Enough Is Enough

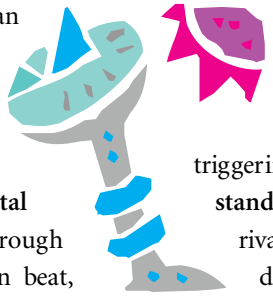
A Timely Look at Financial-

by Edward L. Golding and Carol A. Wambeke

TIME AND RISK ARE BOTH AMORPHOUS COMMODITIES, NOT EASILY GIVEN TO measurement. Both are important, though, despite their intangibility. Just as an increasingly time-conscious world relies on precise time measurement to avoid mass confusion, housing-finance institutions depend on accurate risk measurement to decide when they have set aside a prudent sum of ***capital****. Efforts to more deftly quantify both time and risk have led to a procession of increasingly sophisticated gauges. In the case of financial risk, though, the four distinct assessment tools developed so far have yet to rival the exactitude achieved by the best of the time-telling devices. Thus, mortgage-finance institutions and their regulators continue to face a critical question: When, relatively speaking, is enough capital enough?*

Great Moments in Time Telling and Risk Weighing

The sundial is the first timepiece noted by recorded history. The **leverage ratio**, by comparison, ranks as one of the earliest gauges of financial soundness. Both are fairly crude measures. The sundial does little more than chase shadows; the leverage ratio is but an exercise in simple division—quite commonly a firm's capital divided by its assets. The ratio reveals little about the extent of risk but, when used for regulatory purposes, does attempt to contain losses by establishing a floor below which capital may not drop without triggering early government intervention.



The emergence of the **risk-based capital standard**, a concept conceived nearly 50 years ago, provides a risk-measurement breakthrough rivaling the wind-up clock's debut. Just as the mechanical clock established an even beat, dropping no more than five minutes a day, a risk-based approach to measuring capital adequacy solved some of the leverage ratio's shortcomings by sorting assets into four risk categories.

The next major time-telling advance, an electronic tuning-fork mechanism that ticked off the seconds inside Accutron® wristwatches, was put into production by Bulova Watch Co. in 1960. Some 15 years later, the mortgage industry hit upon the **stress test**—which simulates how a company would perform if forced to ride out a long string of bad luck. A stress test provides a viable framework for capturing all of the main risks faced by a firm and for expressing the severity of its potential losses in dollar terms.

The quartz watch revolutionized time telling when it hit the marketplace in 1969. Not only did this watch never need winding, but the quartz movement—pulsing 32,768 times a second—proved accurate to within a few seconds a day. Similarly, the **value-at-risk** measure grabbed the attention of large financial firms in the 1990s. The value-at-risk technique offered a way to pin down risks accompanying rapidly changing **trading portfolios** and enabled firms to place a probability on their ability to remain solvent under a wide variety of economic scenarios.

Both the stress-test and the value-at-risk measures represent the latest chapters in the financial industry's search for ever-better risk yardsticks. Although neither provides an iron-clad guarantee of when enough capital is enough relative to risk, both sufficiently advance the accuracy objective by helping risk managers maintain a low probability of insolvency. Thus, both measures reduce the need to hold as much capital as in the past.

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Soundness Measures

1 Leverage Ratios: Drawing the Line on Losses

UNTIL RECENTLY, A LEVERAGE RATIO SERVED AS virtually the only capital-adequacy indicator within the financial services industry. One of the more common types of leverage ratios is a capital-to-assets ratio, which measures how much capital supports a company's assets. The capital-to-assets ratio for a company with $1 million in assets and $80,000 in capital, for example, is 8 percent ($80,000 ÷ $1 million).

Despite heavy regulatory and marketplace reliance on the leverage ratio in the past, the tool is flawed in several respects. For one, it encompasses only on-balance-sheet assets. It does not detect risks posed by off-balance-sheet activities. For Freddie

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2 Risk-Based Ratios: Getting Closer

THE INTERNATIONAL BASLE COMMITTEE ON Banking Supervision started the ball rolling toward linking capital and risk in 1988. That's when central-banking representatives from 12 nations published a uniform capital standard intended to replace the prevailing international patchwork of regulatory capital requirements. The **Basle Accord** produced by the committee settled on the relative degree of **default risk** posed by broad asset categories as a more suitable basis than leverage alone for determining capital levels. The capital-adequacy rule proved instrumental in stopping the worldwide decline in bank capital levels that, by the late 1980s, had threatened the safety and soundness

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3 Stress Tests: Riding Out the Worst

A STRESS TEST, A TYPE OF **SCENARIO ANALYSIS**, measures the adequacy of a firm's capital base by simulating its staying power under damaging financial conditions. Statistical models project the company's performance in the face of economic shocks that produce capital-eroding losses severe enough to potentially provoke insolvency (see "Anatomy of a Stress Test," page 51).

Although the main point of stress testing is to deliver a stiff dose of worst-case reality, the drill, nonetheless, is purely fiction. For instance, these simulations tend to overstate the rapidity of a firm's deterioration for simplicity's sake by assuming that the company does nothing to stem the flow of red ink. In the real world, most companies are

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4 Value-at-Risk: Playing the Odds

IN THE YEARS SINCE THE 1988 BASLE ACCORD, the country's largest commercial banks and other major financial institutions have acquired a technical prowess never imagined by the agreement's negotiators. Aided by increasingly powerful computers, these institutions now collect and manipulate vast databases of interest rates, various market prices, default rates and loss recoveries. Employing modern financial theory, the firms then can translate their exposures into a value-at-risk figure, which is the amount of capital that a company might lose over a designated period under historical market conditions.

Employing standard statistical concepts, the value-at-risk approach combines a firm's exposure

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Leverage, *continued from page 29*

Mac and Fannie Mae, off-balance-sheet obligations amount mostly to **mortgage-backed securities** (**MBS**) issued by the firms with a guarantee against **default**. A depository's contingent liabilities might include **recourse** on loans or performance guarantees ensuring that a client will deliver goods or make payment to a business partner as agreed.

On the plus side, a leverage ratio is easy to calculate. As a measure of a firm's relative indebtedness, the ratio also offers insight into how much money company stockholders personally are willing to risk on the enterprise. Yet, the formula discloses little about a firm's risk exposure, except as implied by the amount of the company's assets. In simpler times, when the vast majority of mortgage-finance and banking transactions occurred on the corporate balance sheet, asset size alone served as a fair proxy for risk. Accordingly, the larger the firm by assets, the more capital it needed to protect against asset values falling so low as to leave insufficient funds to repay corporate debts, let alone satisfy company stockholders.

The first regulatory use of a leverage ratio, which in this instance measured capital-to-debt, began as early as 1914 when the Comptroller of the Currency ordered banks to maintain capital levels of at least 10 percent of deposits. Unfortunately, that precaution proved insufficient to ward off the blows sustained by the banking industry 15 years later with the arrival of the Great Depression. During the 1930s, more than one-fifth of U.S. commercial banks suspended operations, setting off waves of withdrawals by distraught depositors. To staunch the flow of bank panics, Congress enacted federally backed deposit insurance in 1933.

By 1948, with the deposit-insurance **safety net** firmly in place, the Comptroller eliminated the capital-to-deposits requirement. Over the next 20 years, bank regulators experimented with a variety of ways of tying capital to the riskiness of the different assets on a bank's books. The increasingly complex nature of these efforts eventually prompted a return to a straight capital-to-assets ratio in the early 1970s. Regulators later revived a risk-based approach to capital adequacy to coincide with the rise in off-balance-sheet activities in the 1980s. □

Risk-Based, *continued from page 29*

of the international banking community (see "Wanted: Bank Regulators Who Act More Like the Market," page 6). The Accord also provided the first official recognition of the growing importance of off-balance-sheet activities in bank operations. The recommended risk-based-ratio approach relates a firm's capital to obligations recorded off the balance sheet as well as to assets, while adjusting capital levels up or down to reflect the default risks posed by these activities.

Two years later, U.S. banking and thrift regulators adopted a risk-based-capital ratio based on the Basle recommendations—a depository must hold capital equal to 8 percent of risk-weighted assets correlated to the degree of default risk presented by four asset groups. This definition extends to the many off-balance-sheet activities that are not assets but subject the holder to default risk nonetheless. Risk exposure from off-balance-sheet activities is quite substantial in some cases. At year-end 1997, for example, 46 percent of all commercial-bank business was transacted through loan commitments, trade performance guarantees and other off-balance-sheet obligations, according to figures compiled by the Federal Financial Institutions Examination Council.

The U.S. risk-based regulatory regime places assets and off-balance-sheet activities into the four categories shown in *Exhibit 1*. As the perceived default risk of a financial instrument increases, so does the extent of capital an institution must hold against that position. In short, this rule would require a depository to reserve the full 8-percent capital requirement against instruments falling in the 100-percent risk-weight category but nothing

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Risk-Based, *continued from page 30*

against those carrying a risk weight of zero.

Today, depositories must comply with both the 8-percent risk-based-ratio requirement and a 4-percent capital-to-assets leverage ratio. The latter constitutes the threshold below which conditions are considered serious enough to warrant possible regulatory intervention, similar to the regulatory **minimum capital** and **critical capital** thresholds set for Freddie Mac and Fannie Mae (see "Avoiding Capital Trip Wires," page 49). However, for some depositories—such as those with few off-balance-sheet activities and assets with a low risk of default—the 4-percent leverage ratio can constitute a higher capital hurdle than the 8-percent risk-based gauge.

Although tying capital adequacy to one of four risk classes constitutes an improvement over the simple leverage ratios that preceded them, these rules still possess some of the same weaknesses. For instance, divvying up risks among four buckets provides only rough approximations of risk within broad investment categories rather than precise default-risk measurements. To illustrate, a commercial loan carries an arbitrary 8-percent capital charge regardless of whether the institution extends the money to a low-risk, AA-rated company or a far riskier unrated firm.

Moreover, the risk-based rules present opportunities for a firm to obscure its risks by rebundling the company's assets. For instance, an institution may attempt to reduce its total capital requirement by encouraging a mortgage applicant purchasing a $100,000 home to take out a $10,000 second mortgage and an $80,000 first mortgage in lieu of a $90,000 first mortgage. The borrower's $10,000 cash down payment remains the same, but this sleight-of-hand cuts the lender's capital requirement to $4,000 (4-percent capital against the $80,000 first mortgage plus 8-percent capital against the $10,000 second mortgage) from $7,200 (8-percent capital against the 10-percent-down first mortgage), while leaving the firm's default risk unchanged.

For the most part, the risk-based-capital rule also fails to look at risks in the context of a company's overall portfolio, thereby muddying a reading of the firm's total risk exposure. That is, the rule does not give sufficient recognition to efforts to hedge or mitigate risks. Finally, the risk-based capital rule concentrates solely on default risk and ignores **interest-rate risk**, the other major predictor of insolvency for banks and thrifts. □

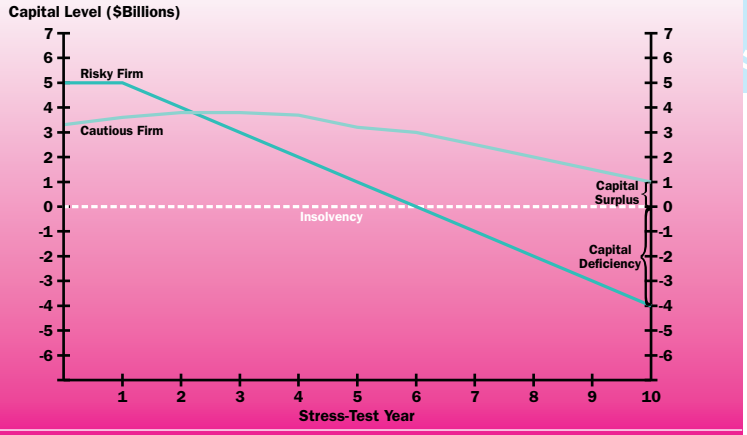
EXHIBIT 1: Depository Risk-Based Capital Standards

Risk Weight	Financial Instrument Characteristics	Example
0 Percent	Unconditionally backed by the national government in one of 30 economically developed countries	Cash; U.S. Treasury bills
20 Percent	Low default risk, easily liquidated	Freddie Mac, Fannie Mae mortgage-backed securities; federally insured banking deposits
50 Percent	Low to moderate default risk, well collateralized	Many private-label mortgage-backed securities; single-family mortgages with down payments of 20 percent or, if less, mortgage insurance
100 Percent	Ineligible for lower risk-weight categories	Single-family mortgages with down payments of less than 20 percent and no mortgage insurance; some second mortgages; commercial loans

Sources: Federal Reserve Board, Office of Thrift Supervision

Stress Tests, *continued from page 29*

EXHIBIT 2: Hypothetical Stress Test for Two Firms



This stress test uncovers the vulnerabilities of a risky firm that is seemingly well capitalized at the start but folds after six years of higher-than-expected mortgage defaults and a sharp increase in interest rates.

unwilling to go down without a fight. Typically, they work to offset declining earnings by raising more capital through stock offerings or by seeking out profitable new business.

The first significant stress testing within the mortgage market probably took place two decades ago when the capital strength of the **private-mortgage insurance** industry was called into question. To demonstrate the resiliency of its business, the mortgage-insurance industry hired consultant Arthur D. Little to assess its capital adequacy. The consulting firm developed a computer simulation showing how a representative mortgage insurer would perform under several variations of optimistic, pessimistic, catastrophic and doomsday economic forecasts for the coming decade. In the most extreme case tested, the company succumbed in the second year when its low-down-payment mortgage holdings defaulted at a 14-percent clip, compared to the industry's historical 1-percent rate, according to the 1975 study.

Capitalizing on the mortgage insurers' lead, Moody's Investors Services later began issuing mortgage-insurer and mortgage-conduit credit ratings consistent with 10-year distress scenarios modeled after the Great Depression. Taking a cue from Moody's, Freddie Mac also developed a Great Depression-like stress test that served to guide the company's internal capitalization strategies for a number of years. Currently, the Office of Federal Housing Enterprise Oversight is building a stress test around the mortgage-default and default-loss experiences in four oil-patch states during the 1980s. The test also incorporates a six-percentage-point swing in interest rates (see "Stressing Performance: Evaluating the Capital Adequacy of Freddie Mac and Fannie Mae," page 47).

Other stress tests might revisit different historically stressful episodes, such as the 1987 U.S. stock-market crash, the 1992 European Monetary System crisis and the 1994 Mexican peso devaluation. A few stress-test types, though, are not tied to specific past events but are predicated on extremely large movements in stock prices, exchange rates or other underlying factors, even though they are very unlikely to occur given historical fluctuations.

The stress tests administered to companies heavily invested in mortgages tend to revolve around financial upheavals involving drastic changes in interest rates that might accelerate or slow down mortgage **prepayments**, or around steep declines in house prices that may encourage mortgage defaults. *Exhibit 2* depicts a hypothetical stress test based on a rapid, but prolonged, 6-percentage-point rise in deposit interest rates and stagnating property values. This particular scenario tells an interesting story about how capital, despite initial stockpiles, can vanish as the risks and strengths of a firm unfold under stressful conditions.

Although the risky firm depicted in Exhibit 2 starts out with a strong, $5-billion capital base, it

soon starts to slip. Going into the second year, it begins losing the bet that it can fund a portfolio of low, 5-percent-down mortgages yielding a fixed rate of 7 percent over 30 years with inexpensive short-term liabilities bearing 4-percent interest. The firm spends the next four years paying the price for its misplaced trust.

To continue attracting deposits, the institution is forced to repeatedly bid up the price of its liability base before pulling even with competing market rates that have stabilized at 10 percent. Consequently, the company winds up paying 10 percent for the privilege of earning 7 percent on its loan portfolio. Over the same time period, the firm experiences above-average losses on mortgage defaults when house prices do not appreciate rapidly enough to offset errors in lending judgment.

In Year 6, the risky firm is out of capital and out of business, at least hypothetically. Fortunately, by opting for the insight of a stress test over the hindsight following a real-world calamity, the risky firm now knows what to do. The company must nearly double its capital to $9 billion or change its risk profile if it is to survive a full 10 years under equivalent economic conditions.

In contrast, the cautious firm holding $3 billion in capital against a similar mortgage portfolio easily survives the entire 10-year ordeal because it takes a much more guarded view of the future. As a result, the firm better hedges its interest-rate risk with long-term obligations that come closer to matching the long-term maturities of its mortgage assets. In fact, the firm makes a bit of money before the slight imperfections of its funding strategy show up in the last six years of the simulation to eat up nearly two-thirds of its capital.

This careful firm, by requiring higher, 10-percent down payments, also is able to keep its loan losses to a minimum. That decision further enables the company to attract a customer base less inclined to default. At the same time, the larger borrower contributions of equity more than make up for the failure of the underlying properties to appreciate. Thanks to this cautious posture, the firm not only survives, but it also retains a $1-billion capital cushion against insolvency at the end of the 10-year period.

Stress tests overcome many of the weaknesses associated with the simple leverage and risk-based capital ratios. These ratios cannot identify easily the differences in risk exposures that a stress test can. Not only would both ratios fail to detect the differences between the risky and cautious firms, but both measures would view the riskier firm as better capitalized. Likewise, the two ratios cannot recognize efforts by the cautious firm to lower its risk exposure through interest-rate hedging; a stress test, though, would appropriately reward such behavior by returning a lower capital requirement.

Capital ratios are incapable of assessing potential worst-case business losses. Stress tests, on the other hand, quantify how much a company stands to suffer in the event the stipulted scenario occurs. The size of any capital deficiency at the end of the test period gives a precise measure of how much more capital a company should hold to limit its vulnerability to insolvency.

Finally, stress tests are not as easy as risk-based capital rules to manipulate in an effort to lower a firm's capital requirement.

Stress tests are not without their flaws, though. By relying on historical data, a stress test could miss situations that have no precedent but are possible nonetheless in light of changing events. A subjective quality also creeps into stress testing because the results produced are a direct reflection of the scenario tested. There is no standard way to carry out stress testing and no standard set of scenarios to consider. Consequently, the testing process is highly dependent on the judgment and experience of a firm's risk manager. A bad or implausible scenario will do little to illuminate whether a company is sufficiently capitalized against its true risk exposures. At the same time, setting risk capital based on worst-case events that are extremely improbable may result in unnecessarily high capital reserves.

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Stress Tests, *continued from page 33*

Freddie Mac is working to minimize the limitations of traditional stress testing. The company has designed a decision-making model to identify the most appropriate worst-case scenarios against which the firm regularly should test its performance (see "Drawing an Ellipse Around Risks," page 39). The model employs the statistical framework of a **joint-probability ellipse**. It takes into account the interrelationships among relevant risk factors and the probability of their occurrence then devises numerous challenges for a firm to face. □

Value-at-Risk, *continued from page 29*

to various sources of risk with the probability of an adverse market movement. A full-blown value-at-risk formulation equates adequate capital to the amount a firm must hold to reduce the likelihood of insolvency to a low probability—typically within the 0.1-percent to 5-percent range—over a selected time period (see "Putting a Value on Laying Low Versus Flying High," opposite page).

When teamed together, daily value-at-risk testing and periodic stress testing produce a clearer view of a firm's overall risks than either approach could achieve separately. The mutually reinforcing results likewise capture and quantify risk with greater precision than a leverage ratio or risk-based ratio ever could approach.

The value-at-risk method quantifies how bad losses can get within a certain probability of accuracy, whereas stress testing involves no probability ramifications. Stress testing, however, does quantify the magnitude of potential losses under extreme or even catastrophic conditions that value-at-risk projections, based on a **normal distribution** of recent historical experience, may miss. For example, a value-at-risk figure calculated using a 99-percent probability standard can determine the amount of capital necessary to survive all but 1 percent of events. A stress test, on the other hand, can specify the amount of capital needed to survive the 508-point stock-market drop that occurred on October 19, 1987. That event was so extreme that it stood no chance of happening in value-at-risk terms. That's because value-at-risk calculations based on a 1-percent involvency probability would have considered a stock-market drop of merely 65 points so improbable—so unlikely to occur 99 percent of the time—that the risk measure stops looking for losses beyond that point.

A chief advantage of the value-at-risk approach is that it collapses a company's risk exposures into a single number. A value-at-risk model arrives at a dollar figure by aggregating the individual components of risk of a firm-wide portfolio; it accounts for the volatility of those risk factors and the correlations between them. The formula is relatively straightforward for computing the volatility of returns on a simple portfolio devoid of complicated assets such as options. Assuming that these returns are normally distributed, the model then can calculate a value-at-risk figure for a given probability threshold based on well-known properties of this distribution's familiar, bell-shaped curve.

Yet, for all its convenience, a single summary statistic looms large as the Achilles' heel of the value-at-risk methodology. Abbreviating a firm's risks in this manner sacrifices the insights contributed by a stress test or the joint-probability-ellipse framework as to whether it is an interest-rate spike, a stagnating economy or other conditions responsible for getting a particular firm into trouble. Likewise, it is difficult to discern what simplifying assumptions—of which there are many—went into the figurative black box that generates the value-at-risk figure. The main assumption is that the portfolio of returns follows the normal bell-shaped distribution. While this

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Putting a Value on Laying Low Versus Flying High

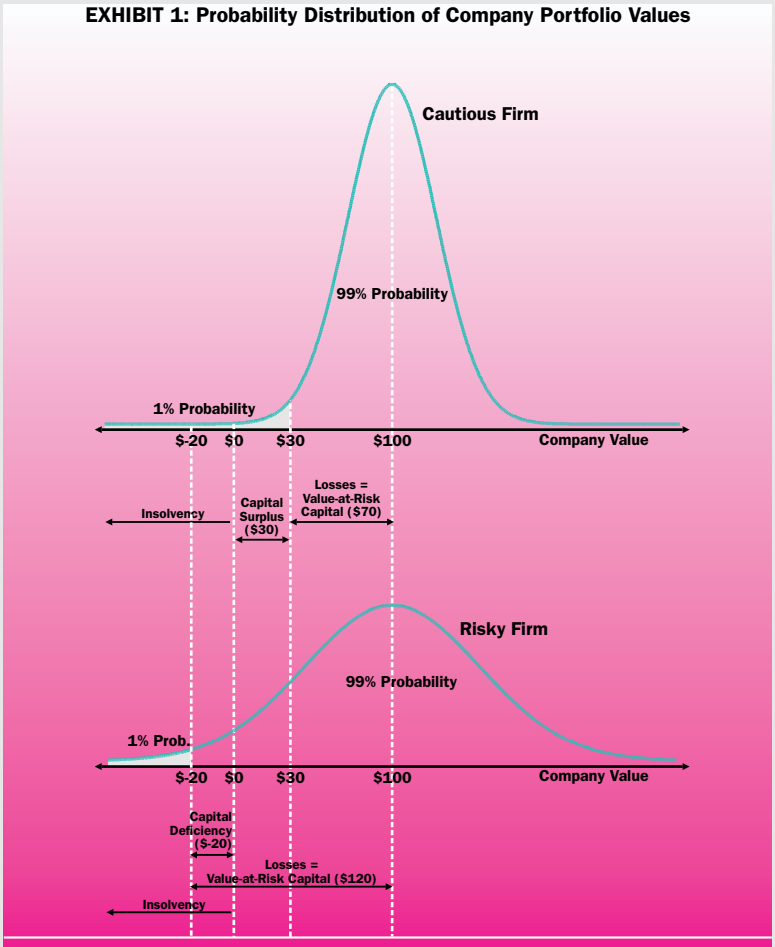
Suppose two housing-finance competitors both want to hold enough **capital** to survive 99 percent of the economic scenarios that could develop in one year based on changes in interest rates and house prices observed in the past. The two firms hold identical sums of capital at $100 each, but one is fairly cautious and the other far bolder when it comes to taking **risks**.

Before computing their respective value-at-risk estimates, the firms obtain many years' worth of data to build a historically accurate reconstruction of interest-rate movements and house-price changes. Based on that information, the value-at-risk model generates a **probability distribution** of company net worth under hundreds of different combinations of changes in the two factors over one-year time horizons.

The differences in the risk profiles of the two firms become apparent, as shown by the dissimilar shapes of their probability distributions recorded in *Exhibit 1*. The contours reflect the firms' values under possible rate and price scenarios by showing the likelihood of each outcome. The cautious firm's distribution is steeper, denoting a smaller variance in possible outcomes due to its risk aversion. That reluctance consequently binds the potential outcomes more tightly to the distribution's midpoint. As the better-hedged or better-diversified firm, the cautious operation does reasonably well most of the time. That is, the cautious firm never wins the lottery, but it rarely goes insolvent. In contrast, the risky firm's probability distribution is flatter because the variance in its potential outcomes is higher. Under propitious conditions, the riskier firm wins big; under unfavorable conditions, it loses big.

Managing each company to a capital-adequacy standard limiting the probability of insolvency to 1 percent—meaning, the likelihood that the firm's capital will fall below zero is 1 percent or less—would result in different capital requirements for the firms. The cautious firm would need to reserve $70 in capital, while the risky firm would need to hold $120. As such, the safe firm is holding excess capital of $30 that it could use to support faster growth or greater risk. The risky firm, though, shows a capital deficiency of $20. That is, the risky firm would need to raise $20 in capital—or correspondingly lower its risk—to avoid the 1-percent-event probability by which the company is defining its capital adequacy.

EXHIBIT 1: Probability Distribution of Company Portfolio Values



Note: Company value includes on-balance-sheet and off-balance-sheet items.
Source: Freddie Mac

When risk tastes diverge, two firms managed to the same 1-percent insolvency tolerance will end up with different capital requirements under the value-at-risk methodology. For the cautious firm, there is only a 1-in-100 chance under historical market conditions that its losses will exceed $70, leaving it with $30 of its $100 in capital as a cushion. The risky firm must increase its capital to $120 to narrow its chances of bankruptcy to the same low odds for any one-year period.

The value-at-risk figure for either firm depends on the **covariance** between the changes in interest rates and house prices. The more frequently the adverse movements tend to occur together, the larger the resulting value-at-risk. An even stronger correlation might mean, for example, that the bolder firm must hold $500 instead of $120 to prudently support its risks. At the other extreme, if a favorable movement in house prices always exactly offsets an inauspicious change in interest rates, then a firm's value-at-risk works out to virtually zero.

—Carol A. Wambeke

Value-at-Risk, *continued from page 34*

supposition greatly facilitates the aggregation of risks over different factors, it imposes a particular probability pattern on potential losses. That explains the failure to anticipate the previously mentioned 1987 plunge in stock prices.

Furthermore, arriving at defensible assumptions for computing a value-at-risk is difficult given the challenges of accurately estimating the volatilities and correlations of the relevant risk factors. The common practice of inferring volatility and correlation projections from historical data or from market prices is based on the presumption that the structure of risk-factor relationships will remain unchanged over the forecast horizon. For short horizons, such as a day or a week, this may be approximately correct. The assumption, though, is far less reliable for long horizons of one year or more.

Value-at-risk systems also pose more implementation problems than do stress tests or other risk measures. Not only does terminology vary across firms, but no clear-cut agreement exists as to the right way to calculate value-at-risk figures. Similarly, a clear-cut consensus has yet to emerge for standardizing the value-at-risk parameters to make comparisons among institutions meaningful. The value-at-risk practices among banks, for instance, differ with respect to the probability measure, with 95 percent, 97 percent and 99 percent all finding an audience (see "New Capital Rule Signals Supervisory Shift," page 24). The holding period also can vary, with some firms selecting two-week periods and others analyzing losses over a full year.

The computations that go into a value-at-risk formulation are extensive. Many firms calculate the market value of their positions on a daily basis then run the new data through a value-at-risk model that is updated frequently as volatility and **covariance** relationships change.

The 1997 work of economic researchers Chris Marshal and Michael Siegel underscores some of the simpler, real-world implementation challenges. The pair asked a number of leading risk-management software vendors to assess the value-at-risk for the same portfolio of government bonds, foreign-exchange forwards, interest-rate options and other financial instruments. Each software producer built its product around the same value-at-risk model—J.P. Morgan & Co.'s RiskMetrics—using the same one-day time horizon and 95-percent probability parameter. Nonetheless, no two vendors produced precisely the same value-at-risk estimate, and some of the results varied widely. Implementation discrepancies arose on a number of fronts, including the values assigned to portfolio holdings, financial-relationship linkages, methods for calculating interest-rate changes and transaction-date adjustments to account for holidays and weekends.

Although less-sophisticated pricing and portfolio-risk models are in wide use, no more than a handful of institutions—led by J.P. Morgan and Bankers Trust Corp.—have pressed the value-at-risk methodology into service. Among the nation's commercial banks, only certain large institutions manage their risks and capital adequacy through this type of valuation system. These technologically sophisticated banks generally limit the use of the value-at-risk methodology to evaluating interest-rate risk and other forms of **market risk** associated with their **trading activities**. Banks have been slow to incorporate default risk into their evaluations of risk because it is hard to find the breadth of historical market prices needed to model this peril in a value-at-risk framework. Banks tend to regard their loan-default data as proprietary, whereas Wall Street freely disseminates market-risk data on securities.

Nonetheless, the stage now is set for a greater convergence around value-at-risk parameters, given that banking regulators have recognized that the risk-management models in use by major banks are far more advanced than anything they could propose.

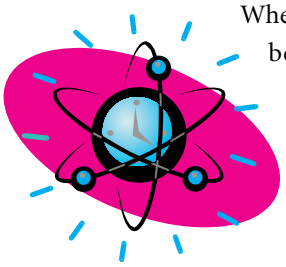
That has led regulators to consider ways to replace major banks' capital ratios with each institution's own risk-valuation system when it comes to trading-book exposure to market risk. One such experiment, known as a **pre-commitment**

approach, is now under review by the Federal Reserve Board (see "Regulators Trust but Time Verifies Under Experimental Capital Plan," page 38). Banking regulators already have embraced an **internal-models** approach to setting bank capital standards with a new market-risk rule that took effect in January 1998.

Outside of these two trading-book experiments that rely on value-at-risk assessments, the rest of a bank's activities still are subject to a Basle-like capital standard. Nonetheless, the value-at-risk methodology is fast becoming an essential tool for conveying market-driven trading risks to senior management, board directors and shareholders.

What's more, value-at-risk modeling of default risks may enjoy a rapid evolution, given the intense research efforts underway in industry and academia. In fact, the International Swaps and Derivatives Association, based in New York City, this spring urged its members with substantial trading portfolios to develop the same kind of value-at-risk approach to managing default risk that large banks now are using to capitalize against the market risk of these activities. □

Next Up: The Atomic Clock of Risk Measurement?



When it comes to measuring time, the ultimate achievement, at least for now, belongs to the incredibly accurate atomic clock, which loses no more than one second every million years. Although value-at-risk is one of the most accurate forms of risk measurement to date, the approach is nowhere near as precise as the atomic clock, which serves as the official standard to which clocks around the world are set. More importantly, only certain types of businesses currently are sophisticated enough to take advantage of the value-at-risk technique.

However, the value-at-risk standard does resemble the atomic clock in one somewhat unflattering respect dealing with practicality. An atomic clock is propelled by an engineering feat that harnesses the extraordinarily stable rate of vibration at which eletromagnetic waves are emitted and absorbed by molecules. The value-at-risk approach, for its part, requires an enormous amount of computing power to operate complex econometric models capable of digesting massive quantities of historical data. So just as the clock-watching world has yet to convert the power of the molecule into a more practical application—an atomic timepiece for the wrist, perhaps—the financial community is searching for a more pragmatic approach to value-at-risk.

For now, arguably the best approach to risk measurement combines the use of value-at-risk testing to evaluate certain risks under typical market conditions and stress testing to assess a firm's vulnerability to extreme pressures. In the housing-finance sector, at least, the joint-probability ellipse enables stress testing to come closer to embracing the probability properties of the value-at-risk approach, offering a useful transition device to the next generation of risk-measurement tools.

The perfect insolvency risk measure has yet to materialize. With some of the most innovative minds in the financial world fast at work on the challenge, however, the next major advance is sure to happen. It's just a matter of time. SMM

Regulators Trust but Time Verifies Under Experimental Capital Plan

Bringing the notion of self-regulation much closer to reality, an experimental program is relying on banks themselves to pick the regulatorily prudent capital levels by which they will abide.

A bank operating under this alternative **pre-commitment** approach would determine for itself how much capital is needed to cover the maximum losses it potentially could suffer from **market risks** associated with its **trading-portfolio** activities. Despite the emphasis on arms-length capital regulation, government supervisors are disinclined to trust a bank's judgment without verifying the appropriateness of the capital level selected. In this case, the regulators simply wait for the passage of time to prove a bank's capital-need predictions right or wrong. The bank is vindicated when its **trading-book** losses over a financial quarter amount to less than its self-selected capital level. When losses deplete available capital, though, the bank suffers repercussions. Suggested penalties include some combination of fines, public disclosure and revocation of a bank's privilege to dictate its own regulatory capital levels.

As proposed, the pre-commitment approach is positioned to encourage better risk management on the part of banks by prompting risk managers to respond quickly to changing market conditions. The thinking is that banks will take pains to alter their risk exposures if mounting losses during a quarter should threaten the pledged capital amount. Rather than risk a penalty or the pain of public disclosure, managers quickly will close out risk positions and accept current losses as necessary.

Earlier this year, the New York Clearinghouse, an organization of large banks, reported favorably on the idea after completing a pre-commitment pilot study in cooperation with bank regulators. In no instances did trading losses overwhelm capital amounts pledged by the 10 banks participating in four consecutive quarters of testing that began in October 1996.

The New York Clearninghouse report cautioned, however, that the pilot occurred during a period when market volatility was modest and trading results generally favored banks. It remains to be seen whether the self-assessment model would prove as effective if faced with unusual volatility spikes or market reversals.

The pre-commitment approach generally is viewed as a replacement and not a supplement to the **internal-models** option that became available to some larger banking operations earlier this year. Based on informal comparisons among the pilot participants, pre-committed capital amounts for market risk generally fell significantly below capital requirements estimated through the internal-models approach.

Although both approaches promote the concept of self-regulation, the internal-models variation focuses on the risk-measurement process, which results in greater regulatory intrusion into the details of a bank's proprietary risk-measurement model. Initially, the model must receive regulatory certification that it meets certain standards. Subsequently, the accuracy of the information generated by the model is validated by the regulator through a complex though imperfect **backtesting** procedure (see "New Capital Rule Signals Supervisory Shift," page 24).

In contrast, the pre-commitment approach emphasizes risk-management outcomes and so avoids the thorny statistical backtesting problem. What's more, the ease of quantifying actual bank losses to compare against committed capital levels provides a ready indicator of risk-management deficiencies. Banks also receive credit for correct judgments reached subjectively about market risk, operational risk and legal risk and for the ability to manage these risks. Regulators end up basing their actions on the outcome of a bank's strategy, not on an assessment of the bank's financial model.

The pre-commitment approach is not fault-free, however. Given that pre-commitment penalties are applied after the fact and only in the event of losses, the approach may not deter undercapitalized institutions from launching go-for-broke gambits. Bank regulators could avoid this pitfall by permitting only banks in sound financial condition with demonstrated risk-management abilities to take advantage of the pre-commitment option, while excluding those for whom the penalties would serve as no deterrent to excessive risk-taking.

For now, the three banking regulators—the Federal Reserve Board, the Office of the Comptroller of the Currency and the Federal Deposit Insurance Corp.—have no announced date for deciding whether to make the pre-commitment alternative a permanent feature of their financial-soundness regulation. The promised efficiency gains appeal to some policy makers, the banking industry and economists. Yet, the incentive-based nature of the pre-commitment approach concerns some members of the bank supervisory community who worry about losing their ability to intervene before losses occur.**—Paul Kupiec, principal economist, financial research department**