

## Adjusting for mortgage risk

# Get Set for Loan-Level Pricing

WITH ONE NOTABLE EXCEPTION, virtually every credit sector, from credit cards to business loans, links the costs borrowers pay for credit to the risks they represent. The mortgage industry, though, has fallen behind the rest of the credit markets when it comes to adjusting prices to costs.

From all indications, that's about to change. Within the next five years, the mortgage market will move to a **risk-based pricing** system whereby lenders assess borrowing costs loan by loan, aided by computerized loan-evaluation systems capable of forecasting the default risk dictated by each mortgage. Likewise, secondary-market companies will adjust the **guarantee fees** charged to lenders to more accurately reflect the risks represented by the individual mortgages within a loan pool that an originator wants to sell. As lenders begin to pay varying guarantee fees, market forces may well prompt these firms to pass the price distinctions along to borrowers in the form of similarly varying mortgage rates.

The twin engines of better information and greater competition lie behind the evolution of risk-based pricing. The ongoing adoption of automated-underwriting systems



has given the lending industry the ability to measure risk more quickly and accurately than ever. As the competition heats up among market players armed with more precise information, these participants become less able to cross-subsidize higher-risk loans with lower-risk loans.

For years, the country's main residential mortgage market, which is sometimes referred to as the **prime market** because it deals largely with the least-risky "A-quality" lending business, has relied primarily on **average-cost pricing** to determine the interest rates charged to borrowers. Every mortgage-interest rate includes a premium to cover the risk of default. Under average-cost pricing, all "A" borrowers pay approximately the same risk

premium as part of the interest rate. Consequently, an "A" borrower whose credit history shows a high likelihood of repayment might pay the same interest rate as another "A"

borrower whose high credit-line use and other characteristics might make repayment more doubtful. By definition, then, the lower-risk borrowers are subsidizing the some-

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what higher-risk borrowers.

Risk-based pricing leads to a closer alignment of risk and reward because the market explicitly charges individualized rates based on where loan applicants fall along a risk band. Under such a scenario, the two A-rated borrowers might instead be distinguished as "A+" and "A"

*by Arnold S. Kling*

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**EXHIBIT 1: Hypothetical Risk-Price Continuum**

Before Risk-Based Pricing	Prime Market					Subprime Market								
	A			B		C			D					
	7.5%			9.5%		10.5%			12.5%					
After Risk-Based Pricing	A+	A	A-	A--	B++	B+	B	B-	C+	C	C-	D+	D	D-
	7.4%	7.5%	7.75%	8.0%	8.5%	9.0%	10%	10.5%	11.0%	11.5%	12.0%	13.0%	14.0%	15.0%

Note: Interest rates shown are hypothetical averages for a risk category.  
Source: Freddie Mac

This hypothetical risk-price continuum envisions how categories of mortgage-interest rates priced under the current average-cost approach might divide into more precise risk grades that expand the range of interest rates offered by lenders. For example, the prime market's "A" borrowers, who might all now pay 7.5-percent interest, may become "A+," "A" and "A-," paying rates of 7.4 percent, 7.5 percent and 7.75 percent, respectively, as the result of risk-based pricing. The subprime market's "B" loan category likewise would re-form around finer risk and interest-rate distinctions. The line that has traditionally separated the prime and subprime markets might then shift to somewhere between the new "A-" and "B+" groupings.

repayment risks. The less-risky borrower would receive an interest-rate break of, perhaps, one-eighth to one-half percentage point less than what the other borrower pays. *Exhibit 1* imagines how this continuum might look.

Today's mortgage-lending industry relies on average-cost pricing. However, it does pass along to borrowers some of the risk-cost variation through mortgage-insurance premiums charged at different down-payment levels and in interest-rate differentials assessed on certain types of mortgage products (*Exhibit 2*). However, only a small number of risk factors are captured by these pricing factors.

The current lending system does draw one other, more distinct line, which is

**EXHIBIT 2: Even Now, Borrowers Pay Different Rates**

Tying interest rates to risk is not altogether new in the mortgage market, although the relationship between rates and risk may not seem self-evident to borrowers.

For years, the interest rates charged to borrowers have depended largely on product type and a loan applicant's down payment or equity in the property—the size of which dictates the need for mortgage insurance (MI) and the cost of this coverage. Borrower credit history also has played a role when the severity of an applicant's problems pushes the loan out of contention for lower interest-rate pricing.

These pricing surrogates change the cost of a loan to a borrower in several ways. The following chart illustrates the price differential for loans with higher risk characteristics compared with a standard, 30-year, fixed-rate mortgage with 20 percent down.

LOAN CHARACTERISTIC	PRICE DIFFERENCE
<i>Product Type</i>	
Balloon Mortgage	1/2 percent of loan amount up front*
Adjustable-Rate Mortgage (ARM)	1/8 to 1/4 percentage point higher interest rate*
15-Year Fixed-Rate Mortgage	1/8 percentage point lower interest rate*
Investor Mortgage	1-1/2 percent of loan amount up front*
<i>Down Payment</i>	
15 percent	MI premium of 1/3 percentage point higher interest rate
10 percent	MI premium of 1/2 percentage point higher interest rate
5 percent	MI premium of 3/4 percentage point higher interest rate
<i>Borrower Credit History</i>	
Subprime Mortgage	1 to 5 percentage points higher interest rate

\*Assumes that price differences charged by secondary-market companies are passed along to borrowers.

Note: Interest rates for different products also vary for reasons other than those shown here.

Source: Freddie Mac

predicated on borrower credit history. For years, it has distinguished between highly creditworthy A-quality loans meeting the prime mortgage market's purchase requirements and the subprime mortgage market, where higher-default-risk loans go into a different secondary market operated by private-label securitizers. Once again, borrowers near the low-risk end of a given credit category pay borrowing costs that effectively subsidize borrowers at the higher-risk end of the category. At the same time, the expediency of relying on broad risk groups works to the detriment of some borrowers at the margins of those categories. Those borrowers, when viewed individually instead of collectively with others in the risk bucket, would qualify to move into a higher credit-quality category, where costs are lower.

Better information and greater competition also will change the type of risk-based pricing practiced by the privately funded market for higher-risk loans. The broad divisions between the subprime market's "B," "C" and "D" groups of loans likewise may separate into finer risk distinctions, such as "B+" and "B-," and carry differentiated interest rates, changes which also are reflected in Exhibit 1's hypothetical risk-price spectrum. The evolution of smaller and smaller risk buckets eventually may reach the point where each

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borrower pays different costs. Such a finely sliced pricing system also could provide a market signal to consumers trying to decide whether they can keep up their payments over time; a very high mortgage rate would indicate that an individual may be better off postponing home buying for a couple of years while saving up money and eliminating credit problems.

Eventually, lenders and investors will harness automated risk-ranking systems to make pricing decisions based on risk just as they now, with increasing frequency, use them to underwrite mortgages more quickly and less expensively.

#### **A Push Toward Loan-Level Pricing**

The mortgage industry has become much more adept at using mortgage-scoring systems

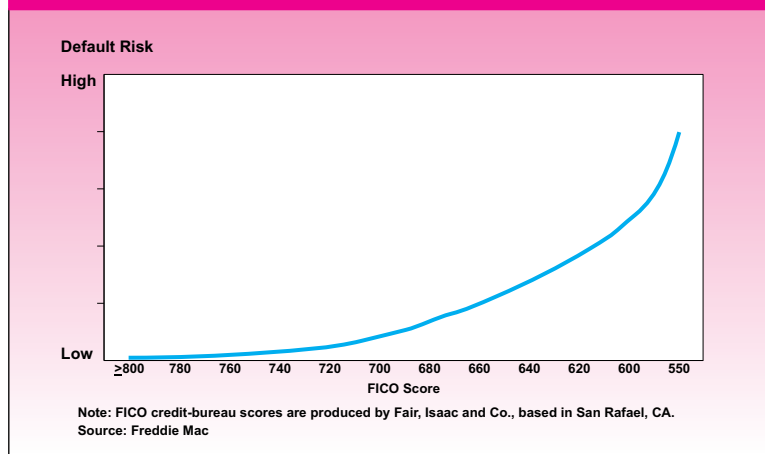
to measure the cost of doing business at the loan level. (See "Loan-Level Pricing: Why Now?" page 21.) Consequently, the race is on to convert this information advantage into a competitive advantage.

Automated-underwriting systems are changing the very nature of risk classification through the use of finely calibrated custom mortgage scores. Until recently, the evaluation of loan applications was left to human underwriters who relied on rules of thumb and their own judgment to categorize loans by risk level.

With **credit-scoring** systems, the merits of a loan application are summed up in a number that reflects the statistical odds that the loan will repay as agreed. These scores capture default probabilities with a high degree of accuracy (see "The Promise of Automated Underwriting," *SMM*, November 1996). The accuracy and ease with which this information can be obtained is pushing lenders to consider offering "discounts" to lower-risk borrowers, thereby undermining average-cost pricing.

With these powerful analytic engines at their disposal, some industry players are predisposed toward using scoring systems to make ever-finer risk-level distinctions. Two of the country's leading developers of generic credit-bureau scores, for example, have opted for

EXHIBIT 3: Credit-Score Measures of Default Risk



**Mortgage-default rates tend to rise continuously in relation to growing borrower risk, as signaled by increasingly poorer credit-bureau scores. In this example, the odds of default are nearly five times greater for borrowers with a high-risk score of 600 than for those scoring a relatively low-risk 700.**

narrowly gauged rating scales. Fair, Isaac and Co., based in San Rafael, CA, employs a spectrum of “FICO” values that range from a high-risk score of around 550 to a low-risk score of around 800 (*Exhibit 3*). Conversely, the MDS bankruptcy score, developed by CCN-MDS, Inc., of Atlanta, ranks the riskiest loans at a low 150 and the least risky at a high 1000.

The continuous risk range that results from the precision of scoring systems makes more intuitive sense than the broad pass-fail decisions that characterize traditional underwriting. For example, the probability that a loan will repay as written does not drop to zero when an applicant is able to set aside only enough money to cover one month’s worth of

principle and interest as opposed to the two-month reserves that traditional underwriting guidelines typically require. Borrower behavior is instead much more likely to change in line with accumulating risk factors. The gradual increase in the probability of default is captured by a well-developed mortgage-scoring system.

The mismatch between loan-performance variability and the broad scope of traditional risk categories was confirmed in recent research conducted by PMI Mortgage Insurance Co., headquartered in San Francisco. Using its “pmiAURA” mortgage-scoring model, PMI found that the riskiest 10 percent of loans it has insured are defaulting at about 10 times the rate of the 10 percent ranked as the lowest risk.

The incongruity between loan-performance variability and average-cost pricing also figures prominently in the competitive problem of **adverse selection**. When a company prices mortgages based on broad risk buckets, any one bucket can hold a wide range of borrower-default probabilities. A competitor, however, easily can skim off the best business from other lenders by offering a better deal to lower-risk borrowers who are paying more than their “fair share.”

Paradoxically, lenders experiencing adverse selection due to average-cost pricing will find that their average costs keep growing. As more of the low-risk borrowers take their business elsewhere, these lenders get stuck with loans weighed down by above-average risk. Yet, these lenders cannot restore profitability by raising prices. Any attempt to do so will give risk-pricing competitors additional leeway to siphon off the best customers.

Only risk-pricing on a loan-by-loan basis offers lenders a defense against poaching by competitors. Consumer loyalty belongs to the lender best able to reward borrowers for the low risk they represent.

Risk-based pricing also is finding more converts due to a growing emphasis, either self-imposed or regulatorily driven, on capital allocation based on risk. For example, federal

regulators are in the process of developing complex, new risk-based capital standards for Freddie Mac and Fannie Mae.

#### A Marketplace in Transition

Competitive pressures already are propelling lenders to take some tentative steps toward risk-based pricing. Some market players, for example, are employing a simple grid that cross-tabulates **loan-to-value ratios (LTVs)** and credit scores to different price points.

Even now, some lenders, armed with scoring-model results, are bargaining for better treatment in the secondary market on deals that involve loans of higher-than-average quality. These lenders want price concessions in the guarantee fees they pay to mortgage-backed-security issuers, such as Freddie Mac and Fannie Mae.

To test the viability of risk-sensitive pricing, Fannie Mae has launched a pilot program that adjusts guarantee fees for lender-customers according to a risk-rating matrix that weighs a range of LTVs and credit scores. The pilot now under way to test what Fannie Mae refers to as “borrower-centric pricing” uses a grid of high, medium and low prices based on credit scores and other common pricing factors such as the LTV, according to published media reports.

Following Fannie Mae’s lead, Freddie Mac is engaged in similar pilot testing. However, Freddie Mac views the use of an

## Loan-Level Pricing: Why Now?

**F**or the first time in mortgage history, lenders are able to statistically understand and measure their risk costs on a per-loan basis. Qualitative approaches to judging mortgage-default risk based on long-standing, though unproven, rules of thumb are giving way to new statistical measures of risk based on actual borrower behavior.

This breakthrough owes much to the acceptance by mortgage lenders of credit scoring, long used by the consumer credit industry to rate applicants for credit cards and automobile loans.

This approach is a more refined classification for approving or rejecting loans. That gives the industry a risk model that breaks away from the pass-fail decision-making paradigm for loans by allowing for letter grades with pluses and minuses to reflect a wider range of considerations. The scoring models quantify the effects of interactions among different risk factors. They also measure changes in risk in smaller increments. In essence, scoring models allow for shades of gray when loan approval is at stake.

With more quantitative measures available, those in the industry who take on the default risk of mortgages can classify loans into finer and finer buckets until arriving at the cost of a loan on an individual basis.

Several reasons prevented the adoption of empirical, quantitative techniques until recently, including:

- *Loan complexity.* In consumer credit, risk assessment ordinarily is based on a borrower’s personal characteristics alone. Mortgages by definition are obligations collateralized by property. Consequently, the extent of default risk is shaped significantly by the amount of equity value the borrower has invested in the property. Other mortgage characteristics—including whether the interest rate is adjustable or fixed and whether the property is a condominium or not—also influence the likelihood of default. Taking these factors into account requires more data and more complex analysis than is necessary for traditional consumer-credit scoring.
- *Lack of extensive default data.* The opportunity to observe default behavior requires the study of many more mortgages to achieve the same degree of statistical reliability as a consumer credit-scoring system. If only a few loans have defaulted, making a statistical distinction between good loans and bad loans is impossible. What’s more, mortgage loans historically have performed much better than consumer loans.

Compared with consumer credit, statistical assessment of mortgage-credit risk requires a database with more loans and a greater variety of data on each loan. Moreover, the degree of statistical analysis undertaken requires the computerization of critical data; paper loan files are not sufficient.

In the 1990s, statisticians have obtained access to sufficient data on mortgage characteristics and performance to estimate reliable models of default. Use of these models has enhanced risk management and streamlined the underwriting process used to approve or reject loan applications.

The initial goals of the first automated-underwriting systems based on statistical models, such as Freddie Mac’s Loan Prospector, focused on making better and faster underwriting decisions. As is evident from the application of automated underwriting to risk-based pricing, the full potential of this technology may be yet to come.

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LTV/credit-score matrix as an interim step that is necessary to precede the market's inevitable embrace of risk-based pricing when refined through the automated mortgage-scoring process. That's because the grid approach provides only rough approximations of the interest-rate/default relationship revealed in the statistical models developed over the past few years to score mortgages. Eventually, the risk buckets of a grid will give way to loan-level, risk-based pricing.

#### **Who Wins? Who Loses?**

Borrowers typically are unaware of the average-cost pricing practices that determine the interest rates they pay. However, the relationship of risk to price becomes clearer under either a pricing grid or an automated risk-scoring system.

Those borrowers who previously were treated alike but actually occupied the top or bottom tier within one of today's broad risk buckets are the most likely candidates to experience a difference in the interest rates they pay under risk-based pricing. For example, someone who is really closer to an "A+" but pays the same interest rate as an "A" should realize lower borrowing costs in the future.

Of course, borrowers at the riskier end of the current bucket-based pricing structure will end up paying relatively higher interest rates. Individuals who have experienced more credit problems or made smaller down payments than their peers will constitute a disproportionate number of the borrowers who face higher loan costs.

However, the winners will outnumber the losers, Freddie Mac research indicates. What's more, the increases will prove

quite small for those who will pay higher rates. In fact, Freddie Mac estimates that 90 percent of borrowers will face either lower costs under risk-based pricing or payments that are slightly higher by no more than \$5 per month.

Moreover, risk-based pricing should expand markets. Loan applicants identified as high risk should find that lenders are not as quick to ignore them as in the past. Instead, mortgage companies likely will discover that—at the right price—they can proceed with the deal. Consequently, more borrowers should qualify for mortgages. Furthermore, those borrowers who now are unable to obtain credit except in the subprime market should become eligible for mortgage financing at lower prices as the "artificial" distinction between "prime" and "subprime" lending begins to blur.

#### **A Winning Business**

Once the new risk-measurement methods and loan-level, risk-based pricing mechanisms become widely accepted, vigorous competition is likely to ensue among lenders willing to take on more default risk, with the most efficient players ultimately coming to bear the most risk. As loan pricing becomes a tool for winning business, the resulting competition should benefit an increasing number of borrowers. **SMM**