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Capital Inadequacies
The Dismal Failure of the Basel Regime of Bank Capital Regulation

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Executive Summary

The Basel regime is an international system of capital adequacy regulation designed to strengthen banks' financial health and the safety and soundness of the financial system as a whole. It originated with the 1988 Basel Accord, now known as Basel I, and was then overhauled. Basel II had still not been implemented in the United States when the financial crisis struck, and in the wake of the banking system collapse, regulators rushed out Basel III.

In this paper, we provide a reassessment of the Basel regime and focus on its most ambitious feature: the principle of "risk-based regulation." The Basel system suffers from three fundamental weaknesses: first, financial risk modeling provides the flimsiest basis for any system of regulatory capital requirements. The second weakness consists of the incentives it creates for regulatory arbitrage. The third weakness is regulatory capture.

The Basel regime is powerless against the endemic incentives to excessive risk taking that permeate the modern financial system, particularly those associated with government-subsidized risk taking. The financial system *can* be fixed, but it requires radical reform, including the abolition of central banking and deposit insurance, the repudiation of "too big to fail," and reforms to extend the personal liability of key decisionmakers—in effect, reverting back to a system similar to that which existed a century ago.

The Basel system provides a textbook example of the dangers of regulatory empire building and regulatory capture, and the underlying problem it addresses—how to strengthen the banking system—can only be solved by restoring appropriate incentives for those involved.

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Introduction

One of the most important and distinctive features of modern central banking is the growth of bank capital adequacy regulation—the imposition by bank regulators of minimum capital standards on financial institutions. The main stated purpose of these regulations is to strengthen institutions' financial health and, in so doing, strengthen the safety and soundness of the financial system as a whole.

Until the second half of the 20th century, capital regulation was fairly minimal and often quite informal. In the 1980s, however, the major economies attempted to harmonize and expand the scope of bank capital regulation under the auspices of the Bank for International Settlements' Basel Committee. The defining event was the 1988 Basel Accord, now known as Basel I. This "Basel regime" was a rapidly expanding work-in-progress as the regulators attempted to keep up with developments in banking, finance, and financial risk management. The most significant overhaul was Basel II, published in 2004, which was the subject of protracted negotiations around the turn of the millennium. Member countries had either just adopted Basel II, as the European Union had in 2007, or, in the case of the United States, were preparing to adopt it when the financial crisis hit.

At the dawn of the crisis, the big banks in the United States and Europe were fully Basel-compliant and, as far as Basel was concerned, more than adequately capitalized. The crisis then revealed the true weakness of the banks in the starkest possible terms. Many of the biggest banks failed, and most of the banks that have survived are likely to remain on government life support for years to come. The collapse of the banking system is, of course, the clearest imaginable evidence that Basel has not worked as intended: not to put too fine a point on it, but every ship in the fleet passed inspection—and then most of them were lost at sea.

The knee-jerk reaction of the regulatory community has been to patch up the system as quickly as possible. A new, improved Basel system is already agreed in principle, with negotiations underway regarding its implementation. Its designers tell us that this new Basel regime takes on board the lessons of the crisis and the weaknesses of its predecessors, and assure us that it will deliver a safer and more stable financial system in the future.

Let's see if we understand this correctly. The regulators spent most of a fairly quiet decade producing Basel II—which, in essence, is just thousands of pages of regulatory gobbledygook—designed to make sure that the international banking system is safe. The banking system then collapsed shortly afterward. In the resulting panic, they rushed out thousands of pages of new draft rules, plus many more pages of discussion and consultation documents. Indeed, the deluge of regulatory material was so great that by the spring of 2010 observers were jokingly referring to it being tantamount to a Basel III. But by the fall, the joke—Basel III—had become a reality. But surely the *real* jesters were those telling us that the solution to all that gobbledegook was now to have even more of it, crafted on the fly under crisis conditions by the very same people who had gotten it wrong before. Now these same people ask us to believe that they have gotten it right *this time* around, and never mind all those previous failures.

With a track record like this, it must be obvious that what is needed is not some rushed patch-up of the Basel system, but a serious reassessment from first principles. That is what this paper seeks to provide. In particular, it aims to offer a (fairly) readable guide to the policy economics of the Basel system: the underlying issues and objectives of the main players, the policy issues Basel presents, the effectiveness of the system, and how it might be reformed. It seeks to outline the big picture and, as far as possible, avoid the vast and oppressive minutiae that render this subject almost impenetrable to the outsider.[1] At the same time, it highlights the most innovative and ambitious feature of the Basel sys-

tem: the principle of "risk-based regulation," which attempts to build a capital adequacy regime on firms' own risk models using the rapidly evolving practices of modern financial risk modeling.

We suggest that the Basel system suffers from three fundamental weaknesses. First, financial risk modeling provides the flimsiest basis for any system of regulatory capital requirements. This is, in part, because of the intrinsic weaknesses of such models, in part because physical science models do not easily carry over to social and economic problems, and in part because of basic economics—that is, neither the models nor the regulators' use of those models allow for the bankers' incentive to produce low-risk estimates to obtain low regulatory capital charges. Taken together, these factors suggest that risk-based regulation is fundamentally unsound even in principle, let alone in practice.

The second weakness consists of the incentives that Basel creates for regulatory arbitrage, typically taking the form of securitizations designed to produce lower regulatory capital charges. Indeed, it is no exaggeration to say that the Basel capital rules are the primary factor driving the securitization bonanza of the last two decades, the main consequence of which has been to greatly weaken the financial system by depleting it of much of its capital.

The third weakness is regulatory capture. The key players in the modern banking system have little interest in maintaining high levels of capital or even practicing serious risk management. Both are drags on the short-term profit-making (via excessive risk taking) that really drives the system. Again and again, they have been able to overwhelm the feeble attempts of the regulatory system to control them, capturing the regulatory system and manipulating it for their own ends. We suggest that this weakness is simply intractable and that any worthwhile reform of financial regulation needs to start from the premise that capture will be inevitable.

These weaknesses suggest that Basel III has much the same chance of success as its predecessors—that is to say, none. Its rules are reminiscent of King Canute ordering the incoming waves to stop rising. In the case of the modern financial system, the waves are the endemic incentives to excessive risk taking, particularly those associated with government-subsidized risk taking such as deposit insurance, the lender of last resort, and the now-established doctrine of "Too Big to Fail." These waves are now so strong that even another massive overhaul of Basel would still leave the financial system open to being overwhelmed when the next wave of crisis occurs, which will probably happen sooner rather than later.

This said, the financial system *can* be fixed, but to do so would require much more radical reform. This would include the abolition of central banking and deposit insurance, the repudiation of "too big to fail," and the establishment of reforms to extend the personal liability of key decisionmakers—in effect, reverting back to a system similar to that which existed a century ago. At the same time, the restoration of a sound monetary standard—or at the very least, the abandonment of monetary policy activism typified by successive Federal Reserve chairmen Alan Greenspan and Ben Bernanke—would put a stop to the central bank stoking the highly damaging boom-bust cycles of recent years. The combination of extended liability, market forces, and sound money would then force the banks to become safe and stable again: their capital levels would rise and excess risk taking would be reined in because the risks would again be borne by the risk takers and not innocent parties—most obviously, the taxpayers. Within that context, the capital adequacy "problem" would disappear; capital adequacy regulation would become redundant and could be safely scrapped.

A Tale of Two Banking Systems: American Banking Then and Now

The issue of bank capital adequacy is best understood in historical context.

Basel capital rules are the primary factor driving the securitization bonanza of the last two decades.

American banking a century ago was very different from what it is today.[2] In those days, there were no systems of deposit insurance or capital adequacy regulation, and no central bank. The preeminent financier of the time, J. P. Morgan, chose to operate his firm as a partnership with unlimited liability. This meant that with every deal his firm undertook, Morgan put his own personal wealth, and not just his shareholding, on the line. This liability made for conservative banking: risk taking was limited and credit was extended cautiously; relationships were carefully cultivated with a focus on long-term profitability and not short-term results. Even where banks operated with limited liability, bank shareholders were often still subject to double liability—they were responsible in bankruptcy to a liability of twice their shareholding—and/or shareholdings were often still only partially paid up, meaning that shareholders could be required to pay up their remaining shareholder obligations in bankruptcy. These practices of unlimited and extended liability and partially paid-up shareholdings gave partners and shareholders strong incentives to exercise tight corporate governance, which led to careful risk taking. Banks were also very highly capitalized by modern standards—American banks operated with capital ratios not far short of 20 percent—and, although capital was always expensive, there was no perception of a bank capital adequacy problem or of any need for extensive systems of capital adequacy regulation along modern lines.

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This conservatism in banking practice was also due, in part, to the absence of deposit insurance and any official lender of last resort as they exist today in the Federal Deposit Insurance Corporation and the Federal Reserve, respectively. A bank always had to operate subject to the threat of a run in the event that it lost the confidence of its depositors. Therefore, a bank had to cultivate and maintain that confidence by reassuring its depositors that it was well capitalized and not taking excessive lending risks: the threat of a run kept the bankers in check and kept the banks themselves strong.

The system did experience occasional crises, but as time passed the banks evolved ways of responding to them. This private-sector resolution of financial crises centered on bankers' clubs, which would issue emergency loans to banks in difficulty, provided those banks were considered sound, while throwing the unsound ones to the wolves. The most famous example occurred in 1907, orchestrated by Morgan from his personal library with no federal government involvement.

The earlier American banking system differed from its modern counterpart in a number of other notable respects:

- In lending, the "originate to hold" model predominated—banks would make loans from their own deposits, and then would hold those loans until maturity. Banks focused on their core function of credit assessment: by keeping loans on their books, banks were liable for their own credit mistakes and hence were incentivized to be careful with the credit they extended. It was in the mutual interest of all concerned to build up long-term relationships. Therefore, relationship banking was paramount, and "name"—whether it was the good name of the bank or of the borrower—was all-important in maintaining the trust on which depositor confidence and access to future credit depended.
- Banks' positions were relatively uncomplicated and fairly transparent, given the limited disclosure practices of the time. A bank depositor could easily assess the financial health of his bank and decide whether to withdraw his deposit. Similarly, a bankers' club could easily assess whether a bank asking for assistance in a crisis was fundamentally sound or not.
- Banks did not get involved with derivatives or complicated securitizations

that were difficult to value and even more difficult to risk-manage. Financial product innovation was a slow and steady process: new products were usually developed by investment banks and only became widely accepted after they had gone through the crucible of having survived a market downturn in reasonable shape. Also, there was little need for financial engineering and (thankfully, given its recent achievements) only limited ability to do it before the advent of the computer.

- There was no need for a separate "risk management" function in the modern sense of the term. In essence, risk management was the assessment and management of the risks of individual loans or underwritings, a task that the bankers of the day performed very well and much better than many of their modern counterparts.
- Trading activities and bonuses were limited and of little significance.
- Last but not least, government involvement was extremely limited. Not only was there no central bank and no deposit insurance, there were also no equivalents of government-sponsored enterprises (GSEs), such as Fannie Mae or Freddie Mac, offering government guarantees to bundles of securitized mortgages. There also were no government policies to push homeownership and there was no expectation of a federal bailout if banks got into difficulties.

This model worked because the principle decisionmakers—those who extended credit—bore the consequences of their own mistakes in a context of well controlled conflicts of interest.

It is important to note the basic logic of the system: extensive liability leading to tight corporate governance, in turn leading to conservative risk taking and maintenance of adequate capital—in an environment *sans* central bank and with minimal government intervention.

Modern American Banking

Fast forward to the eve of the recent financial crisis and the system is transformed completely. The practices of extended liability and partially paid capital had fallen into disuse, and the old system of shareholder capitalism based on strong individual shareholdings had given way to managerial capitalism, giving senior managers the upper hand. The remaining investment-bank partnerships started to disappear in the 1980s, led by Salomon Brothers under CEO John Gutfreund. Converting the partnerships to joint stock form allowed the principals involved to get their hands on the accumulated capital that the investment banks had built up over many decades. The CEOs of other firms on Wall Street voiced their disapproval, but then gradually followed suit themselves—with Goldman Sachs being the last to make the transition in the late 1990s. These changes led to a significant weakening of the corporate governance mechanisms: senior management was no longer incentivized to take the long-run perspective and shareholder capital was now seen as so much more "dumb money" that they could manipulate for their own ends. These changes also combined to create and intensify a major disconnect between the interests of shareholders and those of senior managers, whose remuneration skyrocketed.

Leverage ratios soared and investment banks had average leverage ratios of 30 to 1 by the end of 2007.[3] These were exceedingly high by traditional standards, and especially so in speculative boom conditions, but even these ratios greatly understated banks' true leverage because of the hidden risks involved in their off–balance sheet and derivatives positions. The investment banks were now severely undercapitalized just as the crisis was about to hit. For their part, the commercial banks were in little better shape, with average leverage ratios of about 15–20 to 1, which also greatly understated their true leverage because of their myriad off-balance-sheet vehicles.

These incentives led to the most distinctive features of the modern system, including

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a huge amount of trading activity and a shift in focus toward short-term results and the next bonus. Concurrently, within the banks, there was a major power shift away from traditional bankers and corporate financiers toward the traders, whose own remuneration sometimes vastly surpassed that of the senior management, who were now grossly overpaid themselves. Additionally, there was major growth in derivatives, securitizations, and financially engineered products generally. Many of these "innovations" involved new forms of creative, and often hidden, risk taking, but they were also very remunerative for their designers. Some prominent examples were mortgage-backed securitizations based on subprime mortgages and credit derivatives such as credit default swaps (CDSs), both of which proved to be highly toxic in the recent crisis: the latter in particular are the archetypal financial "weapons of mass destruction." In short, there was a major shift towards short-term risk taking, the profits of which were privatized, whereas the risks and losses were passed on to others and effectively socialized.

Unlike the early 20th-century model, the modern system was characterized by extensive state intervention, including the establishment of a central bank in 1914 and federal deposit insurance in 1934. Over time, the former took on an ever expanding "lender of last resort" role and the latter offered banks protection against bank runs. Both of these developments enabled banks to take more risks than they would otherwise have taken and reduce both their liquidity and their capital ratios below the levels they could have successfully maintained before. It was noteworthy, for example, that American banks' capital ratios fell sharply in the aftermath of the establishment of deposit insurance—from 14.1 percent in 1934 to only 6.2 percent in 1945.[4] In later years, after the bailout of Continental Illinois National Bank in 1984, and even more so after the bailout of Long-Term Capital Management in 1998, banks could also anticipate bailouts if they got into difficulties. The larger banks could also regard themselves as being "too big to fail," thus further encouraging their irresponsible risk taking. In addition, accommodative monetary policy, especially the Greenspan-Bernanke "put," artificially inflated asset prices and helped create a series of asset price boom-bust cycles from the mid 1990s onwards. In short, government and central bank interventions were now encouraging banks' excessive risk taking and further destabilizing the financial system. Smugly, if candidly, Salomon Brothers' Gutfreund summed up the modern system three years ago: "it's laissez faire until you get in deep [trouble],"[5] at which point it is no longer your problem, but the taxpayers." The recent bailouts, of course, then made these incentive problems very much worse.

The modern system is therefore rather different from its pre-1914 predecessor. Today, weak corporate governance—itself a product of state interventions to limit the liability of key decisionmakers—leads to out-of-control moral hazard problems, excessive risk taking, ineffective risk management, inadequate capital, and increased systemic instability.

Instead of bank capital requirements being determined by the banks themselves, motivated by the desire to remain financially strong over the long term, we now have a situation where key decisionmakers simply see capital requirements as a constraint on short-term profitmaking. This creates the potential for a "race to the bottom," in which the competition for profits leads banks to ever lower capital standards—and, hence, an ever weaker banking system.

It was against this secular backdrop that the capital adequacy issue gradually rose up the regulatory agenda.

American Capital Regulation

American banks have been subject to capital regulation in one form or other since the antebellum period. This took a variety of forms, but one of the most significant was

the use of maximum leverage ratios. However, these were crude metrics, not least because they made no allowance for the risks inherent in banks' positions.

Various attempts were made over the years to improve these metrics. Perhaps the most important was the development of what later became known as the "standardized approach" (also sometimes known as the "risk-bucket" or "building-block" approach) by officials in the New York Fed and the Board of Governors in the 1950s. The idea was to group assets by their level of riskiness. Assets in each group would be given a fixed "risk weight" and the minimum capital requirements were calculated by multiplying the size of each asset class by its risk weight. These weights included 0 percent for assets classified as "riskless" (e.g., cash or short-term U.S. debt); 5 percent for "minimum risk" assets (e.g., longer-term U.S. debt); 12 percent for "normal risk" assets (e.g., performing loans); 20 percent for "substandard" assets; and 50 percent for "workout" assets (i.e., those that can only be recovered by foreclosure).[6]

This new system was far from perfect, as both the risk classifications and resulting risk weights were crude, but it did take account of the broad levels of riskiness of different assets based on past experience. The system also worked tolerably well for a long time because it produced conservative capital requirements, banks' positions were straightforward, and economic conditions were fairly stable until the 1970s.[7] This standardized approach was to become the model for the later Basel system.

The Basel Regime: Basel I and Basel II

The origin of the Basel system[8] can be traced to the aftermath of the serious disturbances to banking and currency markets that followed the Herstatt bank failure in 1974.[9] The resulting Basel Committee on Banking Supervision was to provide a cooperative forum for the central banks of member countries to discuss banking supervisory matters, and its initial focus was simply to establish rules for bank closures. In the early 1980s, however, the committee became increasingly anxious about the capital ratios of the major international banks, which were deteriorating at the same time as the international environment was becoming more more risky. The committee sought to reverse this deterioration and strengthen the banking system while working toward greater convergence across different countries' national capital requirements. Thereafter, the committee experienced one of the most remarkable cases of mission creep in history. Over time, the Basel system transformed into a vast transnational regulatory empire that spawned a huge cottage industry of parasitic "Basel specialists" whose sole purposes were to interpret and implement the ever-expanding Basel rulebooks. This Basel empire is still growing strongly and, thanks to its own repeated failures, is likely to expand much further yet.

The metric on which these original Basel capital requirements were to be based was the standardized approach, which by this time was already being used by a number of central banks to determine their own national capital standards. The new system, the Basel Capital Accord, or "Basel I," was approved after much negotiation in 1988 and was implemented in 1992. Under this system, any asset on a bank's balance sheet would be given a highly judgemental risk classification and, dependent on that, an arbitrary fixed-risk weight between 0 and 100 percent. (The original Basel Accord dealt only with credit risk, so "riskiness" in this context referred to the risk of default by the issuer.) At one extreme, a risk weight of 0 percent would be given to the safest assets, such as the government bonds of countries in the Organisation for Economic Co-operation and Development. At the other extreme, the supposedly riskiest assets (e.g., corporate bonds) would be given a weight of 100 percent. Assets of intermediate risk would be given weights of 10 percent, 20 percent, and so on. "Risk-weighted assets"

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were then obtained by multiplying the size of each asset by its risk weight. Basel I then specified minimum capital requirements for core capital ("Tier I" capital, consisting of equity, preference shares, and some debt-equity hybrids) and supplementary capital ("Tier II" capital, consisting of subordinated debt and other debt/equity hybrids), both equal to 4 percent. Thus, total capital—Tier I capital plus Tier II capital—was to be at least 8 percent of risk-weighted assets.[10]

Various amendments were issued over subsequent years, the most significant of which was the Market Risk Amendment (MRA) in 1996. The MRA specified capital requirements for banks' market-risk positions such as positions in equity, foreign exchange, traded debt, commodities, and many derivatives. It also allowed approved banks the option of having their capital requirements determined by their own internal risk models or, more precisely, by models that used the Value-at-Risk (VaR) risk measure that was then taking the financial world by storm. The adoption of the MRA now signified that bank regulators had accepted the principle of risk-based regulation; thereafter, they were hooked on it.

These developments took place against the background of extensive lobbying by the industry. At the time, there was mounting concern about financial derivatives because of a number of recent scandals—Procter & Gamble, Orange County, and others in the early 1990s—and influential calls for greater regulation of financial markets. The industry responded to these calls with a highly effective lobbying campaign that, despite the occasional derivatives scandal, left the industry more or less free to police itself.

Apart from lobbying influential politicians and use of effective public relations, the industry also produced a number of reports about best practices in financial risk management—how to manage the risks of derivatives, and so on—the most important of which was the Group of 30 Report in 1993. This highly influential report became the handbook of the newly emerging discipline of financial risk management, and its guidelines about good practice were readily accepted by industry and regulators alike. They were so well received, in fact, that they soon found their way into the regulators' own supervisory manuals. The relationship between the regulators and the firms they regulated was, to say the least, uncommonly cozy, and not least because of the revolving doors operating between larger institutions and the regulators.[11]

This was also the peak of the "VaR Revolution," when VaR models were all the rage and only a few people recognized their weaknesses. In this atmosphere, the industry had no difficulty persuading the Basel Committee that such models would provide a better basis for regulatory capital requirements than the standardized approach, whose weaknesses were already becoming apparent. Nonetheless, the regulators' acceptance of the principle of risk-based regulation created an obvious moral hazard from their point of view: it gave institutions an additional incentive (as if they did not have enough already!) to produce models that delivered low VaR numbers.

At the time, VaR models were still restricted to the estimation of market risks, but they were soon to be applied to credit and operational risks as well. Consequently, once the regulators had bought into the principle of risk-based regulation, it was only a matter of time before it would be extended to other types of financial risk as well. In any case, the regulators had already accepted that the regulatory system needed to keep up with developments in financial risk management and to provide incentives for future improvements. However, the only realistic way to encourage a bank to choose to have its capital requirements determined by its risk models is if doing so leads to lower capital requirements than the alternative—after all, few institutions would freely opt for an internal model option that would penalize them by delivering higher capital requirements.[12] In short, everyone, including the regulators, was now pushing for risk-

based regulation—but only when it would lead to lower estimates of financial risk![13]

Basel II

By the late 1990s, it was being argued that the Basel accord needed a major overhaul. The banks were becoming more sophisticated and risk management and risk modeling were rapidly evolving—especially in the area of credit risk. Accordingly, in 1999, the Basel Committee issued a proposal for a new capital adequacy framework, the main stated objectives of which were to better align regulatory capital with banks' risk taking and take better account of recent financial innovation (e.g., in securitization), while continuing to incentivize improvements. The underlying reality, however, was that the path to Basel II was really determined by the large banks, who wanted recognition for their models so they could reduce their capital requirements and further increase their profit margins.[14]

After a very long and highly politicized process—and a lot of industry lobbying—Basel II was finally published in June 2004. The new framework involved major changes to the credit risk models and, for the first time, brought operational risks within the Basel ambit.

Basel II was based on a new three-pillar principle:

- **Pillar 1:** minimum regulatory capital requirements based either on standardized approaches or on banks' own internal risk models;
- **Pillar 2:** supervisory review of institutions' capital adequacy and internal risk assessment processes; and
- **Pillar 3:** market discipline to make banks safe and sound, aided by the effective use of disclosure.

As with its predecessor, Basel II's focus was on capital adequacy, but with the stated intent of encouraging good risk-management practices—seeking to encourage a strong risk-management culture throughout the organization, and so much other hot air—and achieving a strong and stable financial system.

For market risks, Basel II involved no major fundamental changes to Basel I. However, whereas Basel I offered a single approach to calculating regulatory capital for credit risk, Basel II offered banks a choice of up to three different approaches, depending on the level of sophistication of the bank concerned. (The term "level of sophistication" is just a euphemism for "how big.") The first of these is a revamped standardized approach, which has the novel feature that, for some types of credit risk (notably, loans to sovereigns, corporations, and banks), the risk weights are tied to the borrowers' external credit ratings; for other types of risks, however, the risk weights are fixed. In addition, approved banks could also use their own internal models to determine their credit-risk capital requirements. This Internal Ratings Based approach (IRB) comes in two forms: a foundation approach, in which banks would estimate their positions' default probabilities and a supervisor would set values for loss given default, exposure at default, and loan maturity; and an advanced approach for the sophisticated (i.e., larger) banks, in which all these parameters would be estimated by a bank's own model.

For operational risks, Basel II also offered a choice of up to three approaches, depending on the bank's level of sophistication:

- a basic approach in which operational risk charges are equal to a proportion (usually 15 percent) of the average of a bank's annual gross income over the previous three years;
- an intermediate approach in which capital charges are allowed to depend on the gross income by line of business; and
- an Advanced Measurement Approach (AMA) in which qualifying banks are allowed to use their own internal operational risk models to determine their operational risk capital charges.

Thus, there is the public face of Basel II, the

Banks approved by Basel II could use their own internal models to determine their credit-risk capital requirements.

Dr. Jekyll who offers superficially plausible principles about the need to build on market developments, especially in modeling and securitization, and stresses the need to incentivize capital requirements. At the same time, there is also the hidden side of Basel II—the Mr. Hyde—who represents the unscrupulous self-interest of the big banks and is solely concerned with gaming the system to achieve lower capital charges, higher upfront profits, and higher remuneration for himself.

Modern Financial Risk Modeling

As we have already noted, one of the main objectives of Pillar 1 is to encourage the larger institutions to use their own risk models to determine their regulatory capital requirements and, in doing so, build capital regulations on evolving best practice in risk modeling.[15]

Yet risk modeling offers a very shaky foundation for either capital adequacy or good risk management. Indeed, it has a number of fundamental problems.

Assumption of Stable "Laws of Motion"

One such problem is the maintained belief that quantitative methods from the natural sciences, particularly physics, can be applied mechanically to social and economic problems.[16] This belief is naive for a number of reasons, but one of the most obvious is that the processes governing the operation of financial markets (and more generally, any social system) are not immutable "laws" comparable, say, to the laws of physics. Any social system is changing all the time—as the Greek philosopher Heraclitus put it, you can never step into the same river twice. In social systems, including financial markets, time-invariant phenomena, if they exist at all, are the exception rather than the rule. This is one of the reasons why financial "rocket science" is much more difficult than the real thing.

The comparative absence of stable "laws" is, in part, because the broader environment in which markets operate is itself always changing. This absence is also partly due to the variety of ways in which people respond to the environment and interact with each other. Pricing relationships fluctuate with supply and demand conditions, for instance, and other relationships are simply the temporary consequences of unusual conditions or the result of policies (e.g., exchange-rate policies) that are apt to change. There is, relatedly, a great danger of identifying spurious, but superficially plausible, patterns that are little more than accidental and have no serious predictive value.

In addition, the phenomena measured in physics typically do not change with the measurement itself or with the ways that the observer uses those measurements. The well-known exception, the Heisenberg Uncertainty Principle, is a feature of subatomic particle physics, but it does not affect cosmology or those problems where Newtonian physics gives good answers. In finance, by contrast, the financial equivalent of the Heisenberg principle is much more prevalent. The act of modeling a financial process over time—such as the movement of a stock price—will often lead observers to react in ways that affect the process itself—for example, by adopting a particular risk-management strategy. If enough risk managers adopt the same strategy, however, then that strategy will likely affect the dynamics of the stock price itself.

Nonetheless, one feature that one can confidently identify in financial markets is the apparently random oscillation between "normal" periods, in which markets are stable, and "crisis" periods, in which markets are volatile. Most of the time, markets are fairly stable: volatilities and correlations are low, pricing relationships are steady, markets are liquid, credit is both cheap and easily available, and returns are good. However, once in a while, a crisis emerges and all the above phenomena disappear: volatilities rise, correlations radicalize, relationships break down, credit and liquidity dry up, risk-management strategies that had previously worked well unravel, and financial institutions suf-

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fer large losses. Financial markets have fluctuated between these alternate states since their inception, and one cannot predict what will happen in the one state from what happened in the other. A good analogy may be with fluid dynamics: markets generally follow a pattern of streamlined flow, obeying one set of equations, with only local instances of turbulence where those equations break down. But in extreme circumstances, such as those of 2007–2008, the turbulence spreads throughout the markets, causing a general breakdown of systems.

A final key difference between physical and social models of behavior is that physical models ignore the ways in which thinking agents react to, and try to anticipate, each other. From this perspective, the basic physical model can be described as a "game against nature": the intelligent human agent interacts with nature, and nature responds predictably (and unintelligently) in accordance with its own laws. However, the physical "game against nature" is a poor analogy for many important problems in economics, finance, and society in general. Instead, many of these problems are characterized by strategic interaction or economic games and can only be understood if one takes account of how intelligent agents interact.

Parameter Problems

Then there are the problems of calibrating the parameters of any model, and those of financial markets are notoriously difficult to calibrate. The biggest problem, by far, is that parameters are usually calibrated by estimates based on historical samples, and are almost always very sensitive to the choice of sample period, which is itself arbitrary. So if the historical sample period is one in which markets were quiet, then estimates will reflect that quietness and any resulting risk estimates will be low. Conversely, if the sample period is a volatile one, risk estimates will be high. The problem for risk modelers is that they need to choose a sample period that is believed to be relevant for the horizon over which they are trying to forecast, but what is relevant, to a large extent, begs the question at issue: after all, one does not know in advance whether future conditions will be stable or not.

This also means that if one estimated almost any model using data from the "Great Moderation" period from the early 1990s to early 2007, then that model's calibration is unlikely to provide an accurate forecast for conditions in the recent financial crisis. A model of a portfolio of subprime mortgages calibrated on Great Moderation data would suggest a much higher value and much less risk than was subsequently revealed in the crisis.

Among the most difficult parameters to forecast are the correlations between financial returns. These are important for risk models because correlations take account of how the risks diversify within a portfolio—the more they diversify, the lower the portfolio risk. Most of the time, in normal market conditions, estimated correlations tend to be moderate (and, even then, they still tend to move around quite a bit) and suggest both a fair degree of diversification and a fairly low risk. However, under crisis conditions, correlations will often suddenly radicalize: portfolio diversification then evaporates and the estimated risks rise sharply. The portfolio can experience losses that are orders of magnitude larger than earlier risk forecasts had anticipated. We saw this with the hedge fund Long Term Capital Management (LTCM) in the summer of 1998 and many times during 2007–2008.

A related problem is that many correlations are merely temporary phenomena and often a product of policy. The standard example is the correlation between two exchange rates, which depends on the relevant countries' central banks' policies: an exchange rate can be very stable for years and then suddenly jump when a central bank changes its policy, which is usually in response to a crisis. This has happened repeatedly with the Mexican peso, for example.

Yet the problems of estimating correlations between financial returns pale beside

Many correlations between financial returns are merely temporary phenomena and often a product of policy.

The very circumstances that would lead one mortgage to default are likely to lead others to default as well.

those of estimating the correlations between defaults, and these correlations are the key parameters governing credit-risk portfolios. To start with, one has to estimate default probabilities. How do you estimate the probability that a particular firm, which (typically) has not yet defaulted, is likely to do so over the next year or so? You might, perhaps, collect data on the default histories of other, apparently similar firms, but no two firms are the same and often such data are very limited anyway. Even if you have the luxury to choose, what is the relevant historical period? Defaults tend to follow the business cycle, and if you choose a relatively benign historical sample period, your results will give you little sense of what to expect if the economy tanks. About the only sensible thing you can do is try to build a model of how defaults—including the possibility of multiple defaults—might be related to relevant factors such as the business cycle, but you still have the problems of finding suitable data, choosing a relevant sample period, and so on.

Unfortunately, financial valuations and risk assessments are very sensitive to these elusive parameters. To give an example, which also illustrates what went wrong with collateralized debt obligations (CDOs) in 2007–2008: suppose we have a portfolio of 100 mortgages, all roughly comparable, and we think the probability of default on any one of them is, say, 4 percent a year. We build a CDO with a set of tranched claims against it, with the lowest tranche absorbing the first 10 defaults, and so on. Now consider two alternatives.

First, if we now make the all-too-convenient assumption, commonly made in years before the recent crisis, that defaults are independent—that is, the correlation between defaults is zero—then the probability of the lowest tranche experiencing 10 defaults (and hence of an investor in the first tranche losing all his investment) is 0.22 percent. This looks pretty safe. Similarly, if the second tranche is exposed to the next 10 defaults, then the probability of an investor in that tranche losing all his investment is 0.00000004 percent, which also looks very safe. The more senior tranches are apparently even safer. So it is no wonder that the upper tranches of these securities seemed to be so safe that their originators described them as "supersenior"—even safer than U.S. government debt.

Second, the reality is that the very circumstances that would lead one mortgage to default are likely to lead others to default as well: defaults might be related to the state of the economy or housing market. To deal with this and be on the safe side, we might assume that the default correlation is 1. In this case, if one mortgage defaults, then they all default, and so the probability that all of them default is 4 percent. Moreover, since we probably did not take account of downturn conditions, the true probability of them all defaulting is more likely to be 20 percent or more if we are talking subprime, in which case the probability that all the tranches will default, including the most senior, is also 20 percent or more. In this case, what appeared earlier to be supersenior is actually supertoxic.

In the one case, the CDO seemed to have a high value and be extremely safe, but in the other, its value is much smaller and its true riskiness is revealed: it all depends on what we assume about default probabilities and, especially, default correlations.

We see here the dangers of mark-to-model valuation methods, which can produce notional valuations with little or no connection to market reality. We also see the impact of modern financial alchemy, in which underlying garbage can be magically transformed into securities of the highest quality: we take a bunch of subprime mortgages with poor credit ratings, build a CDO and, voilà, we generate tranched securities that are even safer than U.S. government debt—at least until the market collapses and reality reasserts itself.

These problems go to the heart of what was wrong with the calibration of credit derivatives models: it is no wonder credit de-

rivative portfolios collapsed in value when the crisis hit!

Problematic Models

The subprime mortgage products also point to deeper issues with the design, calibration, and use of modern financial models. In the early years of CDOs, these products were hampered by the absence of a suitable model, and practitioners hankered after some equivalent to the famous Black-Scholes-Merton option pricing model of the early 1970s, which had kick-started the growth of options markets. The industry needed a plausible credit-risk model that took into account the way defaults were correlated. The industry's dreams seemed to come true in 2000, when Wall Street statistician David X. Li proposed such a model based on a statistical approach known as a "Gaussian copula." This model could be calibrated using whatever data were available and then used to value CDOs. The industry seized on the Li model with great enthusiasm and the market for CDOs and CDO-derivative products took off. By the end of the 2007, these had grown to about $35 trillion in notional principal.

Without going into detail, the model itself contributed to the financial crisis in at least two different ways. First, it took limited account, at best, of the factors driving defaults—such as the state of the business cycle—and was calibrated using data from the Great Moderation period. Unfortunately, since such data could give no indication of how bad things might get in a major downturn, the models were blind to the real risk exposures. For example, AIG Financial Products modeled its CDOs using a copula calibrated with whatever data they could get—and then, to be on the safe side, they stress-tested their valuations. AIG thought they were being conservative, but it turned out that their stress tests were not nearly stressful enough, and the model's inadequate valuations contributed directly to AIG's ruin and to the subsequent crisis.

Secondly, the fact that the Li model gave product designers a purportedly solid valuation engine for CDOs encouraged them to design more "sophisticated" products based on the plain-vanilla CDO model. These included synthetic CDOs (in which pools of corporate bonds were replaced with credit default swaps) and "CDO-squareds" (in which bond pools were replaced with CDOs). These products involved one very risky structure built upon another, and the risks involved were often hidden. In short, the development of the model itself led to a spurt of highly destabilizing financial "innovation" that could not otherwise have occurred.[17]

Gaussianity

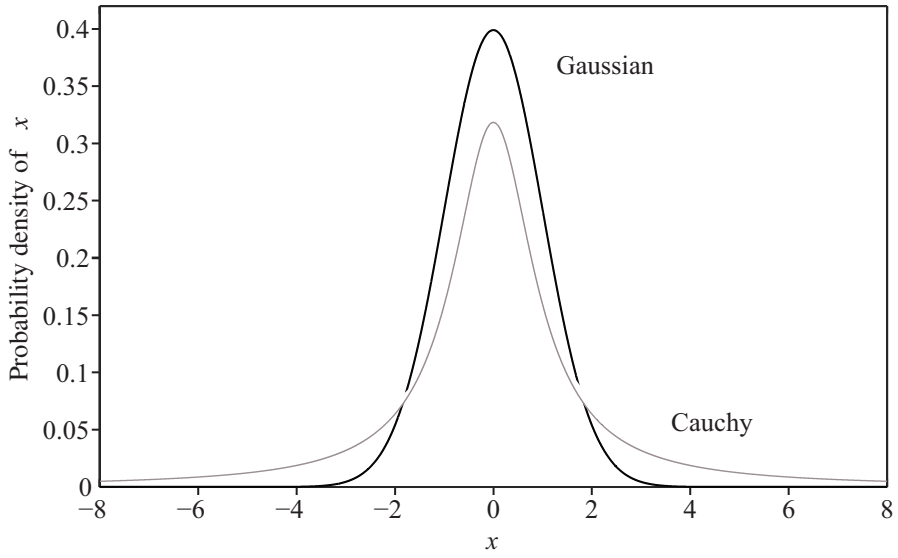
Another problem involves the common assumption that risks can be modeled by a Gaussian distribution, often known as a normal distribution or bell curve. The Gaussian distribution (illustrated in Figure 1) is a very convenient distribution and is a good approximation to many real-world distributions. Unfortunately, it also provides a very poor fit to the tails of the distributions in which risk modelers are (or should be) mainly interested, and there is abundant evidence to indicate that financial returns are far from Gaussian.

A colorful example of the inadequacy of the Gaussian occurred in August 2007, when Goldman Sachs' CFO David Viniar admitted to being puzzled by a series of "25–standard deviation moves" hitting his institution, implying that Goldmans was very unlucky—as opposed to the more obvious explanation that Goldmans was merely incompetent.[18] His comments were widely ridiculed and a number of commentators rushed to point out that a single 25–standard deviation event was likely to occur only once in 10,000—or even 100,000—years.

However, even these estimates were way off the mark. Under a Gaussian curve, a single 25–standard deviation event would in fact occur in one day in every 10^{137} years.[19] To give a sense of magnitude, 10^{137} is equal to the number of atoms in the universe (10^{79}) multiplied by the nanoseconds since the big bang (10^{26}) times all the cells in the

There is abundant evidence to indicate that financial returns are far from being Gaussian distributions.

Figure 1
Standard Gaussian and Standard Cauchy Distributions



bodies of all the people on earth (10^{23}) multiplied by one billion . . . more or less.[20] Such an event is about as likely as Hell freezing over. The occurrence of even a single such event is therefore conclusive proof that financial returns are not Gaussian—or even remotely so.

To be plausible, risk models need to be based on alternative distributions to the Gaussian. Among the more promising distributions are the stable Paretians: these have certain desirable theoretical properties, but are also plausible because the interconnectedness of network interactions often gives rise to distributions that have stable Paretian characteristics. Many crises are characterized by a system that is stressed by a failure in a key node that then produces a cascade of further failures in its wake. Much like power outages and fires caused by hot dry weather, we often see the same effect in financial systems: the entire system gets stressed and a key element fails, starting off a chain reaction of further failures. In the financial context, a stable Paretian model will often provide a good estimate of the losses involved.

To be plausible, risk models need to be based on alternative distributions to the Gaussian.

In risk management there is also a premium on prudence: it is better to make assumptions that, if biased, are biased on the conservative side. After all, it is better to be careful a hundred times than to get killed just once. The most conservative of the stable Paretians is the Cauchy distribution, which is illustrated below, along with the Gaussian for comparison.

What is most striking about the Cauchy is its long drawn-out tails, implying that extreme losses are *much* more likely than under the Gaussian. To illustrate, under the Gaussian shown in the figure, a loss of $x = 4.47$ (a 4.47-sigma event under the Gaussian) would occur 1 day in just over 1,000 years. Under the Cauchy, by comparison, we would expect the same loss to occur in just over 14 trading days, and the waiting time for a 25-sigma event is a mere two and a half months. This is almost certainly too extreme—25-sigma events do not occur *that* frequently—but the main points here are simply that (1) the likelihood of extreme outcomes is itself extremely sensitive to the assumed distribution; and (2) the Gaussian is extremely implausible.

There are further complications. Up to this point, we have implicitly assumed that we are dealing with a single type of position whose losses have a particular statistical dis-

tribution. But, actually, we are often dealing with many different positions, and each of those has its own distribution. We can then, perhaps, estimate each of these distributions and then estimate their risk measures—but, in practice, we would dearly love to be able to aggregate these risk measures to produce an estimate of our overall risk. This turns out to be something of a holy grail and, as so often in the risk-modeling area, we have an answer in theory that does not really work in practice. This answer is provided by the statistical theory of copulas, such as the Gaussian copula discussed above: we take each separate distribution, fit a copula (or a correlation structure) across them, and then obtain a multivariate distribution from which we can estimate our overall risk measure. Unfortunately, this only works well in toy examples. We might be able to aggregate over most of our market risks, for example, but to estimate the overall risk of our market and credit risk positions still remains elusive. It follows, then, that although we can estimate the risk of this or that portfolio on a stand-alone basis, and can occasionally aggregate certain risks, we cannot reliably estimate total risk exposures at an institutional level and, realistically, will never be able to.

The Inadequacies of Value at Risk

Another major problem is that most risk models use the VaR, which is a particularly inadequate measure of risk. The VaR itself is simply the maximum likely loss, where the term "likely" is to be understood in probabilistic terms. For example, the VaR at the 99 percent probability (for short, the 99 percent VaR) over a horizon of a day would be the highest loss we would expect on 99 otherwise similar days out of 100. Put another way, the VaR gives us the worst we can do on the 99 best days out of a 100. It does not, however, tell us anything about how badly things might go on the remaining bad day. This is a most unfortunate property for financial risk management, where it is the tail events—the very large losses—that matter. After all, it is the large losses that can be bankrupting.[21]

These problems have been recognized since the mid 1990s. For the most part, however, the financial risk management profession has ignored these problems and the VaR remains the dominant financial risk measure in use. One can only speculate that the continued widespread use of VaR and the Gaussian distribution might have something to do with the fact that they produce low estimates of risk and therefore serve the interests of those who want low-risk estimates.

Fortunately, there are good alternatives to the VaR:

- There is the expected shortfall, which shows what one can expect to lose if a tail event occurs—what to expect on that one bad day. This measure has been used by actuaries for many years.
- There is the probable maximum loss, the biggest loss from a set of simulated loss scenarios.
- There is the loss from a stress test, or "what if?" scenario, which will often reveal problems that no other method could identify, such as taking account of what might happen in hypothetical bad-case scenarios.

These risk measures are much better than the VaR, but they also tend to produce higher risk estimates. This is good for risk management, but will not appeal to firms that wish to use their risk models to determine their regulatory capital requirements.

Inaccuracy

Many risk models are also highly inaccurate, even under ideal circumstances where risks are believed to be estimable in principle. Suppose we wish to estimate the 99 percent daily VaR on a portfolio and we suspect that the true distribution is somewhere between Gaussian at one extreme and Cauchy at the other. Let us assume a daily volatility of 2 percent, which is not unreasonable for most days. If we assume a Gaussian, then we would estimate the VaR to be 4.65 percent of the value of our portfolio, but if we assume

The continued widespread use of VaR and the Gaussian distribution might be because they produce low estimates of risk and therefore serve the interests of those who want low-risk estimates.

Models can be undermined by the ways in which people respond to them.

a Cauchy, we would estimate the same VaR to be 63.64 percent of the value of our portfolio. Thus, we think that the true VaR is somewhere between 4.65 percent and 63.64 percent—in other words, we have no real idea what it is.

It is therefore not surprising that VaR models can sometimes fail to give the remotest indication of the true risks to which a firm is exposed. A case in point is LTCM: its risk model estimated its daily 99 percent VaR in August 1998 to be about $30 million, implying that there was a 1-in-100 chance of a loss in excess of that amount, and yet LTCM's *average* daily losses in that month were about *three times* that figure.

This case might be extreme, but the problems with VaR systems are certainly widespread and well documented, even in the relatively benign (and hence predictable) conditions that existed prior to the current crisis. To give just one example, a study by Berkowitiz and O'Brien in 2001 examined the forecasting performance of sophisticated (and expensive) VaR models used by leading U.S. commercial banks. It found that they were highly inaccurate and were outperformed by the forecasts of simpler rule-of-thumb models.

Endogeneity Problems

Yet another problem is that models can be undermined by the ways in which people respond to them. Any risk-management system involves an attempt to control intelligent, self-interested agents who will respond to any control system by exploiting its weaknesses. So if traders are remunerated by the profits they make, and if the only way to make large profits is to take large risks, then they will take large risks—regardless of the interests of their employers. If the risks pay off, they make a nice bonus; and if they do not, it is only the bank's money that they have lost and they can always get another job elsewhere. They therefore have an incentive to take more risks than the employing bank would (or at least, should) like.

Banks traditionally responded to this type of problem by imposing position limits on traders, usually determined by risk-model assessment. From the traders' perspective, however, those position limits are a nuisance to be circumvented. Traders typically determine where the system is weak and "game" it accordingly: they build up positions whose risks are underestimated or missed completely by the risk model. One way to do this is to "stuff risk into the tails," for example, by traders selling options that are very unlikely to pay off. Many risk systems fail to pick up the risks involved and traders can then sell them with impunity. A similar problem arises with financial engineers who are incentivized to produce highly complex structures whose risks are incomprehensible, but which are highly remunerative for their designers.

Risk models and risk-management strategies can also be undermined by the way in which users utilize them. A common mistake is to design a risk-management strategy on the assumption that market prices are independent of what one is doing. This is a major problem with the big players in the market. For example, in its last year, LTCM had grown to dwarf its competitors. In late August 1998, when it desperately needed to sell positions to cover its mounting losses, it could not feasibly do so because its own size would have moved market prices against it and so precipitate more of the losses that were already pushing it into its death spiral.

A slightly more subtle mistake, made by LTCM and also those following portfolio insurance strategies in the October 1987 stock-market crash, is to implement a risk-management strategy that fails to take account of how other parties are behaving. Ignoring how others will behave is like assuming that you can safely get to the theater exit in the event of a fire, without realizing that everyone else will be running for the exit as well. The underlying problem here is the assumption that you are in a "game against nature," overlooking the point that you must consider not just "dumb" nature, but other self-interested actors who think the same way that you do.

Let us say you have come up with a VaR-based risk-management strategy that calls on you to reduce your VaR by selling risky positions in the event of a crisis. This makes sense in a game against nature, when you are the only person implementing this strategy, and everyone else carries on as before. If everyone sells in a crisis, however, then the collective reaction will itself exacerbate the fall in prices and create the danger of a positive feedback loop in which the crisis grows as it feeds off itself. Some initial trigger leads prices to fall and VaRs to rise. The increased VaRs then generate further sales as risk managers struggle to get their own VaRs back down, and the new sales cause further price falls and even higher VaRs. The collective attempt to get individual VaRs down destabilizes the market and, paradoxically, increases everyone's VaR in the process, inflicting the high losses that the risk-management strategy was meant to avert.[22]

Unknowable Risks

In this particular case, if we have no idea how many other investors might be following the same strategy as we are, then our risks are unknowable. In such cases, the safest assumption, but one seldom made in the financial markets, is to assume the worst case. So, in the earlier theater example, it is probably best to assume that if a fire breaks out, then everyone else will probably notice it, too—and we should expect a stampede for the exit. In the financial context, this suggests that we should seek to avoid following the herd and that the best strategy is a contrarian one: buying when everyone is selling in a panic. This, of course, is easier said than done, because most investors lack the acumen and resources of Warren Buffett.

Obviously, risk can also be unknowable even in the absence of strategic interactions, such as other parties implementing the same actions. To quote the former U.S. secretary of defense Donald Rumsfeld, "There are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns—the ones we don't know we don't know."[23] Mr. Rumsfeld's splendid comments were widely lampooned, but showed an excellent grasp of statistics.

This is a particular problem with operational risks—the risks of loss due to people or systems failures.[24] They range from the risks of running out of paperclips, at one extreme, to the risks of bankruptcy-inducing events such as uncontrolled rogue trading, which have brought down numerous financial institutions and severely damaged many more, at the other. The risks that can be predicted are those that occur frequently—running out of stationery, turnover of staff, and so on—and their probabilities and associated losses are fairly straightforward to estimate. The ones that matter—the probabilities and losses of extreme operational risk events, such as those associated with rogue trading—are much more difficult to estimate and are, in fact, unknown.[25]

Nassim Taleb gives a nice example in his book *The Black Swan*, which gives a good sense of the limits to quantitative risk modeling. He describes an unnamed casino in Las Vegas.[26] As one would expect, the management of the casino had a good handle on their core business risks: they understood gambling odds, diversified risk across tables, and had good systems to counter cheating. So where did they experience their main losses? Their worst loss was when their star performer, who had a popular tiger act, was incapacitated after his (hitherto friendly) tiger attacked him. Their second-largest loss occurred when a disgruntled former contractor decided to settle scores with the casino by dynamiting it. The casino's third-largest loss was caused by a clerical employee who failed to file tax reports on customer winnings over a long period of time, which exposed the casino to a major fine and nearly cost it its license. Their next-worse losses included, among others, the kidnapping of the casino owner's daughter, which led the owner to violate gambling laws by digging into the casino's coffers to pay her ransom. The point is that none of

The risks that can be predicted are those that occur frequently.

Financial modeling is highly imperfect and very judgmental.

these particular events could have been anticipated in advance: the "unknown unknowns" will always be there and we can never measure them, by definition.

Undermining by Senior Management

Perhaps the most difficult and intractable institutional problem with good risk modeling—and one of fatal significance for the effectiveness of risk-based regulation—is the fact that risk managers report to senior management and, in most modern financial institutions, senior managers have an interest in risks being underestimated. This issue was highlighted by a revealing anecdote told by Andy Haldane, the Bank of England's director for financial stability, in early 2009:

> A few years go, ahead of the present crisis, the Bank of England and the Financial Services Authority [the UK's financial services regulator] commenced a series of seminars with financial firms, exploring their stress-testing practices. The meeting of that first group sticks in my mind. We had asked firms to tell us the sorts of stress which they routinely used for their stress tests. A quick survey suggested these were very modest stresses. We asked why.
>
> Various lame possibilities were discussed, but eventually the real explanation came out: one of the bankers blurted out that:
>
> "There was absolutely no incentive for individuals or teams to run severe stress tests and show these to management. First, because if there were such a severe shock, they would very likely lose their bonus[es] and possibly their jobs. Second, because in that event the authorities would have to step in anyway to save a bank and others suffering a similar plight."
>
> All of the other assembled bankers began subjecting their shoes to intense scrutiny.
>
> The unspoken words had been spoken. The [Bank] officials in the room were aghast.[27]

To draw this discussion together, financial modeling is *not* some grounded process like rocket science, where you can learn the mechanics, build the model, and then send a man to the moon. On the contrary, financial modeling is highly imperfect and very judgmental. Many important risks cannot be reliably estimated and risk models are open to all manner of manipulation and abuse. Consequently, risk modeling cannot provide a solid foundation for capital regulation. Instead, it is a game like fiddling one's tax returns, a process in which integrity is undermined by self-interest—and in the modern financial system, it pays to underestimate your risks. In short, the very principle of risk-based regulation—the use of firms' own risk models to set regulatory capital requirements—is unsound, in theory as well as in practice.

Weaknesses of the Basel System

Leaving aside the issues associated with risk-based regulation per se, there are also other major problems[28] with the Basel system.[29]

The Process that Produced It

The first problem is that the Basel system is the result of a highly politicized international committee process, involving many arbitrary decisions, irrational compromises, and horse-trading. Basel insiders talk of tight deadlines, jetlag, stress, intense political pressures, and stand-up shouting matches.[30] Such a process almost inevitably produces a groupthink mentality that leads to poorly thought-out rules, a compliance culture, and no thought given to the costs involved. Under pressure from the industry, it also led to an obsession with risk modeling and capital measurement, with those involved becoming so bogged down with the risk metrics

that they lost all sight of the risks. Over time, it also led to ever-longer rulebooks that attempt to standardize practice in an area where practice is always changing and where the development of best practice requires competition—*not* standardization—in risk-management practice. Instead, the product is an inflexible and hard-to-change rulebook that is out of date before it is even published, not to mention its onerous implementation costs. Given the history of the Basel system, we are tempted to say that the only quantitative rule that withstands serious scrutiny is that the effectiveness of capital regulation is inversely proportional to its quantity.

Another problem is that the outcome of such a process is inherently unpredictable. Indeed, at one point in the tortuous and prolonged Basel II gestation process, there was so much uncertainty about the outcome that some banks had created a new risk category called "Basel II risk" to deal with it! Once the Basel II juggernaut was let loose, no one could anticipate where it would eventually end up.

It is also a curious paradox that although the regulations are approved by the committees that produce them, individual members of those committees are notoriously reluctant to defend them when speaking on their own account. It is as if each member understands that the rules are indefensible and is too embarrassed to defend them, but he still feels obliged to stand up for the groupthink process that produces them—suggesting that committee members are so worn down by the pressures involved that getting it *agreed* was more important than getting it *right*. One of us also fondly recalls the time when a very senior Basel official, who shall be nameless, gave a seminar on Basel, and then privately admitted afterwards that all this financial regulation would be unnecessary if we had free banking and held the bankers personally accountable for their decisions—but she could not say this in public. Then there is the story of another very senior regulatory official who, in looking over the hundreds of pages of the new Basel II rulebook at a public conference, sighed and said, "It does read a bit as if it has been written without adult supervision."[31] Such comments by the very people who write the rulebooks make external criticism redundant.

The Standardized Approach

Then there are problems with the standardized approach in the Basel system, and in particular with its arbitrary risk weights. In the original Basel Accord, the debts of all OECD governments were given a risk weight of zero, implying that all OECD government debt (including, say, Greek government debt) is in fact perfectly safe. The original accord also gave weights that implied that all corporate debt is equally risky, so corporate AAA is just as risky as junk: the effect of this was to encourage banks to get into junk and get out of high-quality assets. Another damaging anomaly was the arbitrary assignment of only a 50 percent weighting to loans secured by first mortgages; this led to an excessive concentration by the banking system on largely unproductive and highly risky real-estate lending. Such anomalies encouraged the very risk taking that the system was supposed to counteract.

Furthermore, some very obvious key weaknesses survived into Basel II. One was the assignment of unduly low risk weights on liquid assets; this encouraged banks to become overexposed to low-maturity sources of funding and leave themselves with liquidity problems in a crisis. This happened during the Asia crisis and again in the prelude to 2007–2008. Another weakness was the assignment of very low risk weights for some positions that were in fact very risky (e.g., credit derivatives)—as mentioned already, this was a bad anomaly under Basel I that was made very much worse under Basel II.

There was also much criticism of the "adding-up principle," by which risk-adjusted assets were simply added together with no allowance for the possibility of diversification. Critics had a field day poking holes in this, not least because it was inconsistent

In the original Basel Accord, the debts of all OECD governments were given a risk weight of zero.

with the most basic principles of portfolio theory. However, in retrospect, this limitation is more theoretical than real; other things being equal, adding up risk-weighted assets will overestimate the total risk exposure because it implicitly sets correlations to their worst-case values. However, this can be defended as a prudent approach when the true correlations are unknown. Further, from a risk-management perspective, risk measures should be biased on the conservative side because it is better to overestimate them than to do the opposite—especially when portfolio diversification can vanish overnight in a crisis.

Reliance on External Ratings

Another major weakness relates to the reliance of the system on external ratings. The conventional wisdom about the ratings agencies is that ratings are reliable because the ratings agencies' long-term livelihood depends on their reputation and, with each rating they give, they put their reputation on the line.[32] Competition then ensures that the industry is fairly efficient, quality is good, and fees are reasonable.

The reality is a little different. To begin with, the old practice of investors paying for ratings has largely given way over the last 40 years to ratings being paid for by issuers. Whereas investors want honest ratings, the issuers want favorable ones, so this shift puts pressure on the agencies to accommodate their clients. A ratings agency that is too strict will lose business to more agreeable rivals. It also became common for issuers to tell the ratings agencies the ratings they were looking for and have the agencies suggest how the securities could be tweaked to get the desired rating. Such practices further intensified the pressures on the agencies to lower their standards.

Over time, the agencies' business grew enormously and, by the early years of the new millennium, they were rating hundreds of thousands of securities and their individual tranches. By this point, the evidence of ratings inflation and sometimes downright poor ratings was overwhelming. This was especially so for newer products such as CDOs, where the absence of a long track record made such inflation easier to hide.[33]

However, in the longer term, competition among ratings agencies can only lead to ratings deterioration if the investors are also complicit in this process. If the investors really wanted reliable ratings, and issuer-paid-for ratings are unreliable, then they would start to pay for them again, and the practice of issuers paying for rating would disappear as those ratings gradually lost their credibility and their market.

So why should investors, of all people, be complicit in ratings deterioration? The answer is that most of the large institutional investors suffer from much the same short-term moral-hazard problems as the banks. Their managers, too, were getting rich from managing other people's money, and they have every reason to go along with the pretense of good ratings. The last thing any investment manager wants to do is turn lucrative business away, and the fact that the ratings seemed good and everyone else was doing the same thing gave them plausible deniability.[34]

Other factors helping to explain why ratings might be unreliable are the models the agencies were using and the uses to which they were put. In the run-up to the financial crisis, virtually everyone was using poor models. The agencies were therefore making the same mistakes as other people, assuming that defaults were independent and, at best, using copula models that were unreliable because they were calibrated using historical data from an unusually stable economic period. They were also making a few additional mistakes of their own. To give an example, just as the real estate market was approaching its peak, Standard and Poor's was pricing mortgage securities using a model that *assumed* that real estate prices could only go up—in other words, S&P was using a risk model that ignored the main risk involved![35]

A third factor is the government—or rather, its agencies.[36] In 1973, the Securities

Adding up risk-weighted assets will overestimate the total risk exposure because it implicitly sets correlations to their worst-case values.

and Exchange Commission (SEC) revised its capital rules for broker-dealers, and the new rules were dependent on risk assessments that reflected external ratings. The SEC then worried that ratings agencies might start selling favorable ratings, so it decided that only Nationally Recognized Statistical Rating Organizations (NRSROs) would have their ratings recognized by the SEC. The NRSROs effectively became an SEC-regulated cartel: the existing agencies were grandfathered in, with access to a now-captive market; new entrants were deliberately excluded; and there were the predictable effects on innovation, quality, and fees. The SEC's attempt to protect ratings quality had the opposite effect. If the SEC and its counterparts really want to enhance ratings, they could start by dismantling the NRSRO cartel and establishing a free ratings market.[37]

Regulatory VaR

Another glaring problem is the regulators' continuing encouragement of the discredited VaR risk measure, whose only possible rationale is that it is very convenient for financial institutions, which want their regulatory capital requirements to be as low as possible. It is also striking that regulatory documents are deafeningly silent on the weaknesses of the VaR, and there seems to be virtually no pressure by banking regulators to replace the VaR with a more suitable (i.e., more conservative) risk measure for regulatory purposes. We can only speculate that this is due to the influence of the industry, which itself continues to make widespread use of the VaR.

As an aside, there also seems to be little regulatory pressure to do away with woefully inadequate distributional assumptions, particularly the assumption of Gaussianity. If the VaR and Gaussianity are each likely to produce major underestimates of true financial risk when used on their own, the combination of the two is especially dangerous and, in many cases, is virtually guaranteed to massively underestimate true risk exposures. We can only speculate that the regulators are silent on the problems of Gaussianity for much the same reasons that they are silent on the inadequacies of the VaR itself.

Another problem is that, for market risks, the VaR-based capital requirements are based on a 99 percent VaR with a 10-day forecast horizon. This, in itself, produces a risk estimate that, if the model is correct, should be exceeded on one 10-day period out of 99 such periods—a little more than once every three years. If regulatory capital requirements were made equal to such a risk measure, then an institution holding only that portfolio would expect to be bankrupted about every three years. Such a capital level is of no effective use if we wish to set capital requirements for solvency purposes, and the avoidance of bankruptcy is—or at least should be—the main concern of any capital requirements, regulatory or otherwise.

The Basel regulations seek to get around this problem by imposing an arbitrary multiplier on the VaR, in which the capital requirement should be a multiple of the 99 percent 10-day VaR. The value of this multiplier, affectionately known as the "hysteria factor," is determined by a bank's regulatory supervisor based on his or her assessment of the quality of the bank's risk models, and is set at some value between three and four. So, in the worst case, the bank's regulatory capital requirement would be equal to four times the 99 percent 10-day VaR. Unfortunately, this "fix" gives us no idea of how safe the resulting capital requirements might turn out to be: this in fact depends entirely on the probability distribution.

Once again, a comparison of the Gaussian and the Cauchy is very informative:

- Under a Gaussian, wiping out this level of capital would require a 9.305-sigma 10-day loss event—an event so remote it would never happen. The capital requirement then appears to be conservative to a paranoid degree.
- Under a Cauchy, on the other hand, the probability of the capital being wiped out in any 10-day period is 3.41

The SEC's attempt to protect ratings quality had the opposite effect.

percent. This suggests that we could expect to see the capital wiped out more than once a year, and is anything but conservative.

Consequently, the regulatory use of the 99 percent 10-day VaR is highly unsatisfactory over and above the weaknesses of the VaR itself. The root problem here is that one cannot extrapolate from moderate one-in-a-hundred type of risk events to the extreme one-in-tens-of-thousands type of risk events that are relevant for solvency. As Riccardo Rebonato nicely put it, no study of the height of hamsters, however good, will ever give us much sense of the height of giraffes.[38]

The Basel system produces capital requirements that are pro-cyclical.

Procyclicality

Ideally, capital requirements should be anti-cyclical. They should rise as the economy booms (and so help to counter the boom as it approaches it peak) and fall as the economy goes into recession. Unfortunately, the Basel system produces capital requirements that are pro-cyclical. This procyclicality is driven by the procyclicality of the risk estimates themselves—whether those of ratings, credit-risk models, or risk models. When the economy is booming, markets appear less risky and perceptions of risk typically diminish as the economy approaches its peak. The implication is that capital charges will be lowest and lending highest just at the point when the danger to the economy is greatest.

This problem affects any form of risk-related capital charging and applies both to regulatory capital charges and to the internal charges that firms might apply themselves. From the perspective of Basel, this problem goes directly against the main purpose of the system, which is to make the financial system more stable.

The usual response to this problem is to suggest that capital requirements should be designed to move counter to the cycle. This, however, is much easier said than done. Proponents of capital regulation often glibly suggest that some supposedly "wise" regulator would see the turning points in the cycle in advance and adjust capital requirements accordingly. However, even the best market practitioners have difficulty anticipating market turnarounds, and their own track record suggests that the regulators themselves are usually well behind the market.[39] Attempts by regulatory authorities to cycle-adjust risk assessments have also proved to be less than satisfactory.[40]

From a risk-modeling perspective, perhaps the best practice is to take a long-term view and estimate risks (whether those be ratings or other risk measures) while paying particular attention to what might happen on the downside of the cycle, and then try to make worst-case assumptions. Applied to capital charges, regulatory or otherwise, this would lead to capital requirements that were fairly high and steadier across the cycle.[41] Some degree of anti-cyclicality could also be achieved by making capital charges dependent on easily observed variables that move *with* the cycle, such as reported profits.

Beyond that, we would caution against sophisticated attempts to resolve this problem, especially by regulators. The real answer to this problem, to the extent there is one, is to be found in economics rather than statistical forecasting. Key decisionmakers should be incentivized to take responsibility for what might happen in a downturn, rather than kick the can down the road. We will come back to this later.

Systemic Instability

Another problem is that the Basel system tends to promote systemic instability.[42] This is, in part, because any weaknesses in the Basel rules have systemic potential. Any weakness in those rules is likely to affect all banks at much the same time, whereas the same weakness in any one institution's risk management will be unlikely to have any systemic impact. Thus, Basel imposes its own weaknesses upon everyone.

However, the problem goes deeper. If we were dealing with a single institution, we might advise it to move out of risky positions when a crisis occurs. This might make

sense for a single player, but the market as a whole cannot divest itself of risky positions—someone has to hold them. There is, consequently, a fallacy of composition in which the individual institution can sell, but the market cannot. The collective attempt to dump such positions then sends prices down sharply and creates the vicious spiral we discussed earlier, in which the collective attempt to move out of risky positions makes those positions even riskier. The fundamental problem is, then, that the encouragement (by regulators or anyone else) of a *single* risk-management strategy can itself destabilize the market. Market stability instead requires players who pursue different strategies: when many firms are selling in panic, we need other institutions willing to move in and buy. In short, *any* regulatory risk-management standard is inherently systemically destabilizing.

Manipulating and Gaming the Rules

A final problem with the Basel system is the way in which it is open to manipulation by regulated financial institutions. Institutions will lobby for changes in the rules and leniency on new products, and they have the influence and resources to ensure that they often get their way. More often than not, manipulation of the system takes the form of regulatory arbitrage, in which institutions play the existing rules to their own advantage. This typically takes the form of regulatory-driven securitizations leading to lower capital requirements, higher short-term profits and big bonuses for those involved, and a hidden transfer of risk to other parties, usually without them even realizing it.

An early example is the very first CDO in the late 1980s, carried out under First Executive Life Insurance Company's Fred Carr. His "problem" was that the regulators insisted that First Executive's junk-bond portfolio be backed by the usual full capital requirements. To solve this problem, Carr securitized the lot, kept them all on his books, and then argued that only the bottom tier warranted the full capital requirement—even though the bank's exposures were the exactly same as before. In effect, he argued that relabeling his positions warranted lower capital requirements—and amazingly, the regulators bought the argument. Frank Partnoy wryly commented that this was like the owner of a three-story house persuading the local municipality that it was really three separate pieces and that only the ground floor should be subject to property tax.[43]

This pathbreaking innovation paved the way for traded securitizations: you take any portfolio (of bonds, mortgages, etc.) and securitize them through a special-purpose vehicle. The tranching will ensure that all but the most junior tranches obtain investment-grade ratings, and the more senior tranches can then be sold off. Often the recipients will be other banks, and the high credit ratings on these securities will ensure correspondingly low regulatory capital requirements. The net result is that the same underlying assets have been reallocated among the banks to obtain lower capital requirements. Any assets (including previously securitized assets) can be packaged up and recycled in this way, with each successive securitization leading to further "capital release" and large profits for those involved, and never mind what might happen down the road. The regulatory capital system thus helped create a securitization bonanza that lasted a quarter of a century and depleted the banking system of much of its capital.[44]

Another example was J. P. Morgan's now infamous BISTRO securitization, an early credit default swap, in 1997.[45] The team that put this together argued that it was "supersafe," and regulators eventually agreed, cutting the capital requirement on a $9.7 billion issue from $700 million to a mere $160 million—from 8 cents on the dollar to 1.6 cents—on what was, in fact, a very risky security. To give them their due, the regulators insisted that the bank prove the risk was really negligible and ensure that the securitization get a AAA credit rating, but these superficially demanding conditions were easy to meet given the inadequate models everyone

Manipulation of the system takes the form of regulatory arbitrage, in which institutions play the existing rules to their own advantage.

Regulatory arbitrage is the primary factor driving securitizations and the growth of credit derivatives.

was using. This transaction saved the bank $540 million in capital and set the pattern for the enormous wave of similar securitizations that followed. By the eve of the crisis, the notional principal in the CDS market had grown to over $60 trillion. Consequently, the Basel system was a key driver behind the CDS bonanza as well.

A third example is "pig on pork." In a recent article, financial engineer Graham Kerr discusses how, around the turn of the millenium, one of his colleagues working for a British bank came up with a clever plan that generated completely illusory profits by exploiting the weaknesses of the regulatory capital system.[46] Their bank had a portfolio of commercial bonds worth some $4 billion, and the capital requirement on this portfolio was 8 percent, or $320 million. The bank then entered into two credit derivatives transactions involving an American insurer and a European bank. These transactions were a scam,[47] but had the effect of enabling the bonds to be reclassified as a form of credit derivative, so lowering their capital charge from 8 percent to 0.5 percent. This freed up $300 million of capital, which could then be booked as instant profit. In addition, under the lax accounting rules in place, the expected profit on the bond book over the next 30 years could be classified as an additional instant profit; this further boosted reported profits and the bonuses for those involved. This transaction was widely copied, and Kerr was later left wondering why it took so long for the system to collapse.

It is widely accepted by finance industry insiders that regulatory arbitrage is the primary factor driving securitizations and the growth of credit derivatives. The result, therefore, is that in a context where decisionmakers are already incentivized to take excessive risks: the regulation itself pushes bankers to plunder their own banks, reduce their capital standards, and take additional risks that are passed on to unsuspecting third parties. In this respect, Basel is a spectacular example of a policy that achieved the direct opposite of what it set out to do.[48]

Damaging securitizations have also continued apace in the last couple of years. Amongst these are "failed sale" and "covered bond" securitizations, both of which typically have the effect of secretly pledging bank assets. Bank counterparties then enter into arrangements with banks, not realizing that the prime assets that appear to buttress their balance sheets are already pledged to other parties. In the short term, such securitizations give banks better access to finance (because of the higher collateral involved), but as banks' positions become ever more opaque and the pool of pledgeable assets diminishes, their longer-term impact is to undermine confidence in the banking system and destroy banks' abilities to raise finance. In addition, central bank assistance programs to the banks—especially quantitative easing—have spawned a new and highly profitable securitization bonanza in which the banks package up their most toxic assets into asset-backed securities and sell them to their local central bank. Many of the most toxic assets end up on the central banks' balance sheets, where they pose a potentially lethal threat to the central banks, some of which (especially the Fed and the European Central Bank) are already leveraged like aggressive hedge funds.

Supervisory Weaknesses

We should also consider that all modern financial regulatory systems are at a number of disadvantages relative to the institutions they regulate and, as a consequence, are prone to intimidation and capture:

- Financial firms have vastly greater resources, so they can hire the best talent and assemble expert teams in relevant areas (e.g., financial modeling, accounting, law, etc.), giving them the ability to outgun the regulators, especially on complex technical issues. This helps them to "blind the regulators with science" and set the agenda on those issues. By comparison, regu-

latory bodies are often short-staffed and have inadequate research support. Consequently, regulatory officials are often outnumbered and outgunned in key meetings. They are also hampered by a steady exodus of their staff, who take their skills and institutional knowledge to the private sector.

- Firms are often able to hold carrots in front of individual regulators with the prospect of much-better-paying future jobs in the private sector. As a result, regulators are often reluctant to challenge firms for fear of jeopardizing their own future prospects.
- Financial firms wield big sticks: they have great influence and powerful friends who can (and sometimes do) bring pressure to bear and, if necessary, intimidate individual regulators who get in their way. Their greater resources also allow firms access to superior legal firepower, which means, in practice, that they can often get their way merely by threatening the regulators with legal action.
- There is the remarkably cozy relationship between the financial industry giants, the regulatory system, and the government. Key players move back and forth between all three, leading to industry capture, not just of the financial regulatory system, but of the political system, too.[49]

United Kingdom Experience

Among the worldwide regulatory community, the United States and, supposedly, the United Kingdom, are often said to have the best regulatory institutions. Yet the British experience offers a classic case study of the weaknesses of financial regulation, the dangers of regulatory capture, and the results of establishing a self-serving regulatory empire that grows from its own failures.

When it took office in May 1997, the new Labour administration replaced the previous byzantine and highly dysfunctional system of financial regulation with a new streamlined tripartite system. Different tasks were assigned between the Treasury, the Bank of England, and a new monolithic financial regulatory body, the Financial Services Authority (FSA), which would focus on the day-to-day regulation and supervision of financial institutions operating in the United Kingdom. The idea was that the Treasury, the Bank, and the FSA each had their own assigned responsibilities, but they would coordinate harmoniously with each other in a spirit of selfless dedication to their shared task. The reality was rather different: each party loathed the others and their "coordination" was reminiscent of the Three Stooges on a bad day.Within this context, the FSA's main policy was essentially one of industry-friendly "light-touch" regulation—in short, give them what they want for fear that they might sue us or relocate elsewhere.

The FSA senior management took the line that the models needed to be approved with few questions asked. FSA supervisors and senior management would then often defend the models and silence the concerns of their own risk specialists who understood the models much better than their superiors. FSA officials often behaved this way in the model-review meetings, thereby publicly undermining their own experts in front of the very people that they were meant to stand up to. (The incentive to stand up to the industry was also undermined further, it later turned out, because the FSA was using feedback from the industry in the performance assessment of its supervisory staff, incentivizing its own staff to curry favor with the people they were meant to stand up to!) This was in spite of the fact that most FSA senior management had a very poor understanding of the fundamentals of risk modeling and still struggled with the subject even after remedial training sessions had been put on for them. As well as being undermined, FSA risk specialists who voiced concerns risked becoming pariahs, with supervisors sometimes requesting that certain specialists *not* be assigned to review their firms' models in case they raised too many inconvenient questions.

The British experience offers a classic case study of the weaknesses of financial regulation.

This culture invited institutions to treat the review process with barely disguised contempt: in one widely discussed case, a team from a major U.S. investment bank was asked about their contingency plan in the event that the FSA refused to approve their model. After some inhaling of breath—the firm was not used to such impudence!—the most senior bank official replied that he would phone the FSA chairman to take it up with him. The risk specialist who asked the question was well known for challenging firms' approaches and was quickly labeled a troublemaker, overlooked for promotion, and eventually left.

In another case known to us, a bank had lobbied for FSA approval on some dubious new innovation, and the FSA sent along a single inexperienced official to the review meeting. For its part, the bank sent in an experienced team whose members were determined to obtain approval; they wore her down, keeping her late and overwhelming her until she finally broke down in tears and was too exhausted to resist any further.

With this sort of model review process, it was inevitable that some very dubious models would be approved. In this context, it is telling that none of the major problem banks in the UK—Northern Rock, HBOS, Lloyds TSB, and RBS—had any problems obtaining regulatory approval for their internal risk models not long before they hit the buffers themselves.

The FSA performance on Basel II's Pillar 2, regulatory supervision, was equally unimpressive. Many sensible regulatory insiders had felt that this should have been even more important than Pillar 1, because it was under Pillar 2 that supervisors could weigh in and demand capital charges beyond Pillar 1. But neither supervisors nor the industry really wanted that. Instead, the FSA busied itself with producing enormous rulebooks and sundry other useless activities, and Pillar 2 became a box-checking exercise.[50] Naturally, everyone paid lip service to the need for good risk management, but the reality was that the industry did whatever it wanted.

The FSA busied itself with producing enormous rulebooks and sundry other useless activities.

The weakness of this system was highlighted by the FSA's handling of the big bank, HBOS. In the years before the crisis, its head of regulatory risk, Paul Moore, had warned his bosses—including then-CEO James Crosby—that the bank was heading for problems. The bank was, he said, was "going too fast, had a cultural indisposition to challenge, and was a serious risk to economic stability and consumer protection."[51] He subsequently likened his experience to being "like a man in a rowing boat trying to slow down an oil tanker." His superiors dismissed his concerns, although they turned out to be amply justified. He also raised his concerns with the FSA, but they apparently wanted an easy life and did nothing. HBOS senior management eventually decided that Mr. Moore "didn't fit in"—he clearly didn't—and fired him; for his part, Crosby was subsequently rewarded with a knighthood for his services to the finance industry and became a key financial adviser to the government.

Bad as the HBOS case was, the FSA's handling of Northern Rock beggars belief. This was an institution that was traditionally regarded as solid, even staid, but it changed focus and grew very rapidly around the turn of the millennium, specializing in the British version of subprime and using an extreme business model that relied more heavily on access to wholesale funding and securitization for its financing than any other major British bank. The FSA, however, seemed stuck in a time warp and was oblivious to Northern Rock's new aggression. The bank was supervised by insurance regulators who knew little about how a mortgage bank operated; apparently, the FSA wanted to give them some work experience on a safe bank where nothing much could go wrong. Only eight supervisory meetings were held between 2005 and August 9, 2007—mostly involving low-level FSA staff. Of those meetings, five were held over just one day and two by telephone, and—on the one occasion when paperwork would actually have been helpful—the supervisors did not bother to take notes.[52]

In February 2007, Northern Rock's share price started to deteriorate and, as the year progressed, concerns about mortgage defaults were rising. Although it was obvious to the market by this point, it still had not occurred to the ever-vigilant FSA regulators that Northern Rock might be in any danger or that it might want to suggest that the bank stress-test its liquidity exposure. Instead, the FSA's response was to approve a dividend payment and fast track the approval process for its models. Northern Rock hit the rocks shortly afterwards: on September 13, 2007, it acquired the ignominious distinction of being the first English bank to experience a run since Overrend and Gurney in 1866. The Treasury Select Committee's subsequent report about the fiasco was scathing in its criticism of the FSA's handling of the case—"asleep at the wheel" being the gist of it.

The FSA chief executive Hector Sants then offered an apology of sorts. "We're sorry that our supervision didn't achieve all it could have done." He was certainly right about that and had the decency to forgo his own bonus for that year. That said, he was still happy to defend FSA bonuses increasing 40 percent the year after the British banking system collapsed. He also did himself no favors by claiming that the Northern Rock fiasco was unpredictable. In fact, it later came out that, as early as 2003, the British authorities *had* anticipated a scenario remarkably close to the one that occurred, correctly identifying Northern Rock as a potential problem. They also drew an important conclusion: there was a need for a fast-track bankruptcy procedure to handle such a problem. But having identified both the problem and the solution, they then did absolutely nothing about it. The buck-passing that followed was straight out of *Yes, Minister*.

There followed much soul-searching, numerous reports, and one reorganization after another. Yet the FSA managed to ride out withering public criticism of its mistakes and argued successfully for both an extension of its mandate and a large increase in its resources and staffing. Its budget increased by 36 percent during 2009 and by 9.9 percent in 2010.[53] Naturally, there were the usual reassurances that the FSA now finally had its act together (of course!), and the FSA's new chairman, Lord Turner, was now telling bankers to "be afraid, be very afraid" of the new get-tough FSA.[54] The era of light-touch regulation was over, we were assured, and the FSA's new policy was now one of "intensive supervision"[55] and, implicitly, covering its back.[56] Then came a general election in May 2010, and at the end of the year, the new coalition government announced its solution—yet another reshuffling of the regulatory pack: it intended to break up the FSA, moving some of it back to the Bank of England and the rest to a new Prudential Regulation Authority. It remains to be seen whether the new regulatory structure will turn out to be any better than its predecessors, but we are not optimistic; the more things change, the more they stay the same.

Basel and the Financial Crisis

Returning to Basel, by the eve of the crisis, all major international banks were Basel compliant, with capital ratios between one and two times their minimum requirements. The crisis itself resulted in the collapse of the banking system: Basel had failed spectacularly. The inadequacies of the Basel rules were sometimes highlighted very strikingly, too: five days before its bankruptcy, Lehman Brothers boasted a Tier 1 capital ratio of 11 percent—nearly three times its regulatory minimum requirement—which would indicate strong capital health by Basel standards.

Yet there were warning signs that something was wrong even before the crisis. For example, under Basel II's most *conservative* method, banks were allowed a maximum of 10 times the leverage in equities and 50 times that in AAA bonds. Both of these rep-

By the eve of the crisis, all major international banks were Basel compliant, with capital ratios between one and two times their minimum requirements.

Market discipline is undermined by pervasive state-created incentives to take excessive risks.

resent very high levels of risk. The equity maximum meant that a 10 percent fall in equities would wipe out the portfolio. The bond maximum meant that an increase of 0.25 percent in risk spreads on a portfolio of 10-year 4 percent bonds would wipe out even this purportedly stable portfolio. The most elementary "what if?" would therefore have revealed that the banks were very vulnerable.

Some major banks had core capital equal to 3 percent or less of their assets, which is very low by traditional standards, and informed observers were already warning that banks had been lending too much, particularly to customers with poor credit ratings, and that the credit boom was unsustainable. Then there was the impact of the many hidden risks banks were taking—the impact of off–balance sheet securitizations, credit derivatives, inadequate risk models, and poor risk management—indicating that the banks were even more vulnerable than they appeared to be.[57]

Despite these warning signs, it is remarkable how clueless the bankers themselves seemed to be about their own vulnerability. A well-cited case was the chairman of Citigroup, Charles "Chuck" Prince, who on July 10, 2007, famously brushed off concerns about growing liquidity problems by explaining that: "When the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you've got to get up and dance. We're still dancing." This state of denial continued into the fall. The music finally stopped when analyst Meredith Whitney announced on October 31 that Citi was in such a mess that it would have to either slash its dividend or go bust. Her announcement took almost everyone by surprise and financial stocks instantly fell $369 billion in value. Prince was chucked out of his job four days later. Citi's case was not atypical, however. Going into the crisis, there were few, if any, senior bank managements who understood how vulnerable their institutions really were.[58]

It was also apparent before the crisis that banks' risk disclosure practices were woefully inadequate. Such reporting has to be seen in the context of the huge growth in all manner of financial "disclosure" leading to ever-longer reports with ever-increasing data, but less and less real information. By 2008, for example, HSBC's annual report had become so heavy that the British Post Office refused to deliver it on the grounds that it posed a health and safety threat to its staff. As for banks' risk disclosures, studies have shown that most so-called risk disclosure is no more than boilerplate in nature, typically consisting of bland statements along the lines of "We do this and that" and providing VaR information that would give little real indication of banks' risks or their ability to withstand severe events.[59] It was therefore no surprise that banks' reports gave no indication of the banks' actual risk exposures in the run-up to the crisis. In addition, risk disclosure was not so much undermined as made completely impossible by the complexity of banks' positions and, of course, by the fact that most bankers themselves did not know the risks they were running. The unfortunate timing of the implementation of the new "Fair Value" accounting standard, FAS 133, did not help either.[60]

These problems had fatal implications for Basel II's Pillar 3, which relied on disclosure to produce market discipline: it was therefore always naive to expect Pillar 3 to work. In any case, typical Pillar 3 reports were themselves mindless compliance exercises consisting of basic balance-sheet material and uninformative twaddle about risk-management systems that only worked on paper. More fundamentally, market discipline is undermined by pervasive (and in the final analysis, state-created) incentives to take excessive risks: "market discipline" in the modern financial system therefore amounts to a license for risk takers to take excessive hidden risks, knowing that they will reap the benefits but other people will bear most of the downside.

To be fair, the regulators were quick to respond to the possible lessons to be learned

from the crisis and there has been a flurry of analysis and reports.[61] These culminated in Basel III, which was unveiled in September 2010. Its main proposals were:

- The definition of core capital is to be tightened up, with more emphasis on common equity. There is to be a minimum common equity (or core Tier 1) requirement of 4.5 percent, and that for Tier 1 more generally is to be 6 percent. On top of this, there is a "conservation buffer" of another 2.5 percent, taking the minimum core Tier 1 and more general Tier 1 requirements to 7 and 8.5 percent respectively, and 10.5 percent if one includes Tier 2 capital. Banks that fall below this minimum will be unable to pay dividends.
- There is to be a countercyclical capital buffer of up to 2.5 percent, which is meant to counter the procyclicality of capital requirements and ensure higher capital requirements when the economy is booming.
- There is to be higher capital requirement on "systemically important" (i.e., bigger) banks.
- There is to be a minimum liquidity standard—including, in particular, the requirement to maintain enough liquidity to withstand the impact of a 30-day freeze in market liquidity.[62]
- There is to be a maximum leverage ratio to provide an additional capital constraint.

These amount to a significant tightening—and most of these proposals are worthy enough, as far as they go. The greater emphasis on common equity helps ameliorate the problem of banks bolstering their core capital with dodgy debt-equity hybrids, and the introduction of liquidity and leverage requirements provide additional useful safeguards. However, the proposals for a countercyclical capital requirement are so vague that they amount to little more than a restatement of the problem to be solved. It is also interesting that the Basel Committee ducked the awkward question of how this should be implemented by passing it back to the national regulatory bodies.

Beyond that, Basel III retains many of the weaknesses of its predecessors: its reliance on a highly gameable weighting system with risky positions still receiving very low weights, its reliance on banks' own risk models, and so forth. In any case, under pressure from the banks, the proposed higher requirements for larger banks were quickly watered down and the implementationof its key proposals were postponed, allowing the banks to carry on as before. Liam Halligan gave Basel III its epitaph before the ink on it was barely dry. "In truth," he said, the new Basel Accord "had been eviscerated by the all-powerful banking lobby."[63] So much for Basel III!

Conclusion

Any effective reform needs to go much further, and a good guiding principle is that any solution should address underlying causes. As we discussed at length above in the section on financial risk modeling, one of Basel's most serious weaknesses is its most distinctive innovative feature—and the foundation on which much of it is built: the principle of risk-based regulation. Once we accept the need to abandon risk-based regulation as a failed experiment, three possible ways forward then suggest themselves.

Abandon the Internal Model Approach

The least radical approach (we may as well call this Basel IV!) would be for the Basel Committee to scrap the internal model approach and revert back to simpler, more robust, and less gameable metrics that generate higher capital charges, while patching up other loopholes as best it can. The key features would be an updated, higher-charging version of the standardized approach and (as in the Basel III proposals) a greater emphasis on severe stress tests and maxi-

Basel III retains many of the weaknesses of its predecessors.

Simply sending the Basel Committee back to the drawing board and telling it to "get it right this time" is plainly naive.

mum leverage ratios, especially those focusing on core capital,[64] reinforced by a parallel system of liquidity regulations to protect banks' liquidity.

The implementation of the standardized approach could also be improved by establishing a standing committee that would periodically revise risk weights in the light of evolving experience, so making the weight revision process more flexible and (hopefully) more timely.

The biggest technical problem faced by this committee would be to assess the capital requirements of complicated products such as CDOs, CDSs, and their progeny. We would suggest that they base these on severe risk assessments, in particular the use of Cauchy and fuzzy-logic "litmus tests" that would flag up the true risks of such pathological products.[65] This would reflect a hard-line policy on them. Naturally, the industry would object vociferously and argue that this would make them uneconomic, but we would counter that this is exactly the point: high-risk products need high capital requirements, and if this helps them to extinction, so much the better. Their extinction would make the system much safer and also go some way toward helping make disclosure effective again.

We would also suggest that the Basel Committee abandon attempts to impose capital requirements on operational risk. Operational risk models have shown themselves to be useless in the face of the operational risks that matter—such as out-of-control senior management. Banks would still be allowed to model operational risks if they wished to, but such models would have no regulatory status.

That said, there is one feature of the Basel operational risk system that could serve a useful purpose: the basic version involves the imposition of capital charges on firms' profits. We would suggest that this is potentially useful, albeit stripped of its redundant operational-risk overcoat. Indeed, in some respects, bank profitability is quite an attractive basis for capital charges:

- Profits reflect risk taking and, other things being equal, rise when banks take more risks. A profit-based capital charge would therefore be indirectly risk based, but without requiring any dubious risk models.
- A profits-based charge would build in an element of anti-cyclicality, leading to capital charges that rise as the economy booms and fall when the economy goes into recession.

The charges would, however, need to be carefully specified to protect them from manipulation by creative accountants playing with the profit figures—a requirement easier said than done.

If suitably implemented, a revamped Basel approach along these lines would help limit model abuses and lead to higher capital requirements, especially on very risky positions. Such reform also has the practical attraction that its successful implementation does not require a whole range of other complementary reforms, desirable as those might be. Instead, it could be usefully implemented almost on a stand-alone basis and with relatively little danger of being undermined if other financial and banking reforms are seriously botched—which is a major risk in the current frenetic policy environment.

However, such reform is still not a substitute for effective risk management and only goes a small way to counter the current system's endemic incentives toward excessive risk taking. Even worse, simply sending the Basel Committee back to the drawing board and telling it to "get it right this time" is plainly naive, not least because it begs the question of why so many well-known weaknesses in Basel II made it through so easily into Basel III. And we all know the answer to that: the process was captured by the banks. Consequently, there is no reason to believe that a future Basel IV would be much better than Basels I, II, or III.

An Insurance-based Approach

A second possibility is to seek a new ba-

sis upon which to establish capital adequacy regulation. One possibility sometimes suggested is to require banks to take out insurance against certain risks such as insolvency or illiquidity risks. This sounds plausible at first, but in reality it boils down to passing the buck to the insurance industry, which is itself in no position to carry the burden.

Leaving aside such obvious questions as which particular risks should be insured and how the insurance would work, any insurance-based approach raises major feasibility problems:

- Insurance companies have limited capacity. Their already-overstretched capital is much smaller than that of banks, and they certainly do not have—and are unlikely ever to have—the resources to underpin the capital of the banking system.
- An "insurance solution" to the bank capital adequacy problem raises the questions about insurers' own solvency risk and the potential for systemic instability. No one wants a repeat of the AIG fiasco, where one firm becomes the dominant seller of some form of corporate insurance and then goes belly-up in a crisis—with potentially systemic consequences.
- Any insolvency insurance has the drawback that it does not avoid the need for risk modeling banks' positions, but rather passes that task to the insurer. Furthermore, the insurer is less well placed to handle that task than the bank it is insuring, and any such insurance is likely to create major moral hazard problems. Insured banks would be able to cut corners on their own capital and risk management, allowing them to free ride on the insurers' guarantee and pass all manner of hidden risks back to the insurer. These considerations suggest that any insurance solution would be inferior to an alternative in which banks are given adequate incentives to manage their own risks properly.
- Even ignoring these problems, any insurance "solution" would merely transfer the burden from the banks' risk models to the insurers' risk models. This just boils down to another form of risk-based regulation—one that failed spectacularly in the case of AIG.
- Leaving aside other objections, there is no reason to think that an insurance-based regulatory system would be any more capture-proof than the Basel regulatory system.

In short, there is no insurance-based solution either. Indeed, we need to acknowledge that there is no regulatory "solution" at all, because any regulatory apparatus would be captured.

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Free Banking

There is, however, one solution that *would* work if the political will were there to implement it. This would deal with *both* the major problems of the Basel system—risk-based regulation and regulatory capture—by restoring appropriate incentives and abolishing the regulatory system. The solution is free banking or financial laissez faire. The state would withdraw entirely from the financial system and, in particular, abolish capital adequacy regulation, deposit insurance, financial regulation, and the central bank, as well as repudiate future bailouts (and especially the doctrine of Too Big to Fail).[66] We would also suggest that the establishment of a free banking system requires major corporate governance reforms and the reintroduction of extended liability for senior officers and shareholders.

Such systems have worked well in the past, and reforms along these lines would take the United States a long way back to its banking system of a century ago, in which banks were tightly governed and moral hazards and risk taking were well controlled because those who took the risks bore their consequences. Such incentives would restore effective risk management and lead to

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banks recapitalizing themselves and returning to a state of true capital adequacy. Dangerous financial products would disappear, banks' positions would simplify, disclosure would be restored, and the financial system would become safe and stable again.

This would, however, have to take place in a context where the problem of accommodative monetary policy had also been resolved—ideally by the restoration of a gold standard. Within this context, there would no longer be a capital adequacy problem; capital regulation would have become redundant and could then be safely abolished.[67] Banks would then be left free to determine their own capital requirements based on whatever models, financial ratios, or any other rules of thumb they consider relevant.

And so we have a delightful good news/bad news situation worthy of the best ancient Greek morality plays. The good news is the solutions to our problems exist—it is possible not only to sort out the Basel mess, but also, much more importantly, to put the financial system back on its feet and restore the integrity of the capitalist system itself. The bad news is that we have to do so in a context where the policy community—and the political system more broadly—are hell-bent on pursuing more of the same policies that got us into this dreadful state in the first place, and where most of the proposals currently offered threaten to make a very bad situation much worse.

Notes

We thank a number of readers, and most especially, Gordon Kerr, for their helpful comments.

1. We cannot even begin to do justice to the incomprehensible jargon, innumerable acronyms, and mind-numbing institutional material that plague this subject, and trust that the reader will thank us for not attempting to do so. We also focus on the banks (and so ignore insurance companies and insurance regulation: e.g., Solvency I and II), and stay clear of vast areas such as the politics of Basel; international harmonization; harmonization across commercial banks, investment banks, and insurance companies; and the legal issues involved.

2. For more on the U.S. financial system and how it compares to its modern successor, see, for example, John C. Bogle, *Enough: True Measures of Money, Business, and Life* (New York: Wiley, 2009); or Kevin Dowd and Martin O. Hutchinson, *Alchemists of Loss: How Modern Finance and Government Intervention Crashed the Financial System* (Chichester, UK and New York: Wiley, 2010).

3. The leverage ratio is the ratio of assets to share capital: the higher the leverage, the greater the shareholder return if the market goes the right way, and the greater the shareholder loss if it does not. Our main concern is with the risk of the shareholder being wiped out. So, for example, at a leverage ratio of 10 to 1, it would take a 10 percent fall in assets to wipe out a bank's equity, whereas at a leverage ratio of 30 to 1, a mere fall of 3.3 percent would accomplish the same result.

4. Richard M. Salsman, *Breaking the Banks: Central Banking Problems and Free Banking Solutions* (Great Barrington, MA: American Institute for Economic Research, 1990), p. 56.

5. Quoted in Michael Lewis, "The End," Portfolio.com, November 11, 2008, http://www.portfolio.com/news-markets/national-news/portfolio/2008/11/11/The-End-of-Wall-Streets-Boom. Gutfreund's poignant remarks are a perfect description of modern crony capitalism.

6. Howard D. Crosse, *Management Policies for Commercial Banks* (Englewood Cliffs, NJ: Prentice-Hall, 1962), 169–72.

7. The biggest problem facing United States' capital adequacy regulation over much of the 20th century was that of forbearance: banks that struggled to meet their requirements were potential liabilities of the regulatory bodies, whose own resources were limited. This made the authorities reluctant to take over troubled banks. The regulators were also subject to lobbying from the banks themselves, which often led to pressure for forbearance from the political system. These factors led to a long-term decline in both U.S. capital standards and in the effectiveness with which they were imposed. These problems are discussed further in Salsman.

8. For more on the history of the Basel system, see, for example Daniel K. Tarullo, *Banking on Basel: The Future of International Financial Regulation* (Washington: Peterson Institute for International Economics, 2008); and Basel Committee on Banking Supervision, *History of the Basel Committee and its Membership* (Basel: Bank for International Settlements, 2009).

9. Herstatt was a medium-sized German bank, the failure of which would have been insignifi-

cant in ordinary circumstances. However, the German authorities foolishly closed the bank while the New York Stock Exchange was still trading. This led to major settlement problems that, given the unsettled conditions already existing, destabilized international markets on a scale not seen since the failure of the Creditanstalt in 1931. The Herstatt failure made it obvious to bank supervisors and central banks that they needed to be more coordinated—not that the resulting coordination was of any use when the next major cross-country bank disaster occurred, involving the Bank of Credit and Commerce International, in 1991.

10. It is worth comparing these Basel I requirements to those of U.S. banks in the 1950s. For example, under Basel I, normal commercial assets would merit a minimum capital requirement (including Tier I and Tier II) of 8 percent regardless of their quality, whereas under the earlier regime normal commercial assets would merit a minimum capital requirement of 12 percent and impaired assets would merit a minimum of up to 50 percent. The Basel requirements were therefore much less stringent.

11. A leading example is William J. McDonough, previously of First Chicago and president of the New York Fed from 1993–2003, who led the Basel committee while it was drafting Basel II. He took a very industry-friendly view and was also a leading exponent of the unspoken but understood-by-all theory that the biggest banks were somehow "superior" to the smaller ones and should therefore qualify for regulatory breaks denied to the latter.

12. This was evident when the internal-model approach was first adopted in the 1990s. This problem was highlighted more recently in the UK, when most of the banks that applied for their operational risk capital charges to be determined by the Basel II Advanced Measurement Approach dropped out when they realized that the models would probably lead to higher capital charges than under the simpler approaches. Reassuringly, the banks involved subsequently claimed that regulatory capital was not an issue for them and that they were only interested in good risk management.

13. At the risk of belaboring the obvious, it is exactly when risks are high that risk modeling would be most useful. Hence, the Basel system managed to deprive itself of the benefits of risk modeling in exactly those circumstances where it would benefit most from them.

14. The big banks also sought to reduce their capital requirements by pushing to expand a key loophole in the Basel I regulations: this allowed (supposedly) safe positions—typically, highly rated positions involving credit derivatives—the extraordinarily low capital charge of 0.5 percent. By the turn of the millennium, the manufacture of ingenious securitizations that met this requirement had become the biggest growth industry in town, thus drastically reducing banks' capital charges; the capital "released" in this way could then be used to pay bonuses to the financial engineers involved and their managers. The reality, of course, was that risks were merely being shuffled around out of sight of the regulators, and many of these "safe" positions later turned out to be very risky indeed. Yet instead of closing this loophole down, Basel II expanded it, and spurious securitizations flowered like never before.

15. The discussion in this section draws heavily from Dowd and Hutchinson, Parts 2 and 3.

16. This has been known to be a problem for a long time. It is discussed, for example, in F. A. Hayek, "The Use of Knowledge in Society," *American Economic Review* 35, no. 4 (September 1945); Richard Hoppe, "VaR and the Unreal World," *Risk* 11 (July 1998); and Nassim Nicholas Taleb, *The Black Swan: The Impact of the Highly Improbable* (London: Penguin, 2007). The response of the econophysics crowd to these profound criticisms has simply been to ignore them. A good example is the otherwise good book on econophysics by Jean-Philippe Bouchaud and Marc Potters, *Theory of Financial Risks: From Statistical Physics to Risk Management* (Cambridge: Cambridge University Press, 2000).

17. Nor were CDOs the most damaging of these financial innovations. That particular honor goes to credit default swaps, whose notional principal by the end of 2007 had grown to about $62 trillion, well in excess of annual world product. The dangers these products—which are essentially just bets on corporate default—posed to the system as a whole were highlighted for all to see in the AIG debacle. For more on these, see, for example, Dowd and Hutchinson, pp. 190–97.

18. "We were seeing things that were 25-standard-deviation moves, several days in a row." David Viniar, quoted in the *Financial Times*, August 13, 2007.

19. Estimates based on those in Kevin Dowd, John Cotter, Chris Humphrey, and Margaret Woods, "How Unlucky is 25-Sigma?" *Journal of Portfolio Management* 34, vol. 4 (2008).

20. Matthew Tagliani, *The Practical Guide to Wall Street: Equities and Derivatives* (New York: Wiley, 2009).

21. Here we gloss over the awkward point that

the forecasting performance of VaR models is very difficult to assess. These problems also get worse as the VaR probability increases: as we go further out into the tail, we encounter fewer observations and any estimates become less precise and harder to verify. Needless to say, these problems make solvency modeling a real headache. See, for example, Kevin Dowd, *Measuring Market Risk*, 2nd ed. (Chichester, UK and Hoboken, NJ: Wiley, 2005), chap. 15.

22. There can also be related problems: since estimated VaRs are often very volatile themselves, there is the danger that some sudden short-term VaR spike, of no importance in itself, might trigger a crisis as the risk management models kick in and force everyone to sell, causing the lemmings to run over the cliff. There is also the danger of unexpected ricochet effects. A prime example occurred during the Asia crisis, when South Korean banks had loaded themselves with all sorts of emerging market bonds: Brazilian Brady bonds, Ukrainian bonds, and so on. When their VaR numbers shot up, they responded by trying to reduce their positions—but the only bonds they could really sell were the Brazilian Bradys. Unfortunately, they also held a substantial proportion of the market in those bonds, and their attempts to sell them had a substantial negative impact on that market; the net results was that the Brazilian currency, the real, then took a hit out of nowhere.

23. Department of Defense briefing, February 12, 2002.

24. There are also other problems, like the conceptual belief that operational risk can be treated as some add-on risk factor, as opposed to a risk that permeates everything an institution does. For more on this, see, for example, Michael Power, "The Invention of Operational Risk," *Review of International Political Economy* 12, no. 4 (October 2005).

25. A similar problem is how to handle a bank's strategic risks, which are fundamentally important because it is the bank's strategy that ultimately determines what other risks it will eventually expose itself to. However, from a modeling perspective, the risks associated with a firm's basic strategy are unknown and certainly beyond the capacity of its risk models. It does not help that, in practice, the strategists typically know nothing about risk modeling and the risk managers know virtually nothing about strategy, and the two parties rarely communicate.

26. Taleb, pp. 129–30.

27. The fact that the Bank officials were surprised is itself revealing. So, too, were their earnest attempts to persuade the commercial bankers that there *really* would be no bailout if they got themselves into trouble. No private-sector banker really believed this, and quite rightly, too: when the crisis came, the government duly rode to the rescue just as the unnamed banker and his colleagues had anticipated.

28. The list that follows is by no means exhaustive. For example, there were also problems with the definitions of capital used by Basel—in particular, Tier 1 capital allows banks to include debt-equity hybrids, and led to all sorts of creative manipulation.

29. Among the many existing critiques of the Basel system, we would particularly recommend: David Jones, "Emerging Problems with the Basel Capital Accord: Regulatory Capital Arbitrage and Related Issues," *Journal of Banking and Finance* 24 (2000); Edward I. Altman and Anthony Saunders, "An Analysis and Critique of the BIS Proposal on Capital Adequacy and Ratings," *Journal of Banking and Finance* 25 (2001); Jón Daníelsson et al., "An Academic Response to Basel II," LSE Financial Markets Group Special Paper no. 130 (London: London School of Economics, 2001); L. Jacobo Rodríguez, "International Banking Regulation: Where's the Discipline in Basel II?" Cato Institute Policy Analysis no. 455, October 15, 2002; and Marc Saidenberg and Til Schuermann, "The New Basel Capital Accord and Questions for Research," Wharton Financial Institutions Center, DP 03-14 (Philadephia: The Wharton School, University of Pennsylvania, 2003). It is noteworthy how many problems were identified early on and how little was done to remedy them: the Basel Committee's imperviousness to known problems is a recurring theme in its history.

30. Some of these "tensions" are also recorded, for example, in Elroy Dimson and Paul Marsh, "Capital Requirements for Securities Firms," *Journal of Finance* 50, no. 3 (1995): 831–33; and Tarullo (see note 8 above).

31. Riccardo Rebonato, *Plight of the Fortune Tellers: Why We Need to Manage Financial Risk Differently* (Princeton: Princeton University Press, 2007), p. xxiii.

32. See, for example, Richard Cantor and Frank Packer, "The Credit Rating Industry," *Federal Reserve Bank of New York Quarterly Review* 19, no. 2 (Summer–Fall 1994).

33. The basic economics of the ratings are explained, for example, in Charles W. Calomiris, "The Debasement of Ratings: What's Wrong and How We Can Fix It," mimeo, Columbia Business School, 2009; and Alan D. Morrison, "Ratings Agencies, Regulation and Financial Market Stability," in *Verdict on the Crash: Causes and Policy Im-*

plications, ed. Philip Booth (London: Institute of Economic Affairs, 2009), pp. 117–28.

34. In the wake of the financial crisis, the stories are now coming out. See Simon Johnson and James Kwak, "The Hearing: Why Companies Do Stupid Things, Credit Rating Edition," *Washington Post*, October 20, 2009, for a report on how Moody's, the most reputable and conservative of the agencies, stacked its compliance department with people who awarded the highest ratings to mortgage securities that were soon revealed as junk, while punishing executives who attempted to protect the intregrity of the firm's ratings.

35. Lewis.

36. For more on this story, see James Alexander, "Regulatory Arbitrage and Over-Regulation," in *Verdict on the Crash*, pp. 89–90; and Mark A. Calabria, "Did Deregulation Cause the Financial Crisis?" Cato Policy Report 31, no. 4 (July–August 2009): 7–8.

37. Naturally, the ratings also involve regulatory arbitrage problems. For example, under then-current Basel proposals, unrated firms get better treatment than some junk-rated firms. This encourages very risky firms to avoid being rated, and means that capital charges for such firms will, in some cases, be considerably lower than they would otherwise be. See Rodríguez, 13.

38. Rebonato, p. 180. We gloss over the many problems involved with credit-risk modeling, and list just three: (1) the Basel regulations specify an arbitrary 99 percent credit VaR over a one-year horizon, which tells us nothing about credit risks in a downturn; (2) credit-risk models are (for reasons discussed in the text) much more difficult to calibrate and to back-test than market risk models, so it is very difficult to know if a particular model is any good; and (3) even now, credit-risk modeling is still highly problematic, and the lack of good data is a major problem. We also skip over the problems involved in the Basel approach to operational risk modeling: see Imad A. Moosa, "A Critique of the Advanced Measurement Approach to Regulatory Capital against Operational Risk," mimeo (Melbourne, Australia: Monash University, 2008), which has a devastating critique on the difficulties of estimating operational risk using the AMA approach. The problems of operational risk modeling were also highlighted by a number of notable operational-risk experts at a risk conference one of us attended in 2008: they voiced relief that they lacked the data to do op-risk modeling "properly," as this forced them to rely on scenario analyses that can look forward, rather than be pushed by the Basel system to use backward-looking risk models based on historical data, which would have been useless.

39. An honorable exception is Claudio Borio from the Bank for International Settlements (BIS), who persistently warned about the dangers of a credit crunch years before the crunch actually occurred, and he was ignored by his own colleagues. More typical is Brian Quinn from the Bank of England, who was the bank official responsible for the bank's handling of BCCI. In the aftermath of that fiasco, he told a stunned audience in London that the bank realized there was a problem with BCCI when they learned that people in the city were openly referring to it as the Bank of Conmen and Cocaine International. By this point, "respectable" bankers had been avoiding BCCI for years.

40. The Bank of Spain introduced just such a measure in the late 1990s. This took the form of a capital requirement on loans that took account of expected losses at the time the loans are entered into. These expected losses were calibrated on past recession loss experience. The Spanish experiment was not too successful—they took data from the past three wimpy recessions, and the latest one blew through past parameters—but it was still better than what other regulatory bodies were doing.

41. We could also imagine the furor from the bigger banks if regulators attempted to use such an exercise to increase capital charges, especially as the boom approaches its peak. Unlike the mythical central banker of old, who saw his main job as being to take away the punchbowl just as the party is getting started, the modern financial regulator has the much more difficult job of taking away the punchbowl when everyone, the regulator included, is already drunk and rowdy. It is therefore little wonder that regulators rarely try to do so.

42. Recall, too, that we have already discussed how systemic problems can arise from Basel, artificially boosting risky positions by giving them very low risk weights. Again, AIG and credit default swaps come to mind.

43. Frank Partnoy, *Infectious Greed: How Deceit and Risk Corrupted the Financial Markets* (New York: Owl Books, 2004), p. 78.

44. The securitization alchemy was, of course, especially profitable with low quality assets. As we discussed earlier, a portfolio of, say, subprime mortgages would be converted into a series of tranched securities, most of which are rated AAA. It was therefore hardly surprising that banks were so eager to seek out new low-quality asset classes.

45. Gillian Tett, *Fool's Gold: How Unrestrained*

Greed Corrupted a Dream, Shattered Global Markets and Unleashed a Catastrophe (London: Little, Brown, 2009) provides a very readable account of this episode.

46. Gordon Kerr, "How to Destroy the British Banking System: Regulatory Arbitrage via 'Pig on Pork' Derivatives," Cobden Centre, mimeo, 2010, http://www.cobdencentre.org/2010/01/how-to-destroy-the-british-banking-system/.

47. The scheme worked as follows: the bond portfolio was already insured by the American insurer via a CDS. The first transaction then involved the European bank guaranteeing the British bank's bonds, with the beneficiary being the British bank if the American insurer did not pay up, and the American insurer otherwise. The second transaction involved the American insurer insuring those same bonds again—so guaranteeing what it had already guaranteed, hence "pig on pork"—with the beneficiary being the European bank. The combination of the two guarantees then allowed the British bank to reclassify its bonds as a credit derivative and so reduce its regulatory capital. Apart from benefitting from the arrangement fees involved, neither of the other two parties was materially affected: in the event of default on the bonds, the European bank would have to pay the British bank, but would be recompensed by the American insurer, and the American insurer was not affected because its additional insurance payment to the European bank would be offset by the payment from that bank.

48. For their part, the regulators would respond to these problems by sporadically patching up the odd loophole at a snail's pace. For example, the rules now require that a securitization that qualifies for capital reduction involve some risk transfer, and this eliminates some of the simpler, spurious securitizations such as that by Fred Carr. Yet many known loopholes still persist, and institutions continue to come up with ever more ingenious ways around the system.

49. The most damaging aspect of the crisis, by far, is the takeover of the political system by Wall Street, which amounts to nothing less than a coup d'etat. The situation is comparable in a number of other countries too: Iceland, Ireland, and the United Kingdom come to mind. For more on this, see Kevin Dowd, "Lessons from the Financial Crisis: A Libertarian Perspective" *Economic Notes* 111 (2009), http://www.libertarian.co.uk/lapubs/econn/econn111.pdf; Simon Johnson, "The Quiet Coup," *The Atlantic*, May 2009; Luigi Zingales, "Capitalism after the Crisis," *National Affairs* 1 (Fall 2009); and Kevin Dowd and Martin Hutchinson, *Alchemists of Loss*, chap. 14.

50. The *Prudential Sourcebook for Banks, Building Societies and Investment Firms* is the main FSA rulebook for the Basel rules and is nearly 1,000 pages long. One risk management expert, Philip Booth, bravely attempted to go through it, but even he could only get so far. He was also unable to find anything in it on liquidity, which is what brought down Northern Rock, but (ever the optimist!), felt it must be in there somewhere, even though he could not be sure because the file was too big for him to download. See Philip Booth, "More Regulation, Less Regulation or Better Regulation?" in *Verdict on the Crash*, pp. 159–60. Then there was the *General Prudential Sourcebook Instrument*, which contains additional capital rules and is 261 pages long; and *Senior Management Arrangements, Systems and Controls*, which covers further rules on risk management and is another 221 pages long. And all this was *before* the flurry of new rules that came in the wake of the post–Northern Rock reorganization and, after that, Basel III and the major new shakeup of UK financial regulation announced in late 2010. The British regulators liked to brag that they had wisely followed principles-based regulation instead of the mindless rules-based regulations of their American counterparts, but as Alan Cathcart, a senior FSA official, once publicly admitted, they certainly had a lot of principles.

51. Unless otherwise stated, the remaining quotes in this article are taken from Dowd and Hutchinson.

52. For more on the Northern Rock case, see also Alex Brummer, *The Crunch: The Scandal of Northern Rock and the Escalating Credit Crisis* (London: Random House, 2008).

53. Rosali Pretorius and Ming D. Wang, "FSA Business Plan 2010/11 Intensive Supervision," *Complinet.com*, April 7, 2010.

54. Such threats are frankly risible, however. Unlike its counterpart in the United States, the judicial system in the UK is hopelessly inadequate when it comes to major white-collar crime. Convictions are rare, and we are not aware of a single case in modern UK history in which a convicted major white-collar criminal served a lengthy jail sentence.

55. A key feature of this is to develop the FSA's own inhouse risk-modeling capabilities so they can replicate the banks' own risk models. This, however, is a very expensive indulgence and a distraction. That said, other features of the new policy—such its emphasis on corporate governance, "living wills," and stress testing—are to be commended.

56. An example of this is the abuse of Section

166 or "skilled persons reports," in which the FSA would instruct a regulated firm to engage an outside expert to review a particular area of concern (e.g., risk-management systems) at the firm's expense. Prior to 2007, the FSA rarely issued these reports, not least because they were expensive at an average cost of £500,000 each. After the crisis, however, they are being thrown around like confetti; one insider estimated that there were approximately 100 issued in 2010 and perhaps 700 would be issued in 2011. The "skilled persons" consulted were typically ex-FSA people who had gone to the major accountancy firms, who would give the FSA what they and the banks wanted—that is, something not too critical. This was a cozy arrangement for all concerned: the accountancy firms made easy money and the prospect of new audit business, the banks benefited because the FSA could not reasonably justify further action, and the regulators could cover their backs by pointing to all the (other people's) money spent on expert advice.

57. By this point, most "risk management" was merely window dressing that provided no real protection, and the occasional risk manager who recognized and spoke out about the approaching problem was usually ignored or fired. As one frustrated risk manager later summed it up, "Risk management discipline rarely made it into the chief executive's office or the boardroom, or into day-to-day business decisionmaking. We had the appearance of risk management without the reality of risk management so when we really needed it, it wasn't there." See Dan Borge, "A Return to Crediblity," *Risk* (June 2009): 56, http://www.risk.net/risk-magazine/opinion/1497734/a-return-credibility.

58. Citigroup found itself holding $55 billion in toxic CDOs when the music suddenly stopped, in addition to having to buy back another $25 billion on which it had unwisely written liquidity puts. Its then-chairman, ex-treasury secretary Robert Rubin, later admitted that he had never even heard of these instruments at the time. He had to resign, too. David Viniar's immortal line about 25–standard deviation events (quoted above) suggests that Goldman's team was not too well informed either.

59. See, for example, Margaret Woods, Kevin Dowd, and Christopher Humphrey, "The Value of Risk Reporting: A Critical Analysis of Value-at-Risk Disclosures in the Banking Sector," *International Journal of Financial Services Management* 8, no. 1 (2008): 45–64.

60. The implementation of FAS 133 (the accounting standard for financial derivatives) created valuation chaos at a very difficult time. Perhaps the biggest problem is that it allows model-based valuations, which bear no relationship to market reality. So, for example, when FAS 133 came into operation in late 2008, Goldman Sachs reported Tier 3 assets (based on model valuations) of over $70 billion, or more than double its core capital. Most of these assets were believed to have market values of much less than this amount. These model-based "valuations" thus allow banks to create fictitious capital and so hide their true financial health; they allow banks to manufacture fake profits and then distribute those as dividend and bonus payments, and so give bankers yet another means to denude their banks of their capital and dump their losses on the taxpayer.

61. In some cases, regulators were too quick. An example was the hapless FSA, accident-prone as ever. The FSA moved quickly and introduced new liquidity rules for banks operating in the UK. These included waivers for subsidiaries or branches of non–European Economic Area banks. Having set up this new system, however, the FSA then discovered that the draft new EU Capital Requirements Directive due to be implemented across the EU does not allow such waivers. One insider described this as a potentially very embarrassing mess.

62. It is nice to see that the Basel Committee now takes liquidity risk seriously. For those watching the markets, this has been a clear problem since the stock market crash of October 1987, and a blindingly obvious one since 1998. One might also note that it was the failure to take account of liquidity risk that led to the failure of Overrend and Gurney back in 1866.

63. Liam Halligan, "Bankers Regain Power as Davos Summit Ends with a Big Fudge," *Daily Telegraph*, January 29, 2011.

64. There is also an argument for the use of hybrid instruments as supplementary regulatory capital, such as subordinated debt, sometimes referred to as contingent convertible or "CoCo" capital. This would be automatically converted into equity when the Tier I capital hit a particular threshold. Such instruments have the advantage of allowing for an automated recapitalization of a bank when it gets into difficulties. We are somewhat skeptical of this proposal, however; in an environment where banks are already weak, there is the danger that the triggering of such conversions could, in itself, destroy confidence and trigger the very runs they are meant to prevent. There is also the danger of investors in such instruments buying insurance "wrappers," offloading the risk to another counterparty in much the same way as AIG became a dumping ground for the tail risks that no one else wanted.

65. For more on these and how they might be used, see Dowd and Hutchinson, chap. 15.

66. It is also important to mention, at least in passing, the need for major reform of U.S. accounting standards. Currently, the United States is moving from Generally Accepted Accounting Principles (U.S. GAAP) to International Financial Reporting Standards (IFRS). However, IFRS is a very poor accounting standard. Amongst its other hideous features, it throws out the old principle that accounts should be prepared prudently; allows banks to manufacture fake profits and then distribute them as dividends and bonuses; allows banks to inflate capital and hide expected losses; and seriously weakens the audit function in its key task of challenging management. In short, IFRS gives no indication of banks' true financial positions and provides a perfect smokescreen for bankers to plunder their own banks. It is also incomprehensible, even to experts. Indeed, its chief architect, Sir David Tweedie, the chairman of the International Accounting Standards Board that produced IFRS, is on record as saying that if you think you understand IFRS, then you haven't read it properly.

67. There is a caveat. This first-best solution involves not just a single reform but a package of major reforms that form a coherent whole. Our recommendation to abolish capital adequacy regulation is contingent on it being part of that package. Given that the incentives to excessive risk taking that pervade the modern financial system were created by misguided government policy, the removal of capital adequacy regulation, while leaving the rest of the system intact, would mean moving from weakly controlled to almost uncontrolled risk taking. The financial system would soon blow up again, even sooner than it otherwise would, and the bankers would doubtless be demanding yet more massive bailouts from the taxpayer or else civilization will end. Consequently, unless we go for the whole package, it would be better to tighten capital adequacy regulation until the rest of the mess has been sorted out—assuming it ever is.

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