



This article is based on a chapter of the book *Pricing and Revenue Optimization*, by Robert Phillips. Dr. Phillips contends that profit-based pricing is relatively new to the financial services industry; after explaining its success in other industries, he provides 10 key elements of a successful profit-based loan-pricing model.

## Pricing and Revenue Optimization

By Robert Phillips and Frank Rohde

Many lenders consider risk-based pricing to be the ultimate in pricing sophistication. There is no question that identifying higher-risk customers and charging them higher rates to compensate for higher losses is a sensible (and profitable) idea. However, risk-based pricing does not incorporate one of the key elements required to maximize financial return—customer price sensitivity.

Understanding and using customer price sensitivity in setting prices is a highly developed science in many industries. The key to maximizing profitability through pricing in all industries is to trade off the increased profit *per transaction* at higher prices with the reduced

penetration at the higher prices. This tradeoff needs to be made for each combination of customer segment, product, and channel and updated continually as market conditions and cost-of-funds change. This is the discipline of *profit-based pricing*.

Analytical approaches—for estimating customer price response for different products by different micro-market segments and for using this information to optimize prices—have been used successfully in such industries as retail, hotels, and telecommunications for many years. Hotels understand that late-booking customers who want to book a room only for Tuesday night are likely to be business travel-

© 2005 by RMA. Robert Phillips, Ph.D., is co-founder of Nomis Solutions, a company specializing in price optimization solutions for the financial services industry. Dr. Phillips is a lecturer at Stanford University and has previously served as CTO of Manugistics and founder and CEO of Talus Solutions. Frank Rohde is vice president of sales and marketing at Nomis Solutions.

ers who are relatively price insensitive, while early-booking customers for weekend nights are more likely to be leisure travelers who are more price-sensitive. By setting and adjusting rates using these insights, sophisticated hoteliers are able to extract significantly greater profit from the same fixed stock of rooms. Sophisticated retailers track customer demand and price-sensitivity across their stores, adjusting discounts and promotions to target more price-sensitive groups of customers only as needed to move merchandise. Deep discounts are not wasted on customers who are more than willing to buy at higher prices but are targeted specifically to the most price-sensitive buyers in the market.

#### Application to Financial Services

While profit-based pricing has been immensely successful across many industries, lenders are only now starting to use profit-based pricing to set and update APRs offered to various customers for different products. Successful lenders have recognized that there are many characteristics of consumer lending that require specialized approaches and algorithms. Simply put, pricing consumer loans is not the same as pricing capri stretch pants, groceries, or hotel rooms.

- The profitability of a consumer loan is a complex function of the term of loan, the APR, the amount borrowed, and the propensity of a particular customer to repay early or to default.
- Adverse selection means that increasing the APR for a particular credit offering will tend to reduce the average quality

of applicants for that product.

Adverse selection has

no analog in

other industries, and ignoring adverse selection was a shortcoming of some initial attempts to apply retail-based pricing optimization approaches to financial services.

- Banks are subject to both voluntary and regulatory constraints on rate levels, including fair lending laws, which need to be taken into account. Nonlinear profitability functions, complex customer behavior, adverse selection, and regulatory constraints work together to make optimal consumer credit pricing more complex than retail or airline pricing.

However, banks have at least one advantage over retailers when it comes to pricing. Lenders typically have extensive information on failed sales—customers who were approved for a credit product but decided not to take it. Retailers would kill for information about the number and identity of potential customers who were interested enough in their product to go through the effort of filling out an application but decided either not to purchase or went elsewhere. Incredibly, most banks are doing little or nothing with this lost customer information.

#### Getting There

Profit-based pricing starts by applying statistical analysis to historical won/lost information to quantify which products are valued by which customers and by how much relative to the competition. This explicit quantitative under-

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standing of customer price-response is not only a critical input to profitable pricing, it is a source of tremendous market insight.

One bank that has successfully applied pricing and revenue optimization in consumer credit is the Halifax Bank of Scotland (HBOS). HBOS is the largest mortgage and savings provider in the U.K. as well as a major player in the provision of credit cards and consumer loans. It also is one of the world's 20 largest banks with over 22 million customers and assets exceeding £440 billion (US \$800 billion). HBOS faced a particularly challenging pricing problem in the unsecured consumer lending market—over a two-year span, average market APRs had dropped from 11.2% to 8.1% while the average cost of funds rose from 4.6% to 5.1%. A price optimization program was initiated to improve the profitability of this increasingly competitive business.

The first step in the program was to adapt HBOS's existing credit risk and loan profit models to account for adverse selection. A historical database of loan applications and conversions was analyzed to determine the price and non-price drivers of demand for each combination of product, brand, channel, and market segment. Once this was complete, the incremental loan profitability was balanced with price sensitivity for each segment to determine the prices that maximized expected profitability, subject to all UK pricing regulations. Potential benefits of 34 basis points from better

pricing were identified and immediate benefits of £7 million (US \$13 million) per year are already being realized.

The concept of profit-based pricing is not applicable only to credit markets but to any line of business (such as treasury deposits) that involves some degree of personalized pricing. In these lines of business, the concept of understanding the price sensitivity and profitability of different customer/product/channel combinations and calculating the prices that maximize expected profitability has proven to be extremely effective in increasing overall profitability.

In short, it is time for banks to pay some serious attention to pricing. Most banks and financial institutions are missing important opportunities to increase profitability, build business, and increase customer loyalty. Risk-based pricing is an important first step, but it still falls short of corporate best practices in pricing. Forward-thinking banks are using statistical analysis to mine their data to better understand customer behavior and price sensitivity. By incorporating this understanding into pricing, banks and other lenders can increase profitability, drive additional business, and provide better service to their customers.

#### 10 Key Points

Implicit in this article are 10 important points to consider in developing and working with pricing models.

**#1: Adverse selection is critical.** Contrary to traditional price optimization solutions developed for airlines, hospitality, manufacturers, or retailers, software

deployed in the lending world needs to be able to take into account adverse selection. Adverse selection occurs when a bank increases its loan rates—the customers likely to accept loans at higher rates tend to have lower credit quality. An increase of 0.25% in the interest rate of a home equity loan therefore not only decreases the number of customers willing to accept the loan, it also results in a slight deterioration of the credit quality of the customers that do accept the loan. Price optimization software deployed in banking needs to be able to explicitly measure, manage, and limit adverse selection effects in setting prices.

**#2: Lost quote data is valuable!** Banks and insurance companies have large amounts of data and information on those prospects who didn't accept a particular price. Contrary to other industries, the majority of financial services products require an application and credit check, which results in readily accessible data on those people who've applied, and then decided not to accept, a certain product. Sophisticated statistical models can take that "lost quote" data into account when predicting an individual's propensity to respond or accept a certain price point.

**#3: Regulatory oversight requires consistency, constraints, transparency, and defensibility.** More than almost any other industry, the financial services industry is subject to regulation that governs how prices can be set. This requires that price optimization solutions be able to take into account constraints on minimum and maximum prices, minimum and maximum volumes of products sold to different demographic seg-

ments or in different regions, etc. It also means that users need to be able to incorporate fair lending practices and guidelines, Basel II capital requirements, and DOI-mandated rate constraints into the development and optimization of price matrices. Last, any pricing strategy needs to be defensible, which means that 1) users need the ability to generate reason codes for specific price actions, and 2) any optimization software cannot be a black box.

**#4: Market changes need to be incorporated rapidly.** Mortgage and home equity rates change daily, and underlying reference rates might change even more often. To accurately determine profit-optimal lending rates for different market segments, price optimization software needs to be able to recalibrate itself frequently (daily or weekly) and take into account changes in consumer behavior, competitive actions, and economic conditions. For example, when your biggest competitor launches a prime-for-life balance transfer offer on a credit card, your customers' propensity to accept a 6.25% home equity line of credit will drop.

**#5: Utilization is important.** A growing proportion of the consumer and small business credit volume in North America is extended to customers in the form of revolving credit (lines or cards). In order to optimize rates for credit lines, it is critical that price optimization solutions take into account not just the initial probability of acceptance but also the ongoing utilization of credit by those customers. While a specific price point might be the optimal price to sign up a new customer for

a credit line, that same price point may not be the optimal price point to entice longer-term utilization of the credit line. Price optimization solutions need to be able to optimize prices for both short-term and long-term value of the customer relationship.

**#6: Prepayment and refinancing need to be explicitly addressed.** Existing price optimization approaches tend to focus on single point-in-time price setting rather than customer lifecycle view. For lending products in particular, a consumer's ability to refinance a mortgage or loan with a lower-rate alternative needs to be taken into account when optimizing prices at origination. This may mean offering a lower initial rate to reduce the probability of prepayment later on.

**#7: Prices are negotiable.** In traditional price optimization deployments in retail or travel industry settings, customers are offered a fixed price and make a take-it-or-leave-it decision. In financial services, especially business lending, but also consumer banking, customers and bank employees often negotiate particular loan rates as part of a broader deal or relationship. In these cases, optimized price lists need to have flexibility built into individual price recommendations. For example, the optimal indicated rate for a home equity loan to an existing checking account customer may be 6.60%, but the branch banker, in the interest of maintaining and extending the banking relationship, may offer the customer a rate of 6.50% if she also agrees to open a credit card account. Price optimization solutions need to be able to take into account the differences between indicated optimal

rates and negotiated rates in those environments where customer-facing employees have authority to change list rates.

**#8: Understand global vs. local dynamics.** As an increasing number of transactions and relationships are managed online, competition for individual customer relationships takes place on a national and even international playing field. While a local bank may have slight advantages in terms of perceived or actual service quality or brand reputation, a mortgage offer from a bank across the country can be just as competitive as one from the local bank. Price optimization solutions need to be able to balance minute differences in regional consumer demand and risk characteristics with the fact that loan products can be "shipped" virtually everywhere in a matter of seconds.

**#9: Understand when to offer what price.** The loan origination process for mortgages and other consumer loans can be drawn-out and complicated. In optimizing rates for lending products, it is critical to understand when a firm price offer is made during the customer acquisition process, when the customer decides to accept or reject an offer, and if and how quoted prices can be changed. For example, a bank may advertise a home equity rate "as low as 6.30%" on its website or through print advertising. Once a customer comes into a branch, she may learn that her loan-to-value ratio would put her into a pricing cell with a rate of 6.50%. If she then decides to fill out an application, she may further be qualified into a 6.60% rate cell based on her risk characteristics. The difference between the headline rate of 6.30% and the

firm offer of 6.60% is significant. The rate at which the customer committed to accepting the offer was probably 6.50%. Price optimization solutions need to be able to take into account different acquisition processes with different rate quotation mechanisms. Furthermore, a price optimization solution should be able to optimize all rate quotations, not just the final rate.

**#10: Take a relationship view.** Banks and lending institutions will be most successful when they can leverage individual transactions into long-lasting customer relationships across multiple product holdings. What this means for price optimization is that software solutions need to be able to take into account not only single product profitability but also cross-product and longer-term relationship profitability. For example, when determining the profit-optimal home equity line of credit rate, a price optimization solution needs to take into account the customer's propensity to apply for a credit card in addition to the HELOC and price the HELOC appropriately. Put another way, maximizing profitability of each product transaction may not be the profit-optimal strategy for the bank overall. Price optimization solutions need to be able to accommodate these cross-product constraints and goals to fully enable dynamic relationship pricing. □

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