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Nomis Solutions (A)

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Introduction

In early December 2002, Simon Caufield arrived at New York City's JFK airport from London's Heathrow—for the fifth time that year. Collaborating with Bob Phillips, both virtually and in person, he had just finished reviewing what he hoped would be the final iteration of a business plan for Nomis Solutions, a venture that would bring price optimization solutions to the financial services industry. Caufield, already calculating the length of the taxi line outside, was surprised to see Phillips waiting for him as he exited from customs. "I came in person to deliver the good news. We have our first customer," Phillips said as he reached to shake Caufield's hand. Caufield broke into an uncharacteristically wide smile as Phillips filled him in: Peter Thompson, head of lending at e-Car, an online auto loan company, had just signed on to be Nomis's first paying customer.

Phillips[1] started his career in a price optimization analytics firm in 1977, right after graduation from college. He was promoted to CEO in the mid-1990s and, through a merger with a large competitor, built Talus Solutions, then the largest provider of pricing and revenue management solutions across a wide range of industries. In 2000, Talus Solutions was sold to Manugistics, a supply chain management software company seeking expansions into revenue management. While serving as the chief technology officer at Manugistics, Phillips came to know Caufield,[2] who was heading the Manugistics expansion into financial services. Prior to joining Manugistics, Caufield had been a partner at two consulting groups, Mitchell Madison and Mercer Management Consulting, where he had worked on a number of projects helping financial service companies with their pricing. Phillips and Caufield both left Manugistics in 2001. Both Caufield, who was working as a consultant, and Phillips, who was serving as a visiting professor at Columbia Business School, decided to take a higher-

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Professor Phillips is Founder, Chief Science Officer and Board member of Nomis Solutions.

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level view of the analytics landscape in order to consider possible new opportunities. Several months later, they reconnected and founded Nomis Solutions.

Both Phillips and Caufield were convinced that pricing optimization had tremendous potential to improve profitability at a wide range of financial services companies. However, the idea of pricing optimization was still a new concept in that industry. Furthermore, Nomis Solutions had no track record and virtually no name recognition. How would Phillips and Caufield prove the value of price optimization to e-Car's management team?

Industry Background

ANALYTICS TRANSFORMING PRACTICES

Analytics is the application of computer technology, operations research, and statistics to analyze data in order to solve problems for a rapidly growing number of businesses and industries. Pricing and revenue optimization (sometimes called *revenue management*) is a branch of analytics that focuses on determining how to set and update the prices offered for a portfolio of products in order to maximize expected profitability.

Many of the techniques underlying modern pricing optimization were initially developed by the airlines in the 1980s as a way to maximize the profitability of each flight by dynamically adjusting prices and booking class availabilities.[3] Due to the complex and dynamic nature of this price optimization problem, it took advanced modeling capability and technology expertise to build a pricing and revenue management system. A number of technology and analytics firms, often staffed by PhDs, were set up to help airlines implement these systems; Sabre Airline Solutions (a spin-off of American Airlines), Aeronomics, Decision Focus Inc., and PROS were some of the more well-known firms servicing the industry at that time. During the 1980s and early 1990s, these firms expanded their offerings both within and beyond the airline industry to offer pricing and revenue management solutions to businesses in the hotel management, rental car, cruise lines, freight transportation, and retail industries. As the industry matured, specialized companies were launched to provide analytics software and services to specific industries (e.g., KhiMetrics serving the consumer packaged goods industry and ProfitLogic serving the retail space).

The early 2000s marked a wave of mergers, acquisitions, and IPOs for analytics companies. Major enterprise resource planning software companies[4] such as Oracle, IBM, and SAP—viewing analytics as a natural extension of their core capability of assembling and managing large volumes of corporate data—acquired pricing and revenue optimization companies such as Talus Solutions, KhiMetrics, and ProfitLogic. Others, such as PROS and Sabre Airline Solutions, took themselves public. In each case, the companies all received valuations exceeding $100 million—providing their founders and initial investors with substantial returns. The motivation for larger companies such as Oracle and SAP to purchase existing analytics companies was to acquire capabilities that would be difficult or impossible to develop internally and to expand their product lines within key verticals such as retail or airlines.

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Retail Lending: The Potential Opportunity

While 60 of the largest 200 global companies by market cap in 2002 were financial institutions[5] (see Exhibit 1), the industry also had plenty of medium and small players. In 2003 the United States had 22 large banks with more than $50 billion in assets, accounting for roughly half of the total deposits—however, the other half of the deposits was distributed between 9,441 medium and small banks and saving institutions with total assets ranging from less than $100 million to $50 billion (see Exhibit 2).[6] In addition to banks, there were many non-bank providers of financial services including credit card companies such as GE Capital and specialty auto lenders such as Ford Motor Credit. From Phillips's and Caufield's perspective, the abundance of financial services companies was one of the most attractive aspects of the industry.

Another factor that made the financial services industry attractive as a target for a price optimization company was the fact that, in 2002, there were no direct industry-specific competitors. As shown in Exhibit 3, pricing optimization firms such as PROS, Manugistics, and others had concentrated on other verticals such as transportation, media, and retail but—at least at that point—had made no inroads in financial services.

Lastly, lending was a data-rich process. Applicants for loans provided an abundance of information on factors such as income, employment, and assets. Banks also collected additional data from independent credit scoring agencies. While this information was collected to support underwriting decisions, Phillips and Caufield felt there was untapped potential to use it for estimating price sensitivity.

After some thought, Phillips and Caufield decided to focus Nomis's initial offering on retail lending—the provision of loans to individual customers as opposed to corporations or governments. Common forms of retail lending include mortgages, home equity loans, auto loans, and credit cards. The primary determinant of the price of a consumer loan is its *interest rate*, often expressed as an *annual percentage rate* (or APR). For a typical loan, the monthly payment is a straightforward function of the initial balance (the amount borrowed), the term (the length of the loan), and the interest rate. For a lender, raising the interest rate for a particular type of loan—say a 30-year fixed-rate mortgage—means more profit from every loan funded. However, higher rates will also translate to fewer loans funded as customers are more likely to borrow from competing lenders—or not borrow at all if the rate becomes too high. Ideally, lending institutions should price each loan at the price that perfectly balances the risk of losing the loan with the expected profitability if the loan were funded—this is the basic idea behind price optimization.

The Consumer Credit Market

According to Lendol G. Calder in his book, *Financing the American Dream: A Cultural History of Consumer Credit*: "Consumer credit is one of the most remarkable symbols of modern American history."[7] In the United States, the consumer credit era is often considered to have begun in the 1950s, as consumer credit expanded tremendously after World War II. Consumer credit in the United States also increased rapidly after the mid-1980s, partly because quantitative measures of individual creditworthiness, such as FICO scores,[8] had

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become widely available, making it much easier to evaluate individual credit risk. In December 2002, consumer credit (including mortgage) in the United States totaled $10.33 trillion, representing 95% of the US gross domestic product, and averaging $90,000 per household.[9] Exhibit 4 shows outstanding consumer loan balances as percentages of the GDP in the United States from 1950 to 2002.

One unusual feature of the consumer credit market is that the cost of a loan depends on the creditworthiness of the individual customer taking this loan. Riskier customers are more costly since they have a higher probability of default. Indeed some customers are considered so risky that they will not be extended credit by any bank. The difference in risk enables lenders to charge different rates to different customers to offset the differential costs of expected default. In addition, loan rates also typically vary by such factors as size of the loan, term of the loan, geography, and the *loan to value ratio*—that is, the ratio of the amount borrowed to the value of the collateral. For some lenders, this can lead to hundreds or thousands of different loan prices being in play at any particular time—another characteristic favorable to the adoption of price optimization.

Despite the number of prices in play, lending institutions had historically not applied much analytic sophistication to pricing loans. In 2002, the dominant approach to loan pricing was *risk-based pricing*. Under this approach, the bank would estimate the *risk* associated with a loan—that is, the expected loss from default. The loan would then be priced at the cost of capital plus the risk plus a constant margin. Thus, if the cost-of-capital were 1.5% and the margin 1%, a customer with expected loss of .5% would be quoted an interest rate of 3.0% and a customer with expected loss of 1% would be quoted a rate of 3.5%. This approach appeared prudent since it adjusted price for risk, but it ignored opportunities for incorporating customer price-sensitivity into pricing.

SEGMENTING THE MARKET

Nomis Solutions' business proposition was: 1) to increase the number of customer segments so that prices would be better tailored to individual customers, and 2) within each segment, to set the optimal price that balances between profit margins and transaction volume (see Exhibit 5).

While risk-based pricing took the risk of loans into account, it did not factor in the price-sensitivity of individual customers. In that sense, it was equivalent to the old retail practice of *cost plus pricing* in which each product is priced at its cost plus a fixed margin. However, retailers had long realized that applying different margins to products based on price sensitivity would maximize profits: For example, customers are relatively insensitive to the price of jewelry, so it makes sense to charge higher margins on those products, while products such as bulk grains or peanut butter are highly competitive and must be sold with much lower margins. Talus Solutions, KhiMetrics, ProfitLogic, and other analytic firms had also shown that millions of dollars in additional profit could be generated by using analytics to segment customers, estimate the price sensitivity of different segments, and set and update prices over time in response to market and competitive changes.

Consumer lending markets demonstrated a surprising amount of price dispersion: different lenders offered the same loan to the same customer at different—sometimes drastically

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different—rates. Exhibit 6 shows the rate variances among consumer lending institutions in Houston, Texas for consumers with the same FICO score. Similar levels of price dispersion can be found in consumer lending markets as diverse as mortgages, student loans, and credit cards. This price dispersion was a good sign that price-optimization might be effective in these markets.

e-Car: Putting the Idea to Test

After formally incorporating Nomis Solutions, Caufield and Phillips spent several months meeting with banking executives throughout North America and the UK to pitch Nomis Solutions and the idea of price optimization. A few of the lenders they met with either dismissed the idea as impractical or claimed to be doing something similar already. Fortunately for Nomis, many of the executives that they met with agreed that the idea was intriguing and had potential. However, somewhat discouragingly, even the executives who agreed that the idea had potential had, so far, not agreed to move forward. Many of these executives demurred on the basis that their company had higher priorities and couldn't afford the distraction of starting a new initiative. Caufield and Phillips speculated that some of these companies were unwilling to take the risk of moving ahead with a tiny start-up on an idea that was completely untested, at least in financial services. After all, most successful lenders were averse to risk. e-Car, however, was willing to take the next step.

e-Car was a subsidiary of a larger bank that had been created to offer auto loans through the Internet. Initially e-Car had sought to grab market share by offering loans at rates that were generally unprofitable. When e-Car began to gain traction in the market, they hired Peter Thompson—a McKinsey consultant with financial service lending—as CEO. When Caufield and Phillips made their pitch to Thompson, they found him very interested in moving to the next step.

"What you guys are saying makes total sense to me—currently we have no science behind our prices. By pricing more analytically, we could definitely make more money," remarked Thompson, after Caufield and Phillips had presented their vision for Nomis. "If you guys can prove that you can increase profit, e-Car would be willing to license your software. But of course, I need to believe it and be able to prove it to my Board."

Following the meeting with Thompson, Caufield and Phillips prepared a proposal under which, for a small amount of money, Nomis would analyze e-Car's data and prepare a business case for Thompson and the e-Car Board that would justify implementation of price-optimization as a standard part of the e-Car pricing process. Phillips had received a faxed copy of the signed contract when Caufield was still in the air and had rushed to the airport to share the good news.

Now, Nomis had one month to develop a credible business case for price optimization at e-Car. e-Car was a pioneer in online lending. A customer who was potentially interested in an e-Car loan would fill out an online application, providing name, social security number, address, and employment information as well as the make, model, and year of the car set for purchase. For each application, the firm would decide on whether to offer credit. For

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accepted applications, e-Car also determined the price—that is, the interest rate for the loan. Seeing the offer, a customer would either take the loan or walk away. Thompson gave Nomis a dataset containing information relating to more than 200,000 approved auto loan applications made in the past year. The dataset also included, for each application, the loan interest rate that the firm offered, and whether the loan was accepted. Caufield and Phillips needed to use this data to build a convincing case for e-Car to proceed with a much larger deal.

As the Nomis founders waited in the taxi line at JFK, they spoke of their certainty that they could help e-Car to implement pricing and revenue optimization policies. Their next meeting with e-Car was scheduled for January 16—barely a month away, and with the Christmas and New Year holidays in between as well. But Caufield and Phillips were confident that, with hard work, they could pull off a convincing presentation and sign-up e-Car as the first Nomis customer to implement price optimization.

Yet, some questions were lingering. In the short term, how could they sell their business idea without a product or a track record? What should Caufield and Phillips do to make a business case for price optimization? And how large was the market for Nomis?

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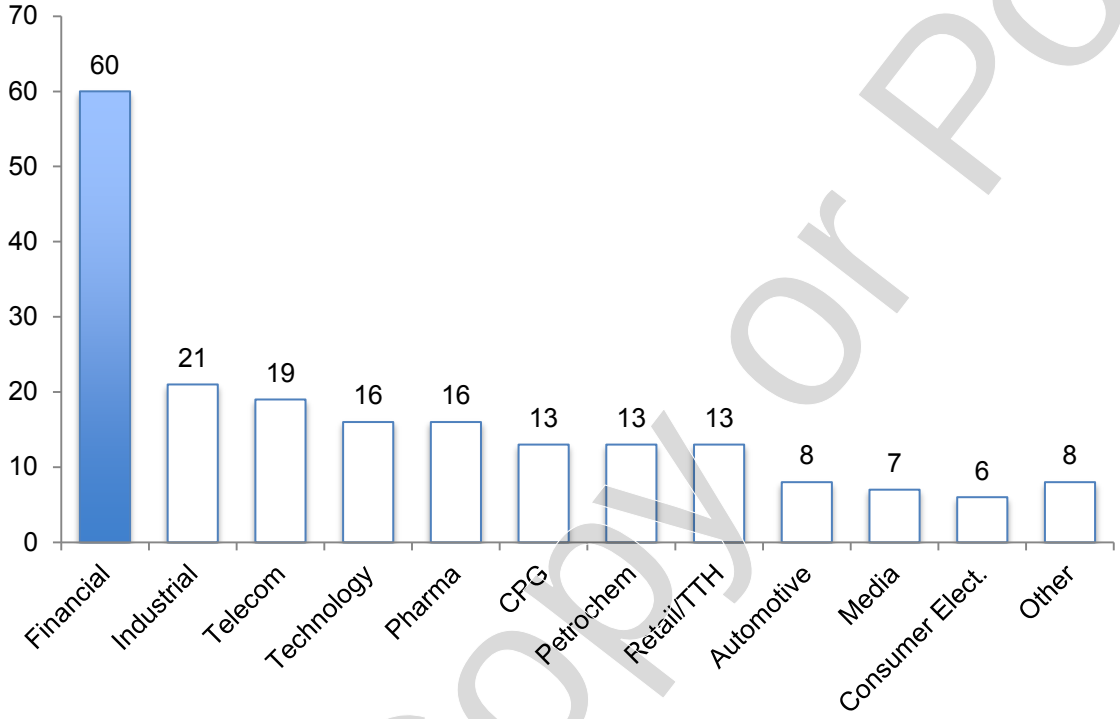
Exhibits

Exhibit 1

The Largest 200 Global Companies (by Market Cap) by Industry



Note: Of the largest 200 global companies, 60 are financial institutions. Of the largest 500 companies, 111 are financial institutions. Of the largest 1,000, 170 are financial institutions. These numbers exclude the large mutual funds, and the finance arms of GE, Ford, GM, etc.

Source: "Top 200 Global Companies by Market Capitalization," *Business Week,* July 15, 2002.

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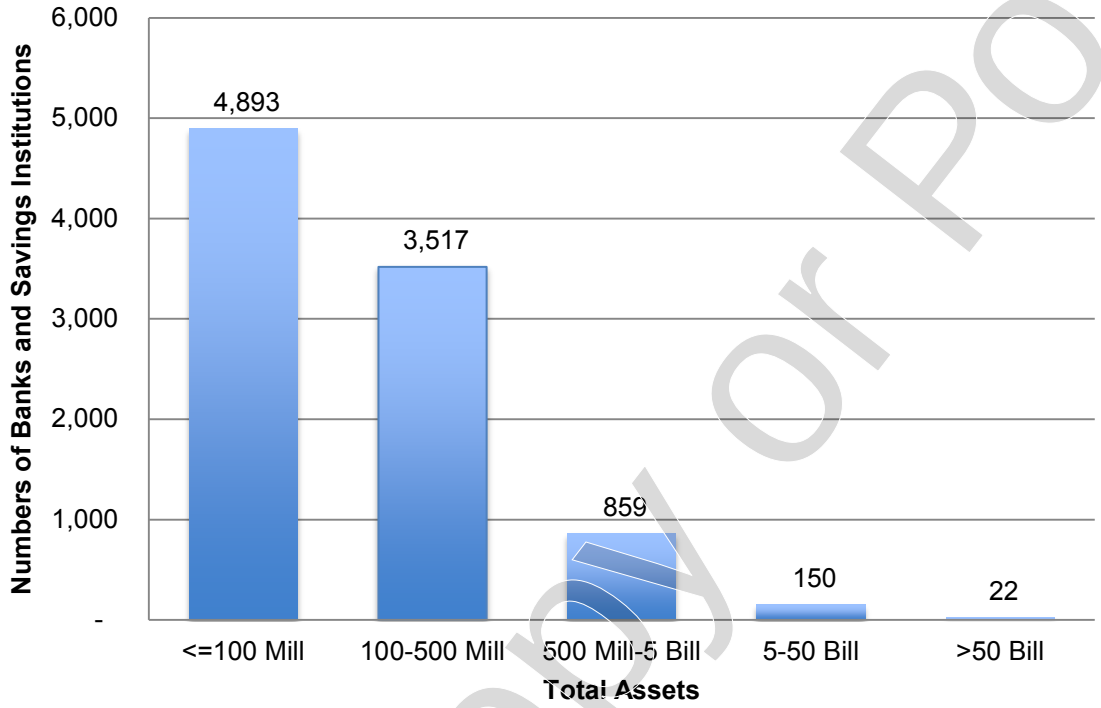
Exhibit 2

Number of US Banks and Saving Institutions by Total Assets, 2003



Source: Andrea M. Maechler and Kathleen McDill, *Dynamic Depositor Discipline in U.S. Banks*, IMF Working Paper 03/226, (Washington, DC: International Monetary Fund, November 2003).

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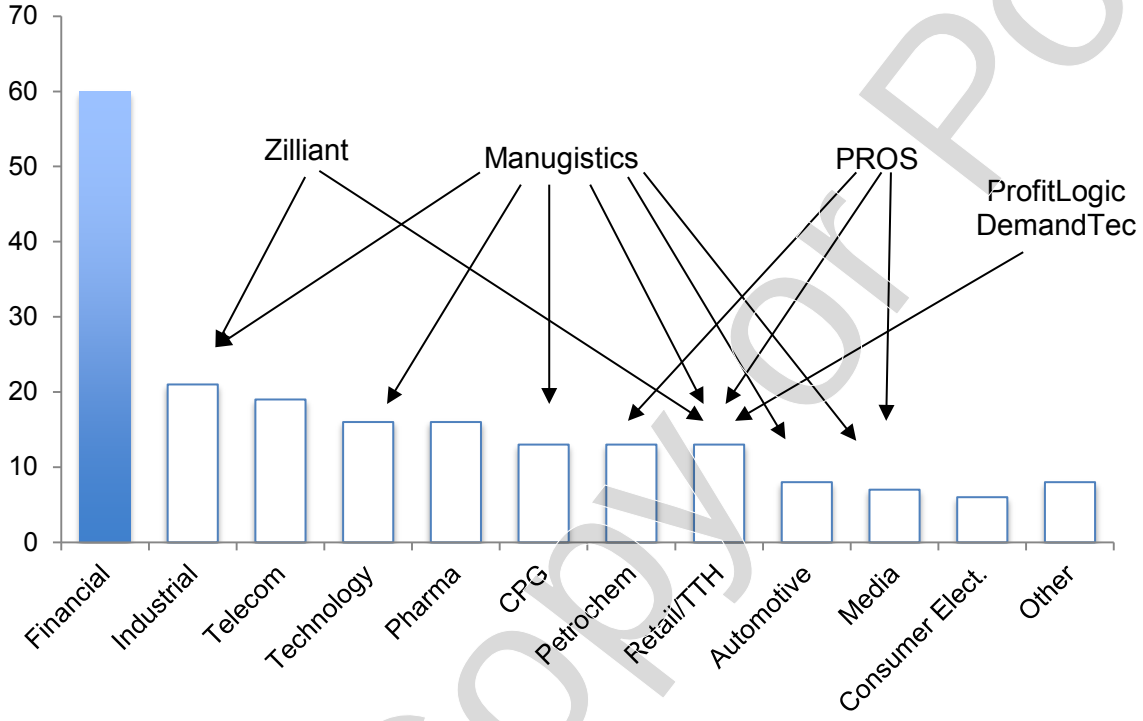
Exhibit 3

Existing Price Optimization Companies and their Industries of Focus (2002)



Source: Nomis Solutions.

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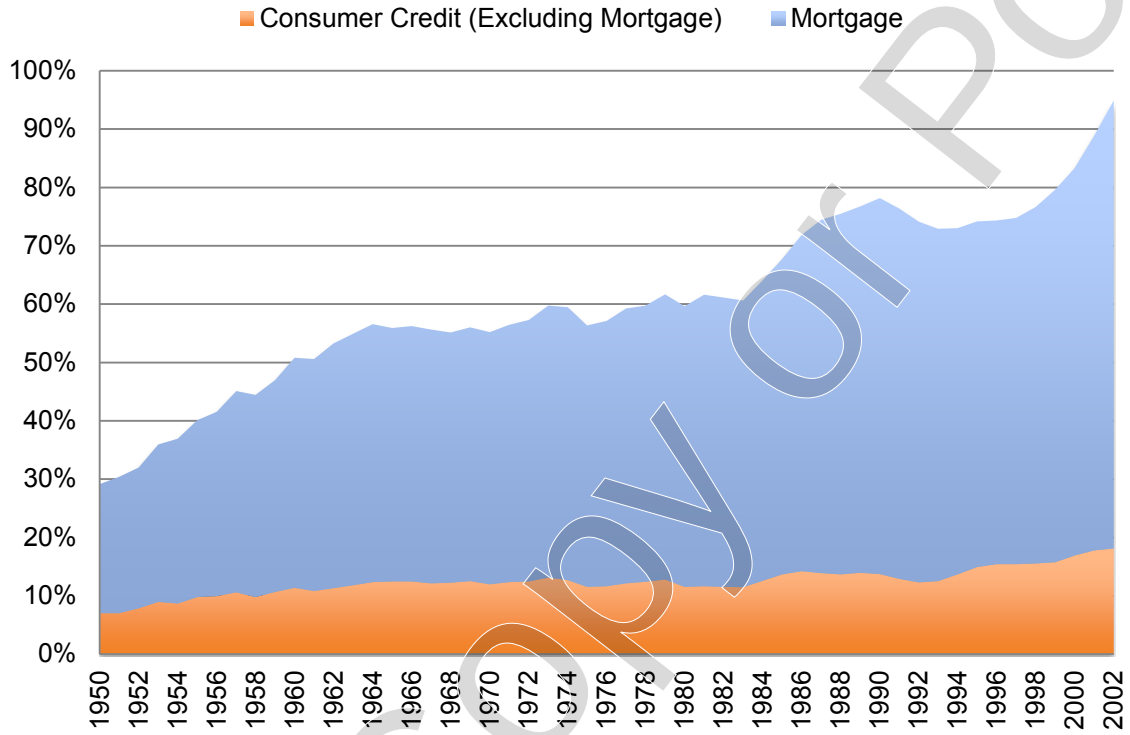
Exhibit 4

Consumer Credit as Percentage of GDP in the United States, 1950 – 2002



Source: Federal Reserve System data (accessible at www.federalreserve.gov).

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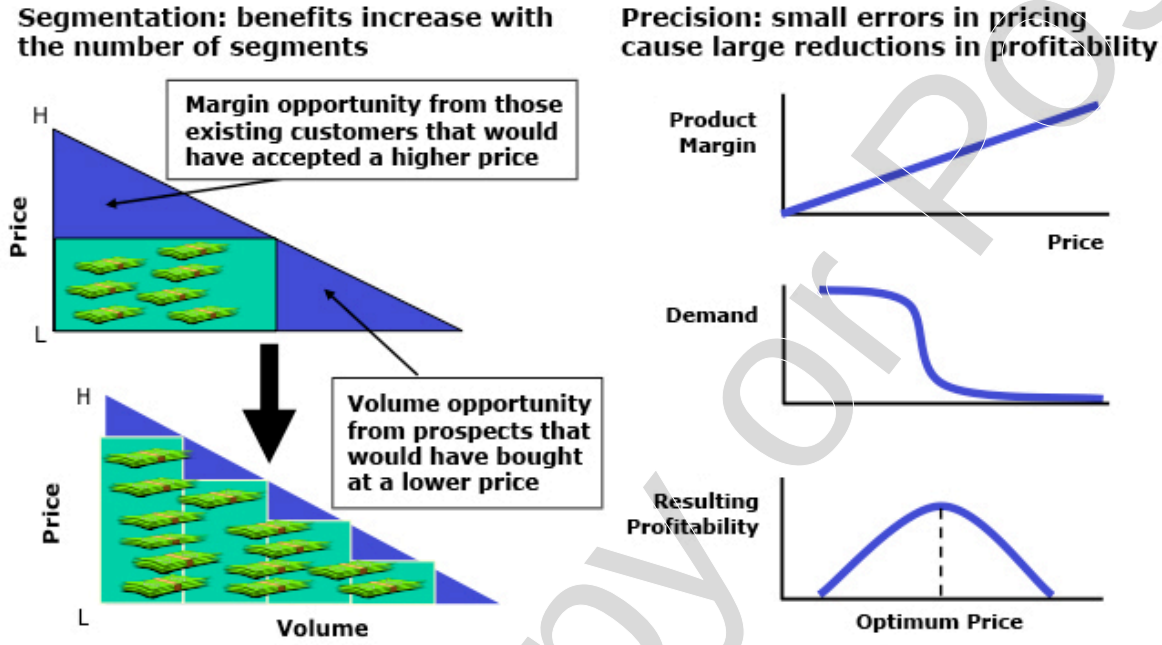
Exhibit 5

Optimizing Prices for Consumer Credit



Note: Nomis Solutions fine-tunes prices to customers' willingness to pay and optimizes the trade-off between volume and margin.

Source: Nomis Solutions.

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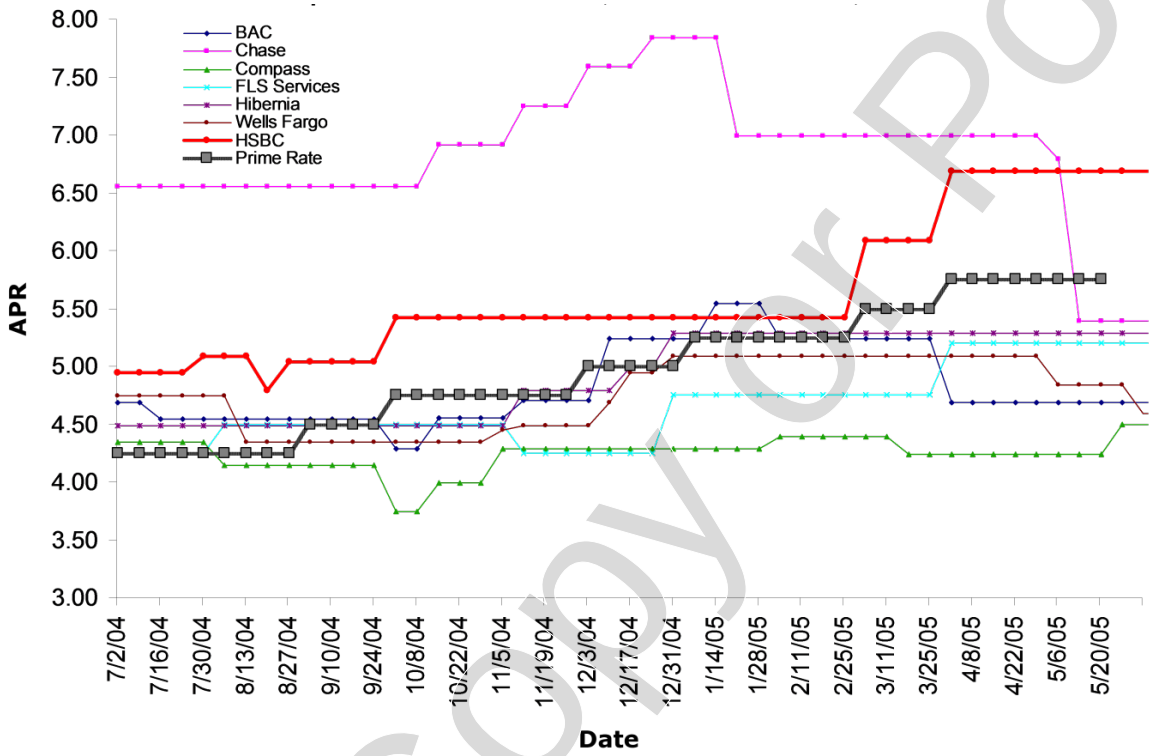
Exhibit 6

Auto Loan Pricing in Houston Market, mid-2004 to mid-2005*



Source: Nomis Solutions Analysis based on Informa Research Rate Sheet data.

*At 700 FICO

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Endnotes

[1] BS Mathematics and Economics, Washington State University; PhD Engineering-Economic Systems, Stanford University
[2] MBA, London Business School
[3] Raymond Fisman, *Airline Pricing on Shuttle Routes*, *Columbia CaseWorks Case # 120308*, (New York: Columbia Business School, September 24, 2012).
[4] Enterprise resource planning (ERP) systems integrate internal and external management of information across an entire organization.
[5] "Top 200 Global Companies by Market Capitalization," *Business Week*, July 15, 2002.
[6] Andrea M. Maechler and Kathleen McDill, *Dynamic Depositor Discipline in U.S. Banks*, IMF Working Paper 03/226, (Washington, DC: International Monetary Fund, November 2003).
[7] Lendol G. Calder, *Financing the American Dream: A Cultural History of Consumer Credit* (Princeton, NJ: Princeton University Press, 1999). Calder's book, *Financing the American Dream*, investigates the history of consumer credit in the United States.
[8] Martha Poon, "Scorecards as Devices for Consumer Credit: The Case of Fair, Isaac & Company Incorporated," *The Sociological Review* 55 (October, 2007).
[9] Federal Reserve, Economic Research & Data, Data Releases, Household Finance (accessed online at http://www.federalreserve.gov/econresdata/statisticsdata.htm)

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