms in danger of insolvency is that such institutions are so intricately interwoven with the rest of the financial system that a failure would cause or deepen a financial crisis. Financial firms and their investors are aware of this externality and the likely public-sector response, and curtail their own monitoring and due diligence accordingly.

Too-big-to-fail has effects on the cost of capital of large financial firms, but also on the overall arrangements market participants make. For example, payments and settlements systems may incorporate a tacit assumption of a public-sector backstop, and that key participants are covered by too-big-to-fail.

The Dodd-Frank Act addresses the too-big-to-fail problem chiefly through the proposed mechanism, noted above, of designating certain large financial intermediaries as systemically important

financial institution (SIFIs). The designation includes all banks with assets in excess of $50 billion and other nonbank intermediaries to be designated by the FSOC. As noted, SIFIs are to be regulated by the Federal Reserve, regardless of whether they are banks. If a SIFI is determined to pose systemic risk, for example because it is in peril of default, the firm is to be resolved or unwound under an Orderly Liquidation Authority (OLA) rather than in bankruptcy. The FDIC is charged with designing and administering the process, which is to include firing management, wiping out equity owners, and imposing haircuts on creditors without absolute deference to the standard rules of seniority, such as equal treatment of unsecured senior debtholders. The Federal Reserve may lend to an individual SIFI only if it is the process of resolution under the OLA or via a facility such as the discount window with broad market eligibility, precluding actions such as those taken in 2008 under Section 13(3) of the Federal Reserve Act (prior to its Dodd-Frank modification) to prevent the collapse of Bear Stearns and AIG.

The "counterparty system" is not what it was prior to the crisis; as noted, the presumption that large dealers collect initial margin from customers has shifted closer to two-way margining. Dodd-Frank, once the pertinent rules are made, such as those on central clearing requirements and on the designation and resolution of SIFIs, will further alter these relationships in OTC derivatives markets in hard-to-predict ways. The impact on intermediaries' credit spreads, and how spreads behave over time, is also hard to predict. The so-called "ratings uplift," the ratings agencies' practice of assigning higher ratings to large banks' debt issues on the assumption that they are too-big-to-fail, also plays a key role in market determination of spreads. Market perception of potential public-sector support, together with the ratings uplift, tends to tighten spreads. Uncertainty about public-sector support, about how resolution will be carried out, and the potential for haircuts on some debt spreads, tend to widen spreads.

Spread behavior if there is an immediate prospect of resolution under the OLA is at least as hard to predict, as there is potential for sparking a sell-off by creditors seeking to avoid supervisor-determined haircuts. Uncertainty about quiet-state as well as stressed-state credit spreads of SIFIs and potential SIFIs will also have been increased by disparate treatment of senior unsecured creditors following major intermediary failures during the subprime crisis, to which we return in our discussion of moral hazard mitigants.

A tough response to the too-big-to-fail problem may be taken in Switzerland, where a federal government-appointed "too-big-to-

fail" Commission of Experts has recommended capital standards considerably more stringent than those proposed in Basel III. As noted above, these additional capital requirements may take the form of contingent capital that converts to common under certain triggers. The Swiss proposal has the same structure as Basel III, but ordains a larger capital buffer and explicitly labels the countercyclical component as a surcharge for systemically important banks yet to be identified. Where Basel III may call for a total of 10.5 percent total capital, with a minimum 7 percent consisting of common equity, the Swiss proposal is for 19 percent total capital, with 10 percent in common equity (see Commission of Experts, 2010).

Implicit guarantees were given to the two government sponsored enterprises (GSEs) Fannie Mae and Freddie Mac, permitting these institutions to issue debt and finance the purchase of mortgage assets at lower cost than otherwise. Prior to the subprime crisis, *agency debt*, as their debt issues are called, had tighter spreads than other private corporations. Their low cost of capital was below the spreads paid even by senior RMBS, whether guaranteed by the GSEs or "private label." Together with their mandate to support homeownership, the spread between agency debt and RMBS provided incentives for the GSEs to go beyond their original business of guaranteeing prime mortgages and packaging them into agency RMBS, and make direct investments in a "retained portfolio" of agency and private-label RMBS and whole loans. While the final cost is still not known with certainty, there is a high likelihood that GSE losses will represent the bulk of the direct fiscal costs arising from public support of financial intermediaries during the subprime crisis.

Walter and Weinberg (2002) have attempted to estimate the present value of these various forms of support to U.S. financial firms; they place the total of explicit and implicit guarantees at $9.2 trillion, largely off-balance sheet. While that estimate is based in part on model assumptions, and is in any case now outdated, it gives a sense of the large magnitude of these explicit and implicit guarantees. Haldane and Alessandri (2009) estimate the total "nominal amount" of support provided during the subprime crisis by the U.S. and U.K. central banks and governments, including guarantees, liquidity and capital infusions, at about 75 percent of annual GDP. These totals, like notional swap amounts, are much larger than the amounts at risk or potential taxpayer cost. Veronesi and Zingales (2010) apply the Merton model to estimate the deadweight cost of bankruptcy avoided by the U.S. Treasury's infusion of capital into U.S. banks and broker-dealers and the FDIC's debt guarantees in October 2008 at $130 billion.

Moral hazard can also arise from changes in the situation of households. For example, as we saw in Chapter 1, U.S. households today have far greater exposure than in the past to equity markets, and home ownership is more widespread, even several years into the subprime crisis, than at any earlier time. This is thought by some to place constraints on macroeconomic stabilization policy. Monetary authorities contemplating a tightening of monetary policy would have to take into account the impact of the consequent reduction in household wealth on the real economy. This reluctance might over shorter periods reduce the frequency and severity of large declines; that is, it would foster positive skewness in equity returns, and possibly thereby make equity investment even more attractive to many households. In the long run, it might thereby increase procyclicality by increasing the magnitude of extreme negative returns when they occur. This phenomenon is similar to the effect of securitization in concentrating systematic risk in the seniormost bonds.

Concern about too-big-to-fail is compounded by the pattern of rescues of financial firms, which, though hardly uniform, has confirmed that some form of too-big-too-fail policy has been in place. In the view of some observers, the new resolution authority of the Treasury and FDIC under the Dodd-Frank Act can be expected to mitigate the too-big-to-fail problem. If, however, a credible resolution process is not established, the public perception that too-big-to-fail remains in place may be strengthened. Similar hopes had been invested in the Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991. FDICIA mandated rapid "least-cost" resolution of weak banks and risk-based deposit insurance fees, and was an important part of the regulatory response to the S&L crisis.

Mitigating Moral Hazard One proposed solution to the problem of moral hazard generated by too-big-to-fail and deposit insurance is the requirement that firms that benefit from implicit guarantees issue subordinated debt in proportion to the size of their balance sheets or risk-weighted assets. Subordinated debt has a number of potential benefits: It increases the cost of raising capital and, because of its subordinate position in the capital structure, relates that cost to the riskiness of issuers' balance sheets. The secondary-market spreads on subordinate debt issues provide information to supervisors as well as to markets about the riskiness of the issuers' assets. It also obliges issuers to be more transparent in disclosures about risk, as investors will otherwise be unwilling to purchase the bonds except at higher spreads. A similar, but somewhat narrower, proposal is to tie regulatory actions to firms' CDS spreads in the marketplace.

It is not clear, however, that required subordinated debt issuance can solve the moral hazard problem. If the perceived solicitude for creditors in a financial crisis is great enough, spreads even of subordinated debt of

highly leveraged intermediaries may stay "too tight." As we saw earlier in this chapter, poor loss absorbency of Tier II regulatory capital, of which subordinated debt is the main component, was a key motivation for the Basel III revisions. The ratings uplift may also tighten sub spreads.

The experience of the subprime crisis has left this issue ambiguous. Apart from Lehman, most failures of large U.S. banks and broker-dealers during the crisis have resulted in an acquisition in which the acquired firms' bondholders suffered no losses, reducing the value of sub spreads as an early-warning signal. The major exception were senior and subordinated debt of Washington Mutual ("WaMu"), a commercial bank particularly active in subprime residential mortgage lending. Its assets and deposits, but not its senior unsecured and subordinated debt, were assumed by J.P. Morgan Chase on September 25, 2008. Recovery on the subordinated debt was zero.

Moreover, the revisions to the regulatory definition of capital described above, regulatory questioning of the appropriateness of including subordinated debt in Tier II regulatory capital under the Basel II rules, and the emphasis on common equity at the expense of other components of capital during the Supervisory Capital Assessment Program (SCAP) discussed in Chapter 13 indicated reticence about viewing subordinated debt as fully at risk of loss. Finally, infusions of capital by the United States and a number of other governments in the form of common and preferred shares, which are junior to subordinated debt, as well as debt guarantees, effectively shielded subordinated debt from loss. The failure of junior capital in some cases to take losses impairs the monitoring function of such capital.

The behavior of subordinated debt during the subprime crisis is illustrated in Figure 15.2 with the example of Citigroup. The graph displays the spread between its long-term senior unsecured and subordinated bond yields. The spread remained close to zero, generally around 10 bps, until the fall of 2007. The senior-sub spread exploded following the Lehman collapse, reaching a wide of nearly 1,200 bps, and collapsed after results of the supervisory capital adequacy tests were released in early May 2009. The most recent spreads are somewhat wider than prior to the subprime crisis, and certainly more volatile. But its overall tightness during most of the subprime crisis, apart from the nine months or so of the 2008–2009 panic, casts some doubt on its efficacy as an early warning signal and on its loss absorbency.

Moral Hazard and Time Consistency *Credibility* and *time consistency* problems contribute to moral hazard. Credibility refers to the extent to which the policy commitments of regulators are believed by market participants. Most financial regulatory policies rely to at least some extent on credibility, which arises particulalry frequently in systemic risk problems. For example, suppose the public sector sets certain conditions, such as tests of solvency, for providing liquidity or credit support for financial firms. If it

then provides support for firms that have not met these criteria, the credibility of the criteria will be called into question, increasing moral hazard.

An important aspect of credibility is the ability to establish time-consistent policies. The focus on time consistency initially arose in monetary policy, where policy makers face the following dilemma: Suppose low inflation and unemployment are both desirable, and can best be achieved by keeping inflation expectations low, but that large increases in employment can be achieved by increasing inflation precisely when it is expected to be low. Lower inflation expectations then increase the temptation of policy makers to raise employment with surprise inflation. Policy makers consequently find it more difficult to persuade markets that they will keep inflation low. The result is a worse outcome, with both higher inflation and unemployment, than if there were no time-consistency problem.

A similar dilemma arises in the case of systemic risk policies. The public knows that in extremis the central bank will likely provide liquidity and possibly credit support to troubled intermediaries. This increases the willingness of financial firms to take risk, particularly systematic risks, since then the probability of a systemic risk event, and thus public-sector support, conditional on the distress of the individual risk taker, is higher.

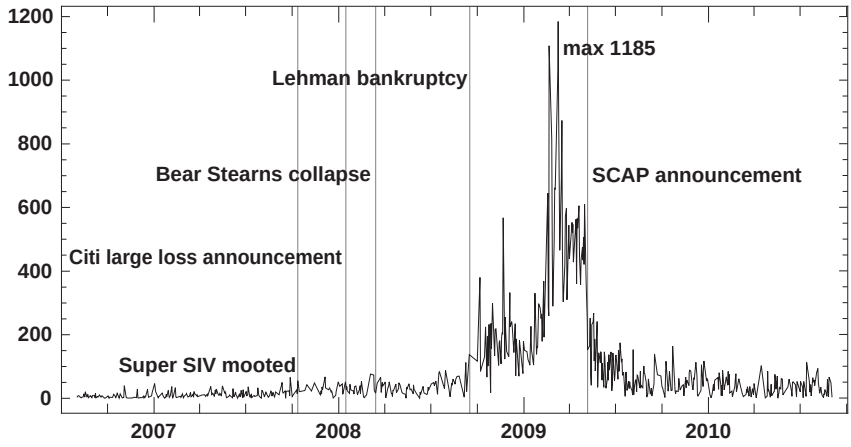

FIGURE 15.2 Citigroup Credit Spreads during the Subprime Crisis
Difference between yields to maturity of Citigroup Inc. senior unsecured and subordinated bonds with maturities of about 10 years, daily, in bps, August 2, 2006, to September 2, 2010. The construction of the senior unsecured bond data is analogous to that described for *z*-spreads in the caption to Figure 13.4. The subordinated bond yields are for the 4.875% issue maturing May 7, 2015.
Source: Bloomberg Financial L.P.

Another example of the time consistency problem are legislative and regulatory initiatives to reduce residential mortgage loan balances following the decline in U.S. home prices from 2007, by legislative fiat or by increasing the latitude of judges in bankruptcy courts. The individual and economy-wide benefits of reduction in debt balances would be immediate. However, future mortgage lenders would have to factor the possibility of debt forgiveness into the interest rates demanded of borrowers, since it would be difficult to credibly frame any such measure as "one time only."

The classic solution to the problem of time inconsistency in monetary policy is the adoption of rules to govern and constrain policy makers. However, it is more difficult to apply rules to the management of systemic risk, because systemic risk events are rare and very different from one another. Also, as Bagehot noted, policy in panics must be "brave," and therefore resourceful and tailored to the situation as it stands, characteristics of policy that are difficult to define thorough rules.

15.4.2 Regulatory Evasion

In advanced countries, regulation is enshrined in two types of source document, legislation and rule-making. Market participants can often find mechanisms that adhere to the "letter of the law"—while substantively avoiding the restrictions. Texts are subject to interpretation, so case law developed through lawsuits and regulatory appeals tends to lag behind techiques of evasion.

An early example of regulatory evasion is the *bill of exchange*, a medieval money market instrument. Usury laws prevented lending money at interest. The bill of exchange permitted merchants to buy and sell merchandise on credit and charge interest. The proceeds due at the maturity of a bill of exchange were generally payable in a different location and currency from the initial loan, concealing the embedded interest payments within a forward foreign exchange transaction.[9]

A more recent example is the development of swap markets, which began with the introduction of currency swaps. As described in Hodgson (2009), one purpose of these contracts was to evade controls, still prevalent in the early 1970s, on international capital flows.

A milder form of regulatory evasion is *regulatory arbitrage*. Among the most important forms of regulatory arbitrage are those involving capital standards and securitization. The simple risk weights under Basel I and the standardized approach of Basel II provided strong incentives to reduce

[9]See Neal (1990), ch. 1.

required capital by securitizing certain assets. A bank issuing loans with a risk weight of 100 percent could securitize those loans rather than hold them in whole loan form. The junior tranches might still have a risk weight of 100 percent, but the senior tranche, if rated AAA, would have a much lower, if not zero, risk weight. Even if the bank retained all tranches on its own balance sheet, it would have drastically lowered the regulatory capital required against the assets. Yet the securitization has the same risks as the original loans.

Two examples of regulatory arbitrage involving securitization were particularly important in increasing the fragility of large banks in the years preceding the subprime crisis:

1. Regulatory capital for investments in non-sovereign bonds were determined by the ratings of the bonds. Risk weights and capital requirements for AAA bonds were the lowest. This provided an incentive for banks to invest in the AAA bonds with the highest yields available, AAA RMBS and CDOs. The bank then earned the spread between the yields on the AAA RMBS and CDOs, and the cost of capital, which included lower-yielding deposits and senior debt of the bank.

   One bank, UBS, was particular hard hit by these investments, many of which it had made in the very last phase of the buildup of mortgage debt. These losses were among the motivations for the aggressive increase in minimum capital requirements, mentioned above, now under discussion in Switzerland.
2. We described off-balance-sheet ABCP conduits at length in Chapters 12 and 14. These vehicles had lower capital charges than if the same securitization and whole loan assets had been held on the balance sheet. The bank earned the spread between the assets and its cost of capital, which was close to the low yield on the ABCP.

In both of these examples, banks chose the path that, within the regulatory capital rules, permitted them to take on the greatest economic leverage. In each case, a relatively narrow spread between the returns of the assets and the cost of capital was enhanced by conducting the trade in size and with high leverage.

Regulatory arbitrage can be carried out by individual households as well as by intermediaries. An example is the use of multiple bank accounts by well-to-do households to increase the amount of insured deposits they hold; deposit insurance is limited by account, not by account owner. Intermediaries have introduced a financial innovation, the Certificate of Deposit Accounts Registry Service (CDARS), to facilitate the process of obtaining deposit insurance coverage for large balances.

15.4.3 Unintended Consequences

The economic and financial systems are complex, and public policies often have unintended consequences. An example in monetary policy is *Goodhart's Law*, which states that when central banks employ specific money aggregates as instruments of monetary policy, based on relationships to macroeconomic variables, those relationships will change and the targeted effects will not be achieved. Intermediaries also adapt the degree and type of risk they assume to the regulatory environment. The form in which risks are taken, for example, via cash positions or expressed through derivatives and structured products, is heavily influenced by regulation. As we can see from the example of ABCP conduits, this often occurs in ways quite different from the rulemakers' intentions.

Myriad examples can be brought. Under Dodd-Frank, risk-conscious deposit insurance fees are based on a bank's entire liability base rather than just on deposit volume. The new fees have prompted some banks to withdraw from the repo and Fed funds markets, drastically reducing money market rates, and with potential further consequences for the money market mutual fund industry.[10]

Bills of exchange and the development of the swap market, and our examples of regulatory arbitrage of capital standards, also illustrate how financial regulation, together with the factors described in Chapter 1, drives financial innovation. The increase in complexity and decrease in transparency in derivatives and other securities, in financial transactions, and in market participants' balance sheets and disclosures, are in part such an unintended consequence. Similarly, regulatory arbitrage is a driver of the long intermediation chains noted in Chapter 12's discussion of "interconnectedness," as illustrated by banks' use of off-balance sheet vehicles to finance mortgages and consumer loans.

Another example is the evolution of the credit ratings business and its impact on capital markets. As we have seen, the effects of ratings standards for the investment portfolios of regulated intermediaries, and the development of the ratings industry generally, are to a large extent historical artifacts. Entry into the ratings business is restricted, but institutional investors have been required to use the product. The ratings business itself has changed dramatically in recent decades:

- The ratings business model has evolved from selling ratings information to bond investors to one in which the bond issuer pays for ratings, called

[10] See Michael Mackenzie, "Repo fee hits money market funds," *Financial Times*, April 11, 2011.

the *issuer-pays model*. This change was driven by the introduction of photocopiers and, later, the Internet, which made it difficult to keep ratings private information and permitted free riders to use ratings they hadn't paid for.

- The structured credit product market created new demand for ratings. In contrast to ratings of corporate bonds, structured credit ratings are part of the process of creating the bonds, since they determine the size of the senior bond tranche and thus the cost of capital of the liabilities. Ratings firms have thereby become involved in structuring deals.

Regulation has interacted with these historical developments. Securitization issuers are said to have used competitive pressures among rating agencies to obtain larger senior bond tranches (lower credit enhancement levels) and improve deal economics, a phenomenon known as *ratings shopping*. Ratings shopping creates incentives for ratings firms to use models that underestimate systematic risk by, for example, underestimating mortgage default correlation. Bond investors' incentives are also aligned with this process. Many institutional investors have high demand for investment-grade bonds that yield even a small spread premium over corporate bonds with the same ratings. An example, mentioned in Chapter 14's discussion of "search for yield" as a source of financial fragility, are public pension funds seeking to meet return targets driven by liability growth. Moreover, regulatory validation of the credit quality of their portfolios based on ratings provides a legal and reputational safe harbor protecting investment managers if there are losses.

Proposals to reform ratings have focused on the issuer-pays model. One variant seeks to counter ratings shopping by having a regulatory body choose the ratings firm for each bond issue. This direction of reform has the disadvantages of reliance on regulators for the accuracy of ratings and further entrenching the NRSROs in the investment process. An alternative approach seeks to remove ratings as a regulatory criterion and place greater reliance on investors themselves to ascertain and demonstrate to regulators the credit quality of their portfolios. Both approaches have found expression in Dodd-Frank.

A final example of unintended consequences is the impact of too-big-to-fail on large intermediaries in early 2009. On the one hand assurances to creditors enabled the firms to maintain access to credit markets and inhibited forced asset liquidations. On the other hand, ambiguity about seniority was generated by the government's purchases of preferred shares in a number of large banks. The possibility that preferred shares might be treated as creditors increased the perceived risk to the common shareholders and made it more difficult for a time for the firms to raise additional equity capital.

Regulation may inhibit competition and protect incumbents, for example through large banks' funding cost advantage. Unintended consequences, at least from the standpoint of the overt intentions of regulation, may also arise from *regulatory capture*, which occurs when regulators exercise their powers at least partly in the interest of the regulated industry. In Stigler's (1971) formulation, "as a rule, regulation is acquired by the industry and is designed and operated primarily for its benefit." It can affect both the formulation and implementation of policy. A related problem is that of coordination among multiple regulators with possibly differing goals and priorities. This is particularly the case for large complex intermediaries in a holding company structure, which often have subsidiaries subject to supervision by different regulators. Macroprudential regulation may face even greater challenges of coordinating the actions of different regulators. Under the Dodd-Frank Act, coordination is to occur through the FSOC, but different agencies must also cooperate in the formulation of the numerous complex rules the Act mandates.

This chapter has focused on how regulation influences financial firms' approach to risk management, how they adapt to regulation in the degree of risk they take, and the impact of regulation on systemic risk, that is, risk to the financial system as a whole. Financial regulation confronts excruciating tradeoffs: It is far more costly, complex and problematic to deal with the consequences of large credit expansions than to limit them ex ante. But attempts to remove risk and volatility from some areas of economic and financial life, or from some market participants, displace those risks elsewhere. It will be some time before risk managers, market participants and policy makers learn what balance has emerged from the revised regulatory framework.

FURTHER READING

Brunnermeier, Crockett, Goodhart, Persaud and Shin (2009), NYU Stern Working Group on Financial Reform (2009), and French et al. (2010) are surveys of and proposals on regulatory issues brought to the fore by the subprime crisis. Counterparty Risk Management Policy Group (2008) is a similar survey by a predominantly private-sector group. Zingales (2009) focuses on securities regulation issues arising from the subprime crisis. The text of the Dodd-Frank Act is available at http://www.gpo.gov/fdsys/pkg/PLAW-111publ203/pdf/PLAW-111publ203.pdf. Davis Polk and Wardwell LLP (2010) is a detailed summary and analysis by a prominent law firm that also maintains a Web page tracking Dodd-Frank rulemaking

at http://www.davispolk.com/Dodd-Frank-Rulemaking-Progress-Report/. Skeel (2011) provides commentary on some of the Act's major titles.

Spong (2000) and U.S. Congressional Research Service (2010) provide surveys of U.S. financial regulation and supervision. Goodhart and Schoenmaker (1995) and Calomiris (2006) presents contrasting arguments in the debate on the appropriate bank supervision role of central banks. Black, Miller, and Posner (1978) applies a creditor-borrower template to the relationship between regulators and the financial firms they regulate.

Ayotte and Skeel (2010) provide a defense of bankruptcy, in contrast to special forms of resolution, for insolvent financial firms. See also Bliss (2003) and Bliss and Kaufman (2006) on resolution.

Merton and Bodie (1993) and Benston and Kaufman (1997) discuss deposit insurance as part of the post–S&L crisis banking reform initiatives. Pennacchi (2009) and Acharya, Santos, and Yorulmazer (2010) discuss the pricing of deposit insurance and current reform proposals. Demirgüç-Kunt, Kane, and Laeven (2008) is a collection of essays on experience with deposit insurance in several countries and on the role of deposit insurance within the overall regulatory framework. The editors' introductory essay summarizes cross-country empirical evidence that deposit insurance increases rather than decreasing the likelihood of banking crises and points out the complex effects on market discipline of deposit insurance fees. Daníelsson (2010) describes the Icesave episode.

See Berger, Herring, and Szegö (1995) and Santos (2001) on the economic rationale for capital standards. Berger, Herring, and Szegö (1995) and Haldane (2010) document the decline in bank capital ratios over the past 150 years. Gordy (2000, 2003) and Saidenberg and Schuermann (2003) present the modeling approach underpinning the Basel capital adequacy standards for credit risk. Basel Committee (2006) is the reference work on the Basel II capital standards. The Basel III updates to the capital standards, including the leverage ratio, are presented in Basel Committee (2010*b*) in the form of edits and additions to Basel Committee (2006). The liquidity standards are presented in Basel Committee (2010*c*). Blundell-Wignall and Atkinson (2010) is a critical summary of Basel III. Admati, DeMarzo, Hellwig and Pfleiderer (2010) is a critical survey of the debate on the cost to firms and the economy of higher capital requirements. De Mooij (2011) reviews the impact of tax-deductibility of interest costs on leverage. Bliss and Kaufman (2003) discusses the relationship between regulatory capital and reserve requirements.

DeBandt and Hartmann (2000) discusses the concept of systemic risk. Tarullo (2011) is a regulator's articulation of financial stability policy. Galati and Moessner (2011) is a survey of the macroprudential supervision literature. Haldane, Hall, and Pezzini (2007) focuses on stability risk

assessment. Some difficulties in defining these concepts are discussed in Borio and Drehmann (2009). Bernanke and Gertler (2001), Cecchetti, Genberg and Wadhwani (2002), Kohn (2002), Roubini (2006), Posen (2006) and White (2009) present contrasting views on asset price targeting and monetary policy. Demirgüç-Kunt and Servén (2010) contains a critical review of the debate. Acharya, Cooley, Richardson and Walter (2010) discuss the Dodd-Frank approach to systemic risk regulation and provide a survey of systemic risk measures.

Eichner, Kohn, and Palumbo (2010) discusses the difficulties of gathering data useful for assessing financial fragility for the United States, but with implications for other industrialized countries. Pojarliev and Levich (2011) propose a technique for detecting crowded trades in currency markets. A number of central banks and international organizations, including the European Central Bank, the Bank of England, and the International Monetary Fund, publish regular reports and working paper series on financial stability. Some of this work is cited in the references to this chapter and Chapter 14. Acharya, Cooley, Richardson, and Walter (2009) discusses systemic risk charges.

We cited several key sources on RMBS securitization in Chapter 9. On the relationship among credit standards, leverage, house prices and the securitization channel in the background to the subprime crisis, see also Gerardi, Lehnert, Sherlund, and Willen (2008), Kiff and Mills (2007), Demyanyk (2009), Demyanyk and Hemert (2011), Mayer Pence and Sherlund (2009), and Geanakoplos (2010).

The early history of the lender of last resort concept is surveyed in O'Brien (2007), particularly Chapters 7 and 8. Goodhart (1988) discusses the key role of the lender of last resort in the historical development of central banking. Bordo (1990) and Miron (1986) provide historical surveys of the issues surrounding the lender of last resort function. White (1983) and Miron (1986) chronicle the importance of smoothing seasonal fluctuations in credit demand to reduce the frequency of financial panics, and the part played in it by the Federal Reserve, in the early twentieth century.

Madigan and Nelson (2002) describes the functioning and rationale of the Fed's discount window. McAndrews and Potter (2002) discusses a rare example of emergency liquidity provision for purely operational, but extraordinary, reasons. Freixas, Giannini, Hoggarth, and Soussa (1999, 2000) provide surveys of the issues in lender of last resort policy. Goodhart (1987, 1988) relates lender of last resort to the unique role of banks and discuss the problem of accurately discerning solvency in real time. Goodhart (2008) discusses the relationships among financial firms' liquidity risk management, moral hazard, and the lender of last resort function. Wood (2000) is a critique of more expansive interpretations of the lender of last resort function.

Bordo (2000) distinguishes in this context between real crises, in which exercise of the lender of last resort is genuinely needed, and "pseudo-crises."

Goodfriend and King (1988) and Borio and Nelson (2008) present contrasting views on the need for the lender of last resort to lend to specific institutions, rather than to the market as a whole, during crises. White (1983, pp. 74ff.), Timberlake (1984) and Kroszner (2000) describe the role and functioning of private bank clearinghouses in nineteenth and early twentieth century financial crises. The problem of stigma in lender of last resort operations is discussed in Furfine (2003), Klee (2011) and in the references they provide. Madigan (2009) discusses the lender of last resort function and financial innovation in the context of the Federal Reserve response to the the subprime crisis. Group of Ten (1996) discusses issues in public policy during sovereign debt crises.

Hetzel (2009) and Haldane and Alessandri (2009) discusses the moral hazard issues arising from the financial safety net in historical perspective. The latter paper discusses specific channels by which banks can exploit moral hazard and shift risks to the public. Akerlof and Romer (1993) describes some distasteful consequences of moral hazard during the U.S. savings and loan crisis. Laeven and Valencia (2008) documents the prevalence of recapitalization as a response to banking crises.

A comprehensive treatment of too-big-to-fail is given in Stern and Feldman (2004). Its historical background in the United States is described in Hetzel (1991, 2009). Ötker-Robe , Narain, Ilyina, and Surti (2011) is a recent internationally-aware survey of the extent of and proposed solutions to the too-big-to-fail policy. Schnabel (2009) documents preferential treatment of large banks in Germany during its Great Depression banking crisis." Flannery (1999) discusses the displacement of private monitoring and the role of payments systems in too-big-to-fail.

Board of Governors of the Federal Reserve System (2000), Calomiris (1999), Ashcraft (2006), and White (2009) discuss the role of bank-issued subordinated debt in prudential regulation. Hart and Zingales (2009) and Caprio, Demirgüç-Kunt and Kane (2010) propose the use of the CDS spreads of large intermediaries to provide market discipline and market-based triggers of regulatory action. Basel Committee on Banking Supervision (2010*a*) reviews the experience with subordinated debt during the subprime crisis.

Stigler (1971) and Posner (1974) discuss regulatory capture, while Peltzman (1989) provides a survey of the "economic theory of regulation" analysis of regulation as the outcome of political competition. Caprio, Demirgüç-Kunt and Kane (2010) and Demirgüç-Kunt and Servén (2010) review the regulatory issues raised by the subprime crisis, emphasizing the role of regulatory arbitrage and incentives. UBS (2008) and Swiss Federal Banking

Commission (2008) provide a detailed analysis of the UBS losses on investment-grade structured products. White (2009) discusses problems arising from the use of ratings in supervision. Acharya and Richardson (2009) and Acharya and Schnabl (2010) give examples of regulatory arbitrage in the securitization process. Calomiris and Mason (2004) examine credit card securitization and find no definitive evidence of regulatory arbitrage.