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OPTIMIZATION AND ITS DISCONTENTS IN REGULATORY DESIGN: BANK REGULATION AS AN EXAMPLE

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OPTIMIZATION AND ITS DISCONTENTS IN REGULATORY DESIGN:
Bank Regulation as an Example

William H. Simon

Economists and economically-trained lawyers tend to speak about regulation from a perspective organized around the basic norm of optimization. By contrast, an important managerial literature espouses a perspective organized around the basic norm of reliability. The perspectives are not logically inconsistent, but the economist's view sometimes leads in practice to a preoccupation with decisional simplicity and cost minimization at the expense of complex judgment and learning. Drawing on a literature often ignored by economists and lawyers, I elaborate the contrast between the optimization and reliability perspectives. I then show how it illuminates current discussions of the reform of bank regulation.

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Optimality is the master value of conventional economics. In its most influential formulation, it means that resources are allocated so that any re-allocation would impose a net loss in aggregate welfare. Economic optimization combines the common sense intuition that, other things being equal, we should marshal our resources to get the most out of them with elaborate and precise techniques for determining when we have done so.

The concept and rhetoric of optimality have become increasingly prominent in regulatory policy in recent decades, in substantial part as a consequence of the growing influence of economics. Optimality is the normative touchstone of the two most prominent law-and-economics projects in public law: cost-benefit analysis of regulatory rules and proposals to simulate or construct markets in public goods, such as schooling or pollution abatement. (E.g., Sunstein 2002, Ackerman and Stewart 1985)

Theorists of management sometimes disparage the economist's pre-occupation with optimality and urge respect for a contrasting value they call reliability, robustness, or resilience.[1] In the critics' view, analysis focused on optimality tends to invoke or assume unitary goals, quantitative measures, and bright-line rules that impair its ability to address a broad range of issues and circumstances. Moreover, the charge goes, optimality often means static efficiency, or cost minimization in relation to a given goal, and is thus oblivious to the vital dimension of learning and innovation.

Economists tend to consider such charges unfair or uninformed. Their conception of optimality is capable, in principle, of embracing any number of factors and of dynamic as well as static efficiency. At the most abstract level, optimization means no more than rational action. But it does seem that in practice optimization rhetoric is associated with narrowly defined goals and parameters and a perspective that takes knowledge as given and constant. The distinction between optimization and what we will call reliability may be more a matter of rhetoric or culture than of logic, but it seems to describe a real difference in orientation.

[1] See Weick and Sutcliffe 2007 (contrasting optimality with "resilience"); Landau and Chisholm 1995 (contrasting optimality with "reliability"); Sabel 2006 (contrasting optimality with "robustness").

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In public law, the contrast between the optimality and reliability perspectives appears in the differing rhetoric and preoccupations of, on the one hand, the law-and-economics school, and on the other, the "new governance" literature. (E.g., Parker 2002, de Burca and Scott 2007) While the former emphasizes static efficiency; the latter focuses on learning and continuous revision. Although these two perspectives are not mutually exclusive, they do tend toward distinct regulatory styles and architectures.

Drawing on the management literature, I am going to contrast the optimization perspective with the reliability perspective and to show how the contrast plays a role in current discussions of the reform of financial institution regulation. I do not mean to deny that the insights associated with the reliability perspective can be integrated into the more abstract versions of optimization. The limitations that the management literature finds in optimization rhetoric might be most plausibly attributed to a popular mindset that we could call Vulgar Optimization, rather than optimization in principle. But while no one self-consciously defends Vulgar Optimization, it seems widely practiced, often under the banner of its more respectable relative.

Financial sector regulation is a particularly interesting area for the contrast between these perspectives, and the parallel contrast between law-and-economics and new governance. On the one hand, the financial crisis has shown the limitations of the "efficient capital market" hypothesis and a variety of associated practices that are typically expressed in optimization terms. On the other hand, some of the most prominent pre-crisis regulatory initiatives, especially those associated with "Basel II" – the 2004 accord of the Basel Committee on Banking Supervision – have a strong reliability and "new governance" flavor. These measures had been implemented only partly by the time of the crisis, but the crisis has revealed inadequacies in them.

I. Optimization v. Reliability

In the regulatory context, the economist's focus on optimality has provided a valuable corrective to the often observed governmental disposition to "regulate… to the hilt whatever [public bads] happen to get on the regulatory agenda." (Ackerman and Stewart 1985, 1337) Striving for optimality means taking account of trade-offs.

Moreover, the economists have developed techniques for addressing trade-offs systematically. And they have shown the possibility of incorporating some of the self-optimizing features of markets – the tendency of unobstructed exchange to bring costs and benefits into line -- into regulatory interventions such as "cap and trade" emissions regimes.

The problems arise when the optimization perspective shades into Vulgar Optimization. The key charges against the Vulgar Optimization are reductionism and myopia. Optimization has a tendency to treat constraints like prices and to treat goals like a known and homogeneous surplus. It is more comfortable with a small number of constraints and goals, and it has a bias in favor more readily measured and precisely defined ones. It tends, further, to interpret its mission as attaining goals by deploying resources at the lowest immediate cost. Reductionism and short-sightedness converge to produce a preoccupation with cost-minimization.

More generally, the difficulty concerns uncertainty, as Frank Knight (1923) defined the term. Optimization can accommodate a known future. It can also accommodate a future that involves actuarially quantifiable "risk." With a large enough group, we can predict average mortality with some confidence. With a long enough period of time, we can do so with small, frequently occurring events like automobile accidents. Innovation within a given technology may be predictable to a limited extent. "Moore's law" – semiconductor capacity doubles every two years – has proven roughly correct for many years. But infrequently occurring, large-scale events like major wars or nuclear power plant melt downs and paradigm-shifting technological discoveries are fully in the realm of uncertainty. Estimation in this realm is a matter of hunch or "animal spirits" more than data and formal technique. The dangers of reductionism and short-sightedness are particularly severe here.

The issue is not a matter of logic, but of psychology. All sophisticated optimizers are aware of the limits of their practices. But there may be a psychological tendency for these limits to evolve into unconscious cognitive constraints. Management theorists associate with optimization a reductionist tendency to "normalize the

unexpected." Unexpected or deviant events get reinterpreted in ways that assimilate them to established practices. Burn marks on the Challenger space shuttle were initially treated as anomalies, but then redefined as normal before they were fully analyzed. (Vaughn 1996) Arguing against "simplification", Karl Weick and Kathleen Sutcliffe (2007) assert that "the diagnostic value of weak signals is lost when details are lumped into crude general categories." They continue, "Categories may improve coordination [i.e., optimization], but they harm detection of events not seen before."(64)

Another part of the problem is organizational. Static optimization is associated with organizational specialization, which often lowers costs in the short-term, and organizational specialization may in turn obscure the limits of static optimization. If design is separated from production, and learning and innovation are associated only with the former, then the tendency to think of optimization as the cost of producing current products can become an organizational imperative for most participants. If production tasks are divided into narrow hermetic units, the capacity to interpret weak signals may be impaired because the center has limited access to frontline experience, and frontline workers have excessively narrow understanding.

Consider an incident at the Davis-Besse nuclear power plant near Toledo in the early 2000s. Maintenance personnel found rust particles "mysteriously clogging" the air conditioning and water filters. They had to replace the filters every two days. The industry standard for replacing such filters was two months, although the workers involved did not know this. After every-other-day replacement went on for two years, other personnel discovered that a metal liner built to contain radioactive material had corroded from its original 6 ½" thickness to about a half inch. The corrosion had been generating the rust particles. Sutcliffe and Weick argue:

> The rust accumulation was a weak signal of plantwide problems that would have been detected sooner had information about industry wide experience been disseminated more thoroughly, had local personnel compared this experience with filter replacement in other parts of the facility, had the purchasing department questioned the large orders for filter replacements, or simply if people had started asking around whether replacement every forty-eight hours seemed out of line. (46)

We can see the pathologies of reductionism and myopia here. The optimization perspective is most comfortable with the precise signals typified by market prices. But the most valuable indicators of catastrophic failure often take the form of "weak signals" that are ambiguous. Moreover, training and sharing of information across specialties needed to make use of such signals involves an easily measured up-front cost with a hard-to-measure pay-off in the future.

Albert Hirschman had an insight into such matters when he observed in 1958 that many less developed countries were able to operate adequate airlines, whereas hardly any were able to achieve adequate road systems. This seems counter-intuitive, since roads involve much simpler technology. The explanation, Hirschman suggested, lay in the relation of certain production processes to "the maintenance problem".

> The basic difficulty about maintenance of capital – as opposed to operation on the one hand and to repair on the other – is that it is a preventive activity that must be performed at fairly long intervals that are neither known with precision nor signaled by the capital itself. (141)

The capacity to detect and interpret the weak signals regarding maintenance may be harder to achieve than the capacity to respond to strong price signals. However, Hirschman suggested that some production processes usefully build in responses to such demands. He pointed to, beside airlines, the "continuous process" industries like oil refining and chemicals. What these industries have in common is that they require virtually constant maintenance, and they enforce these requirements with severe automatic penalties for failure. They thus depend less on the kind of difficult judgment and self-discipline that Hirschman found rare in the case of roads.

Hirschman's idea that some organizational structures are more responsive to uncertainty was prescient, but he underestimated the range of application of the kind of organization he recommended. Toyota showed that automobile manufacturing could be organized with the qualities that Hirschman associated with oil and chemicals. (Womack, Jones, and Roos, 1991)

A central theme of contemporary managerialism is the desirability of designing organizations to counter-act the perverse psychological and organizational tendencies associated with Vulgar Optimization. The most prominent case studies are in high

reliability organizations or continuously innovating firms. In the first, exemplified by nuclear power plants, failure threatens catastrophic physical harm. In the second, exemplified by semiconductor firms, product life cycles are short, and the looming threat is economic marginality. Both have in common the need to confront pervasive uncertainty, and they have adopted common strategies for dealing with it. (See Sabel 2006)

Managerial strategies in such organization are often associated with the rejection of optimization, at least rhetorically. Managers espouse quality, excellence, or reliability as ends in themselves. They urge that cost minimization and profit maximization are secondary.[2] They do this in part to inculcate a sense of idealism and commitment in their workforce. But they also do it because, as a practical matter, they think that optimization leads to a pre-occupation with static norms and goals at the expense of learning and innovation.

A recent managerialist work, after noting the success of Alcoa Aluminum Company in achieving an extraordinary safety record, summarizes some key features of the learning dimension of the reliability ideal:

> Alcoa discovered that perfectly safe systems defy conceptual design but are very close to achievable through a dynamic discovery process in which (a) complex work is managed so that problems in design are revealed, (b) problems that are seen are solved so that new knowledge is built quickly, and (c) the new knowledge, although discovered locally, is shared throughout the corporation. (Spear 2009, 229)

Management can induce the revelation of problems by subjecting the organization to controlled stress and destabilization. Thus, managers espouse a variety of super-optimal norms, such as "total quality" or zero defects. The practice of "benchmarking" in product design assesses proposals against the firm's best performing competitors. The declared goal is to be the best, not reasonable or optimal.

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[2] "Japanese managers have found that seeking improvement for improvement's sake is the surest way to strengthen the company's overall competitiveness. If you take care of quality, the profits will take care of themselves." (Imai 1986, 49-50)

"[T]he manufacturing world learned [from firms like Toyota that] [i]f one focused on improving quality, then cost competitiveness would follow." (Suri 1998, 55)

Production is stressed through the elimination of norms or practices that tolerate and accommodate error or deviance. The Toyota Production System introduced "Just-in-Time" parts delivery. This system eliminated stocks of buffer inventory, so that defects in parts would be reported immediately. It also eliminated end-of-the line re-work departments.

Another characteristic stress involves responses to unexpected events. Organizations striving for reliability tend to define unanticipated events as problems calling for investigation. They may increase the likelihood of unexpected events by insisting that actors specify their expectations in detail. Specification may be required even where not necessary to keep production going; its purpose then is to reveal and permit closure of areas of ignorance.

Stephen Spear, who found this practice at both Toyota and the Navy's nuclear submarine program gives an example with respect to the testing of a radiation shield for a nuclear submarine:

> Before any measurements were taken, [Theodore] Rockwell insisted that predictions be made about what the measurements at each point would be. It was not sufficient to find out if the various sections passed or failed in terms of emitted radiation. … [T]hey wanted to know for certain – sooner rather than later – exactly where and when they were wrong what they misunderstood…. [Even] if the shielding worked better than needed or expected, that, too, revealed a gap in their knowledge which could prove costly or dangerous and which needed to be plugged. (122)

The best way to inhibit normalization of the unexpected is to habitually problematize it.

The next element of the "dynamic discovery process" prescribed by the reliability ideal is immediate diagnosis and remedy of problems when they are revealed. In the Toyota Production System, when a defect or problem is discovered at any point in the line, a worker pulls the andon chord to stop the line, triggering a deliberation about how to fix the process.

There are analogous practices in high reliability organizations. Before the transformation of nuclear power plant safety in the 1990s, Joseph Rees (1994) reports, "maximizing the output of electricity meant fixing the reactor after it breaks."

Conventionally trained managers resisted supporting "operations review" engineers because the benefits of their work could not be measured. They were uncomfortable with committing resources to "solve problems that haven't even occurred yet." (131) The transformation after the Three Mile Island crisis involved a refusal to consider that any serious level of error might be optimal.

The analogue in high reliability organizations to the Toyota andon chord process is the response to what the aviation industry calls "near misses" and the nuclear power industry calls "significant events." A deviant observation, such as rust particles in the air conditioning filter, gets immediately reported and analyzed, and where it discloses a remediable problem, the remedy is quickly implemented.

The characteristic response in these systems to defects, problems, and deviant observations is "root cause analysis." The issue is traced through the causal chain to determine if there is a problem at any stage. The "root cause analysis" perspective requires that, not only must the problem be addressed, it must be interpreted and understood in systemic context. There is a presumption against seeing a problem as isolated or local. This practice counters the tendency to "normalize" deviance by presuming that deviance reflects a corrigible systemic problem until it is shown to be otherwise.

The third element of the dynamic perspective is the diffusion of locally discovered knowledge throughout the organization. Workers are broadly and continuously trained. Equally importantly, as improvements are made, they are codified in standardized protocols and "lessons learned" manuals. There is no reliance on tacit or craft knowledge or local improvisation.

The type of norms used in systems of this kind tend to have different qualities from those connoted by optimization rhetoric. Norms that define both goals and constraints in the reliability perspective tend to be contextual, deliberative, multifarious, and diagnostic.

Contextual in contrast to formal or categorical. The norms should be interpreted so as to further their purposes in the circumstances in which they are applied. Even

when the norms take a categorical form, "documented exceptions" may be allowed where it would be counter-productive to follow them.[3] These systems do not try to achieve consistency or accountability by casting their norms in categorical form. Rather, they achieve consistency by having those who apply them engage in continual interaction and discussion with each other as to how the norms should be applied. When consensus is achieved in such discussions, they then re-write the norms prospectively to embody the results of the discussions. Accountability is achieved through the process in which norm-appliers explain and discuss their decisions with each other and in continuous measurement and assessment of the extent to which their efforts achieve the goals of the system.

Deliberative as opposed to individual. The reliability perspective requires frequent deliberation among affected or knowledgeable stakeholders. When someone pulls the andon chord on a Toyota production line, it triggers a deliberation that includes anyone likely to have something to contribute to the solution. In a comparison of Australian and U.S. nursing home regulation, John Braithwaite and Valerie Braithwaite (1995) showed that there was more reliability (in the social science sense of consistency) in judgments under the more contextual Australian norms than under the more formal U.S. ones. The difference lay in part in the fact that the Australian norms were applied through group deliberation, while the American ones were applied through solitary official judgment.

Multiple as opposed to singular. The reliability regimes explicitly refuse to reduce its concerns to a single measure or master norm.

Diagnostic as opposed to evaluative. A type of norm distinctive to such regimes is the indicator – a measure of success that does not necessarily command a particular action or lead to any particular sanction but guides action by suggesting how practice can be improved. Scrap rates, machine usage, goods returned, cycle times are examples.

[3] The term "documented exceptions" comes from the Utah child welfare program. (Noonan, Sabel, and Simon 2009, 536). Rees describes a similar norm in nuclear power plant safety regulation (1994, 82).

The reliability perspective on normative structure is well illustrated by the "balanced scorecard" of Robert Kaplan and David Norton (1995).[4] They begin their book by disparaging single metric optimization. (1-2) You would not want to fly with a pilot who consulted only one instrument measuring a single parameter like speed, they say. Why should the manager of a complex organization rely on a narrower range of indicators than an airplane pilot? The balanced scorecard consists of two parallel sets of about a dozen norms – a set of outcome measures and a set of "performance driver" measures. The "performance drivers" (e.g., completion of new product training for sales force) indicate the extent to which the program is being implemented; the "outcome" measures (e.g., increase in new product sales) indicate how successful it is. The scorecard understands management as a form of continuous experimentation, or as the authors put it, "double loop" learning. "Single loop" monitoring only measures compliance with prescribed norms. "Double loop" enables re-assessment of the norms in the light of the experience of implementation.

II. Banking Regulation

With continued over-simplification, we can contrast the likely influence of the optimization and reliability perspectives on regulatory disposition. The optimizing regulator will be strongly inclined to preserve or create gains from trade and to generate or incorporate strong signals from market prices. When she finds market failure, she will want to intervene as narrowly as possible to correct it, for example, by mandating disclosure, opening up trading opportunities, or internalizing costs with Pigouvian taxes or Calabresian liability rules. Her focus will be on getting prices right.[5]

The managerialist regulator, on the other hand, will be more sensitive to unreflectiveness and complacency on the part of regulated organizations, and she will

[4] The "balanced scorecard" should not be confused with the markedly unbalanced "regulatory scorecards" that compare the costs of regulations along a single static metric in a manner that, as practiced, has had an anti-regulatory bias. See Parker 2003.

[5] The optimizing regulator resembles Bruce Ackerman's description of the "activist lawyer," for whom "the real world will come to seem a place full of pervasive transactional problems with many names – "free rider", "moral hazard," "bounded rationality," "non-convex demand and supply curves," – each requiring systematic attention in the analysis of one or another market failure." (1983, 1105-06)

intervene characteristically with carrots and sticks designed to induce transparent self-assessment and self-correction and with efforts to pool and analyze the information gained in monitoring to derive diagnostic indicators. Her goals will be expressed in terms of multifarious standards derived from stakeholder deliberation.

Optimization themes dominated pre-crisis financial reform. Many of the failures of the resulting regime can be helpfully explained within that perspective as misapplications of it. However, post-crisis discussion seems to reflect distinctively managerialist themes and a sense the dangers of Vulgar Optimization. And this recognition seems to arise in substantial part from a perception that the key challenges involve Knightian uncertainty more than actuarial risk.

I focus on regulation in the United States. The Vulgar Optimization themes may have been more salient there, but post-crisis diagnosis suggests that they were influential in other major systems as well.[6]

A. Regulatory Optimization and the Crisis

Any system of bank regulation has to address some basic problems:

First, the coordination problem arising from fractional reserve banking and the consequent threat of a "run" on the banks. This is a Prisoner's Dilemma in which individually rational decisions lead to a collectively disastrous result. When there is a threat of collapse, it can become self-fulfilling, as each person strives to get what he can out of the system before the collapse, but in doing so makes the collapse more likely. This danger requires the government to play a backstop role as deposit insurer and lender of last resort.

Second, the moral hazard phenomenon that results from the government's backstop role. Depositors, knowing that they are insured, and other creditors, knowing that the bank has access to emergency loans from the central bank and perhaps to implicit insurance for institutions that are "too big to fail," will fail to monitor optimally or at all, and banks will take greater risks than they otherwise would.

[6] My generalizations about post-crisis discussion are based on Financial Services Authority, Group of 30 2009, Haldane 2009, High Level Group on Financial Reform in the EU 2009, Tarullo 2008, and U.S. Dept of the Treasury 2009.

Third, the agency problem that arises from the separation of ownership and control in banks. In principle, bank share prices reflect their long-run earning prospects, but managers will usually have a shorter term perspective and will also have incentives to distort public reports of the banks earnings and financial condition. High-powered contingent compensation based on short-term stock performance exacerbates the problem.

Fourth, the asymmetric term structure of the banks liabilities and assets. Banks tend to borrow short term (for example, by taking demand deposits) in order to lend longer term. Their liabilities have shorter terms than their assets. This makes them vulnerable to interest rate shocks or credit squeezes. They may have to pay more to retain their deposits than they are receiving on their outstanding loans, or they may be unable to roll over their short-term debts.

These problems can be understood as market failures. It is less clear whether they represent failures of optimization. An economy in state of financial collapse may satisfy the sparer definitions of optimality that require only that assets be allocated to those who value (pay for) them most. (E.g., Mansfield 1982) More demanding definitions requiring transparency, liquidity, and/or large numbers of active market participants would not be satisfied. Moreover, protecting against spiraling collapse may require limits on the kind of free exchange that economists associate with optimality. The regulator may find herself in the position repeatedly portrayed in the managerialist literature of having to choose between achieving observable and calculable static efficiencies on the one hand and protecting against more speculative and immeasurable dangers on the other.

The New Deal regulatory structure emphatically sacrificed static efficiency in favor of, first, crisis avoidance, and second, protecting certain social priorities in the provisioning of capital, in particular, access for home buyers, farmers, and small businesses. It addressed these goals with elaborate “command-and-control” restraints on entry, range of services, interest rates, and types of investments. These goals were pursued at the cost of obvious inefficiencies, including low returns to savers (due to

interest rate ceilings) and uniform and inconvenient service (some readers will remember when "banker's hours" meant 10 to 4 and there were no ATMs).

The de-regulatory movement began in the late 1970s and culminated in 1999 with the repeal of the New Deal cornerstone Glass-Steagall Act. During this time, the focus on crisis-avoidance and social priorities diminished, and concern with static efficiency increased. The view of the market as an engine of optimization was thickened by various theories of "efficient capital markets." These theories extolled the capacity of markets to allocate financial claims so as to minimize non-systemic risk (risk that can be avoided by diversification) and match the varying risk preferences and time horizons of individual savers and investors. At the same time, they asserted the superior ability of the market to allocate capital by aggregating the varying judgments of dispersed traders about the relative values of projects.

An extreme but important manifestation of such views is a 1998 speech on "Optimal Capital Regulation" by Alan Greenspan, chairman of the board of governors of the Federal Reserve. Greenspan proposed that "a reasonable principle for setting regulatory soundness standards is to act much as the market would if there were no safety net [deposit insurance and lender-of-last-resort service] and the market were fully informed." He proceeded to suggest that requiring banks to maintain the equivalent of a triple-A credit rating would be "demonstrably too stringent", since very few private lenders demand this level of safety. (167).

Greenspan exemplified the tendency to "normalize the unexpected" in responding to the fact that banks appeared to be using novel transactional forms to evade or dilute regulatory capital requirements. Instead of treating this development as a warning sign of potential regulatory failure, he speculated that it was a "desirable form… of regulatory capital arbitrage" and an indication that explicit capital minima should be lowered. (Greenspan 1998, 166). Such views were not unique to the U.S. The U.K. Financial Services Authority (FSA) report on the crisis observes, "An underlying assumption of financial regulation in the US, the UK, and across the world,

has been that the financial innovation is by definition beneficial, since market discipline will winnow out any unnecessary or destructive innovation." (2009, 49)

The regime that emerged in the de-regulatory era abandoned or loosened restrictions on entry, range of services, interest rates, and investments. Its central response to the key market failures was mandatory minimum capital levels. The basic idea was that adequate private capital would constrain excessive risk taking and enlist shareholders in policing managers. As long as shareholders had a sufficient economic stake in the solvency of the bank, they could be expected to rein in risky activities. Compared to the pre-existing regime, minimum capital rules were relatively narrow and simple, and they made share prices a strong market signal for both bank managers and regulators of risk.

Capital is the residual after liabilities are subtracted from assets. Alternatively, it is the "cushion" that protects creditors' claims (the bank's liabilities) from default or insolvency. The appropriate minimum capital depends on the riskiness of the assets -- the likelihood that their values will fall. If the assets are all T-bills, soundness requires a relatively small amount of capital. (T-bills have no risk of default but some risk that their value will decline from a rise in interest rates.) If they are all subordinated corporate debt, then a larger amount of capital would be necessary. In practice, financial institutions have a range of kinds of assets of varying degrees and kinds of risk. Under practices codified in 1988 by the "Basel I" accord of the International Committee on Banking Supervision, assets were categorized into a small number of classes that were supposed to reflect relative risk. The minimum capital standard reflected a weighted composite of the components of the different categories.

A related reform that influenced the determination of minimum capital was the shift to "mark to market" accounting. The issue here is how basic asset values are determined (before they are adjusted for risk). The traditional approach is "historical cost" (what the bank paid for it), reduced in the case of some assets by a fairly rigid formula to reflect depreciation. When the accountant had reason to believe that the actual market value of the asset was different from cost, the traditional approach was to

use the market value if it was lower but to stick with historical cost if the market value was higher. The virtues of this approach were deemed, first, its conservatism (caution about over-stating values) and, second, its obviation of complex judgments (aside from the need to determine when market was below cost).

The traditional approach became intolerable during the deregulation era. The accountants had long been willing to make an exception for assets like securities that were traded in thick markets where prices could be obtained without effort or judgment. Increasingly large fractions of bank assets took the form of such securities. Moreover, "efficient capital market" theory insisted that prices in such markets were more reliable than either historical costs or expert judgments. So the traditional approach was loosened to put more emphasis on current prices in the construction of the balance sheet and, hence, in the determination of minimum capital.

The strong reliance on asset prices as regulatory indicators rested on a view of asset prices as functions of actuarially calculable risk rather than Knightian uncertainty. This view was encouraged by the core assumption, explicitly embedded in "efficient capital markets" theories, that asset prices are "exogenous". In other words, they are driven by events external to the market itself. In the dominant view, asset prices summarize diverse estimates about the likelihood and magnitude of future earnings the assets might generate. Since current prices reliably summarize all known factors, price changes in the future would reflect currently unknown factors and hence could be modeled as random. The theorists thus modeled future prices as "normal distributions" of the sort that represent the likelihood of events like repeated coin flips. These distributions had "thin tails" suggesting a low probability of very large losses.

The "efficient markets" idea was incorporated into other practices beside "mark to market' accounting. It underpinned the "Value at Risk" model of asset risk assessment that became widely used during the bubble period. And it was a premise of the Black-Scholes option pricing model that became standard in computing derivative values. Both "Value at Risk" and Black-Scholes assumed "normal distributions" with very high losses shown as "thin tails" with very low probability. Specific asset

volatility was calculated on the basis of relatively recent periods that excluded major financial downturns.

Current discussion emphasizes that the de-regulatory era under-estimated the volatility of financial markets (in substantial part by mistaking uncertainty for risk) and paid insufficient attention crisis-avoidance (reliability) goals. The specific concerns are these:

First, coordination: The minimum capital regimes were insensitive to "systemic risk." Regulators' systemic focus was largely limited to monetary policy. In banking regulation, regulators tended to assess banking risk bank-by-bank. In particular, they assumed that assets held by banks could be liquidated at their current market values, and they assumed the net effects of second-order pecuniary or "network" externalities from the one bank's default would be negligible. They thus ignored what now appears as substantial "liquidity risk" – the danger that when banks simultaneously sell assets, their prices will drop precipitously or that the market will simply refuse to absorb them. And they further ignored that some assets or liabilities reflected interdependencies that were so large and so complex, that a single institution's default could ramify dangerously throughout the system.

Key features of the regulatory regime involved a "procyclicity" that aggravated these systemic risks. When a bank's assets declined in value or its liabilities increased in value, the rules often forced banks to meet minimum capital requirements by selling assets, contributing to a downward spiral when many banks were forced down this route. Since capital requirements were a function of asset riskiness, the same phenomenon could occur when a credit rating agency downgraded a security. Banks holding it would then have to hold proportionately more capital against the asset, and to do so, they might have to sell other assets and exacerbate the downward market trend. Of course, in the upswing the opposite trends would occur. An increase in the value of assets could become self-perpetuating, as banks were now free to use more of their resources to buy risky securities, thus increasing their price.

A central response to such problems in reform programs are "counter-cyclical" norms, or to use a term from the Spanish regime, "dynamic provisioning." The basic idea is to require that the bank build up a reserve of capital when asset values are rising and permit it to draw the reserve down, rather than sell assets, when they are declining.

Second, moral hazard. This problem turns out to be have correctly defined but vastly larger than was thought before the crisis. The U.S. government has spent billions bailing out uninsured creditors on the "too big to fail" rationale, and the Federal Reserve system has played its lender-of-last-resort role on a scale previously unimagined.

The reform proposals retain the focus on capital requirements, but call for considerably higher minima. They also call for more exacting general scrutiny of risk-generating activity. And they extend capital regulation beyond the formal category of commercial banking to other institutions likely to become "too big to fail."

Third, agency costs. Regulators generally ignored the effects of compensation practices on risk behavior prior to the crisis. Post-crisis, these practices are widely perceived to have induced undesirable risk-taking. Since the effects of much of this risk are externalized, shareholder monitoring is not an effective check. Although this issue is relatively controversial, many proposals call for regulatory scrutiny of compensation practices as part of the general risk assessment of an institution. They favor that incentive compensation be deferred so that it can be calculated on the basis of performance results measured over several years, rather than on end-of-the-year balance sheet values. And they would give the regulators authority to ban or penalize firms that are "outliers" in terms of compensation or whose practices seem to present exceptional risks.

Fourth, term structure. This problem was exacerbated as intermediaries such as money market funds used short-term deposits to buy securities with long maturities and unexpectedly volatile prices. Measures responsive to systemic "liquidity risk" will also improve the risks at the individual firm level from the asymmetry in the term structure

of assets and liability. A pertinent proposal is a "core funding ratio" that would limit the relation of long-term assets to deposits and other short-term liabilities.

Finally, the crisis has a revealed a cluster of previously under-recognized problems that relate to disintermediation. The New Deal regime encouraged "relationship banking" in which banks established long-term connections with localities, sectors, or customers and relied on tacit knowledge and expectations of repeat dealings in assessing creditworthiness and monitoring. Relationship banking withered in the deregulatory era. Increasingly, both the originators and the purchasers of many loans did not plan to hold them for long periods of time. They were using "originate and distribute" or "acquire and arbitrage" strategies. Since the originators were transferring credit risk, they had limited incentives to assess it. Remote purchasers would have limited ability to do so, especially as loans were sliced and repackaged in complex ways.

The system turned to credit rating agencies to assess risk. When loans were bundled into securities, issuers paid them to provide estimates of credit risk that purchasers could rely on. The model failed, in part because of the irresponsibility of the agencies; in part, because there were insufficient data from which the risk of many securities could be reliably assessed. Reform proposals generally propose measures that would both increase regulation of rating agencies, and reduce reliance on their ratings.

Another way banks could reduce risks of lending was by hedging with credit default swaps and other derivatives. This practice further reduced the originating banks' incentives to assess creditworthiness, and it introduced dangerous concentrations of risk. Intermediaries sold large amounts of guarantees of other people's credit, especially credit default swaps, which were then traded in secondary markets. The creditworthiness of the sellers was difficult to assess, not only because of the complexity of the relevant interrelationships, but also because it depended on a seller's net exposure, and available information made this hard or impossible to determine. The problem would be partially mitigated by the creation of a clearinghouse, such as those run by the stock exchanges, that would collect information and net out transactions.

Many see Vulgar Optimization as an important influence on these failures. The regulators adopted a static perspective that minimized the risks of collapse,[7] and they were pre-occupied with "strong" price signals and norms based on them at the expense of weaker or more complex ones.

The Static Focus. We've noted that the regulators were insensitive to the dynamic factors associated with "systemic risk", especially "liquidity risk," "network externalities", and the "procyclicity" of regulatory constraints. The "efficient capital markets" view encouraged a static perspective by excluding the possibility of endogenous "positive feedback" trends. It now seems clear that asset bubbles are facilitated by psychological and institutional factors. Psychologically, people are sometimes inclined to believe that prices will rise because they have been rising, and this belief can become a self-fulfilling prophecy (but only for a finite yet indeterminate period of time). Institutionally, prices can rise if the banking system makes more credit available on the basis of the increased asset valuations. When the bubbles pop, the same forces drive downward spirals. The "efficient markets" view makes bubbles and downward spirals seem rare and anomalous; the "positive feedback" view makes them salient and intelligible.

The heavy reliance on asset prices as regulatory variables now seems to rest on a mistaken conflation or risk and uncertainty. The main data points in risk calculations were prices, but prices proved misleading as indications of the danger of downward spiral. VaR measures of risk in the spring of 2007 were low. As bank leverage increased dramatically from 2003 to 2007, "adjusted risk" was flat. The FSA Report suggests that the "[m]athematical sophistication" of these techniques provided "false assurance that other indicators of increasing risk (i.e., credit extension and balance sheet growth) could be safely ignored." (22) The prices of credit default swaps on the eve of the crisis "suggested that risks were at historically low, not historically high levels."

[7] Moreover, the regulators more or less assumed the benefits of static efficiency would flow from market-like structures, rather than seeking to measure them directly. Yet, as the FSA says, it is "arguable that the allocative efficiency benefits of the creation of markets for many [innovative products] would have been at most trivial even if they had not played a role in creating financial instability." (41)

Bank share prices were rising at the same time. (45) Underlining the radical difference between static and dynamic perspectives in this context, the FSA concludes, "Systemic appears to be highest when measured risk is lowest, since low measured risk encourages behavior which creates increased systemic risk." (23) Economists usually assume that prices, even when not "correct" (reflective of equilibrium values) will encourage activity in the right direction (toward equilibrium). But with "positive feedback," this assumption no longer applies.

Inattention to Weak Signals and Aversion to Complex Judgment. The years preceding the collapse in 2007 and 2008 involve many dramatic departures from historical patterns that, in hindsight, were signals of structural problems. For example, the volume of financial transactions rose dramatically faster than the volume of activities in the real economy. Housing prices increased at historically unprecedented rates, while rental prices and building costs remained relatively stable. The ratio of mortgage debt to borrower income or to demographic indicators of housing demand increased sharply. Yet, the regulatory tendency was to "normalize the unexpected" rather than to treat these indicators as "weak signals" calling for investigation and analysis.

At the same time, post-crisis discussion emphasizes the disadvantages of the simple bright-line norms favored by the optimization perspective. For example, there was "regulatory arbitrage" in which activities were shifted or re-structured to take advantage of relatively loose regulations. To escape the relatively strict regulations of commercial banking, high-risk activity was shifted to a "shadow banking" system of investment banks, insurance companies, mutual funds, and hedge funds. These institutions were more lightly regulated than commercial banks, even where their activities involved significant systemic risks. Within the commercial banking system, firms shifted assets from their "banking books" to their "trading books", which carried lower capital requirements.

The "Basel I" risk criteria from which capital adequacy limits were derived were crude. They treated all mortgages alike, for example. Riskier mortgages thereby

became more attractive, since they promised higher rewards and did not require that their higher risk be cushioned by more capital. A provision exempting from capital requirements loan facilities of less than a year induced widespread provision of 364-day loan facilities. (Tarullo 2008) When banks transferred assets through securitization, they could profit by securitizing the safest assets within each category while retaining the riskiest. Although the average risk of the retained assets would increase, the capital charge would not.

Accountants lost their ambivalence between "rule-based" and "principles-based" approaches to their craft and treated balance sheet norms as rules that permitted misleading practices. Both implicit and explicit residual credit guarantees with respect to securitization that represented major liabilities were not shown as liabilities. And assets were written up "to market" even when trading volume was too thin to give a meaningful indication of even current value.

The rating system was also gamed. The agencies rated on the basis of categorical formulae. They made their models public, a desirable step to the extent that it permitted public assessment of the models. However, issuers responded by "structuring to rating." They found ways of packing in the most risk they could while satisfying the formal criteria.

B. Toward Reliability

The financial crisis has induced a shift in emphasis from optimization (or Vulgar Optimization) to reliability. To some extent, the current perspective is simply a re-affirmation of the traditional regulatory focus in banking on "safety and soundness", and especially, crisis avoidance. But comprehensive "command and control" responses of the New Deal variety are not on the agenda. Current proposals tend to include tightened prescriptive rules and market signals, but they also put frequent emphasis on the managerialist themes of dynamic re-assessment and complex multi-factor and collaborative judgment.

The Basel II accord of 2004 seems a watershed in this transition. The accord had not been fully implemented anywhere by the time of the crisis, and implementation

had only begun in the United States. But it represented, albeit ambivalently and ineffectually, a shift in regulatory direction. Its key ambition was to go beyond the crude asset categories of Basel I to produce more particularized risk assessments by drawing on each bank's "internal" assessment practices. The banks had better information than the regulators about the risks of the loans they made and better ability to use their experience to construct risk-assessment criteria. The interest in protecting its capital base was thought to give managers incentives to rate as accurately as they could. So the "internal-ratings based" (IRB) approach allowed the banks to use the ratings they used for their own management purposes for the purposes of determining regulatory minimum capital requirements. The bank's internal ratings for specific assets were aggregated and plugged into a general formula provided by the regulators that generated an overall minimum capital level. (See Tarullo 2008)

Basel II moved in a managerialist direction by attempting to incorporate a more complex set of signals and to strengthen duties to re-assess practices in the light of experience. But these measures were weak, and the regime incorporated key mistaken assumptions of the national regulatory regimes. Its most prominent provisions tended to exacerbate the weaknesses of these regimes, in particular, by producing lower minimum capital requirements.

Here are some of the key reliability themes in current reform proposals:

The Dynamic Focus. The emphasis on continuous self-assessment is reflected in the now-famous "stress tests". These tests examine the banks solvency in terms, not just of current economic parameters, but under a variety of adverse variations that might arise. The stress tests are a simulated form of the kind of pressures that are actually induced in structures like the Toyota Production System. The tests have long been required, but they have assumed new prominence in the current situation:

> The common stress tests need to be made dynamic, so that the second and subsequent round interactions, and their consequences for system-wide risk, can be evaluated. This calls for an iterative approach to stress-testing in which banks' first-round results and management actions influence second-round stresses facing firms – for example, the effects of asset sales and liquidity

> hoarding. In effect what we would then have is a hybrid stress test-cum-wargame. (Haldane 2009, 8-9)

Another manifestation of the dynamic perspective is the "counter-cyclical" approach to capital regulation in which banks are forced to strengthen their reserves in times of growth when assets values are increasing and measured risk is declining. In effect, these regimes demand that banks respond by moving against the direction signaled by the market.

A further important theme picked up from Basel II and given new emphasis is the demand for continuous validation of risk assessment models. Capital adequacy regulation was just one of three Basel II "pillars". The second pillar – 'supervisory review" – required principles-based assessment of a bank's soundness. (The third involved "market discipline", mainly through disclosure to the securities markets.) Bank regulators are supposed to rely on a bank's internal risk assessments only when the bank's assessment models had been "validated" -- that is, only when evidence showed that their criteria reliably predicted risk. In addition, the banks should have in place processes for ongoing monitoring of experience with their models. The proposals contemplate that banks will collect data from their own experience as well as publicly available data and apply multiple regression analysis to derive effective rating criteria, then periodically re-evaluate the models in the light of recent experience. (Basel Committee on Banking Supervision 2005, 105-06) Observers expected "supervisory review" under Pillar 2 to take the form of "dialog between banks and regulaors" aimed at "mutual learning." (Redak 2006, 203)

Why didn't Pillar 2 work to prevent or mitigate the crisis? One problem seems to be that it was not adequately implemented by the regulators. Another seems to be that the models were impaired by misunderstandings shared by both banks and regulators, including the assumptions that returns would be "normally" distributed and that reliable assessments of volatility could be based on data from short periods. And still another was the reduction of incentives to monitor and re-assess by securitization

and the "originate to distribute" business model. The new proposals aim to correct these deficiencies.

Daniel Tarullo (2008) argues that the bank's internal rating processes are complex and opaque in ways that will make review and assessment difficult for regulators. The problem is exacerbated by the fact that banks' regard their investment and trading strategies as key proprietary assets and hence resist disclosure of most information about them. Yet, without the aggregation of data from different banks and comparison of the consequences of different strategies, effective assessment of a given strategy is improbable.

A less discussed set of issues concerns types of diagnostic self-assessment at the retail level more comprehensive than those involved in the validation of credit scoring protocols. The shift from "relationship banking" toward securitization and derivative hedging seems to have involved a loss of reliability due to reduced incentives for error detection. A retail bank executive describes his institution as responding to defaults prior to the bubble thus:

> When foreclosures occurred, World Savings executives would drive to the house to see if they had made mistakes appraising the property or underwriting the loan. 'We called these the van tours,' Mr. Sandler said. 'And we would say, 'O.K. have we done anything wrong here?" (Moss and Fabrikant 2009)

This sounds like an analogue to "total quality management" and Toyota-style "root cause analysis" in which errors are treated as symptoms of potential systemic failures to be immediately investigated and remedied. But the practice stopped once default risk was transferred and pooled.

In a purely static sense, the bank was sub-optimally diversified when it held on to the loans it originated. But underdiversification operated as a stress on the system that motivated qualitative credit assessment and monitoring. Once the risk was fragmented and pooled, holders had neither the incentive nor the opportunity to engage in comparable monitoring. Proposals to require originators to retain a substantial interest in their loans explicitly mandate that optimality be compromised in the interest of reliability.

Thus, while the general rhetoric of Basel II about validation and continuous re-assessment sounds like a plausible "new governance" approach, the regime's inattention to difficult implementation issues may reflect the same misplaced confidence in the self-optimizing properties of the market seen elsewhere. The regime seems to have assumed that the market as then structured would produce internal risk assessment models adequate for public regulatory purposes. This assumption ignores, not only the skewed short-term incentives of bank managers, but the limits on information available to any one bank. It seems likely that the construction of effective models would require a far more active role by the regulators in generating and aggregating information.

Complex judgment. Many proposals emphasize the need for complex judgment. "Future rules will have to be better complemented by reliance on judgment, instead of being based on internal risk models…. [P]rofessional due diligence should put at the center of [the regulators'] work," the EU Report asserts, calling for less reliance on agency ratings and "mark to market" accounting. (16, 21) "Regulatory and supervisory coverage should follow the principle of economic substance not legal form," according to the FSA report. (7)

Basel II had anticipated this re-orientation by making principles-based norms central to Pillar 2 "supervisory review". (Redak 2006) The Basel Committee recently emphasized, "[T]he supervisory authority will specify a number of qualitative criteria that banks would have to meet before they are permitted to use a model-based approach."(2009, 7)[8]

The reversal of the disintermediation trend both by the loss of investor confidence in mortgage-backed securities and derivatives and through potential regulatory changes such as a requirement that originators hold part of what they originate could create pressures for a return to more complex types of assessment associated with "relationship banking".

The reformers also call for a larger and more diverse set of regulatory norms. A common view is that even a higher and better measured minimum capital requirement

[8] This was the approach of US regulators in principle. (Tarullo 2008).

needs to be complemented by other norms. For example, American banking law imposed two major capital adequacy norms – a risk adjusted minimum and an unadjusted "leverage ratio". Basel II did not prescribe anything like the "leverage ratio". Anticipating that the Basel II internal risk assessment models would lead to much lower risk-adjusted capital minima, American banks argued for elimination or relaxation of the leverage ratio. Post-crisis, many see the leverage ratio as a valuable additional safeguard that protects against inadequate risk-adjustment. (E.g., Tarullo 2008)

In addition, ideas of risk have become more multi-dimensional. Most notably, in addition to the credit, market, and operational risk emphasized by Basel II, there is now great emphasis on liquidity risk, the risk associated with "network externalities," and risks generated by compensation practices. And within each category, more texture has been observed. For example, the systemic dimension of credit risk (that is, the effect of general economic downturn on defaults) turns out to contain usefully distinguishable variations across regions and industries.

A further emphasis is on diagnostic and comparative norms, as opposed to conventionally prescriptive ones. These norms often call for comparative assessment, benchmarking, scrutiny of "outliers," and occasionally "peer review" of business models. (Haldane 2009, 8; FSA 2009, 86)

Finally, there is a call for more collaborative or deliberative judgment. So far, the main discussion of collaborative judgment has been with respect to regulators. There are calls for increased exchange of information and discussions of diagnostic indicators and appropriate regulatory responses across regulatory regimes both within nations (the U.S. for example has for major five major federal bank regulators plus a bunch of state regimes) and across them. Part of the purpose of such measures is coordination and the prevention of regulatory arbitrage. However, part of it appears to be learning. The Committee of European Banking Supervisors has inaugurated a "peer review" process among its participants. The FSA report calls for "colleges" of regulators with responsibility for a given financial institution.

The problem of complex assessment is especially pressing with respect to validation of internal ratings. Assessment of internal ratings processes now appears more difficult than at the time Basel II was passed. Such ratings are likely to play a less prominent role in the future. Effective integration into regulation probably requires sharing of data on experience and disciplined comparison results with different models. Assessment will also require more complex and qualitative judgments than pre-crisis regulation seemed to contemplate.

As yet, such issues have been only scantily addressed, but the emphasis on qualitative and diagnostic judgment will intensify pressures to do so. The literature on reliability suggests that part of the answer lies in some kind of peer review process. (See Rees 1994, Noonan, Sabel, and Simon 2009.) How the peer review process would embrace bank personnel is unclear. The banking industry is highly competitive, and issues of safety are integral to those of business strategy. Thus, industry peer review would encounter both bank concerns about proprietary information and public antitrust concerns. However, regulators can play an intermediating rule, insisting on broad disclosure to themselves, while inducing more selective disclosure and discussion among peers.

Such a process of mutual monitoring and selective disclosure operates in nuclear safety regulation. (Rees 1994) The banking industry has more players and is more competitive. However, a recent legislative proposal to make the 200 largest banks insurers of each other's obligations, including the possibility of assessing the surviving banks for any shortfall after the failure of one of them, would create important incentives for peer monitoring. (U.S. House of Representatives 2009) Such an approach would be a step toward making the banks "hostages of each other", which Rees found a condition of effective peer review in nuclear power. No doubt such arrangements would constrain desirable as well as undesirable competition, but the improvements in reliability might be worth the sacrifice.

III. Conclusion

As a practical matter, many of the specific analytical techniques derived by economists from the idea of optimization are irrelevant or inadequate to many regulatory tasks, including especially the goal of insuring financial institution "safety and soundness". At the abstract level, the idea of optimization is frequently associated with unreflective bias toward static perspectives and norms obviating complex judgment. The rejection of this kind of Vulgar Optimization is a prominent theme of recent diagnoses of the financial crisis. The managerial literature provides an alternative perspective and rhetoric that emphasizes dynamics and complex judgment. Recent reform proposals reflect some its themes, and it would probably be a good thing if they were to do so more.

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