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ID# CU125

PUBLISHED ON
OCTOBER 10, 2014

Nomis Solutions (B)

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Introduction

Start-up company Nomis Solutions utilized advanced analytic techniques to help its clients to set prices for consumer loans and deposits. This case is a continuation of Nomis Solutions Case A, following up with founders Simon Caufield and Bob Phillips as they prepare their pricing optimization report for their first client, e-Car loans.

The Auto-Lending Business

The majority of new-car sales in the United States—and many used-car sales—are financed in part by a loan taken out by the purchaser. If the loan is secured with the automobile being purchased, then it is called an *auto loan*. If the borrower defaults on an auto loan, then the lender has the right to seize the car and sell it to pay down the balance of the loan.[1] The business of providing auto loans is called the *auto-lending* or *automotive finance* business. In 2012 auto loan balances represented about 17% of consumer credit in the United States, which placed them in third place, behind mortgages and credit card debt.

Auto lending in the United States is a highly competitive business, with loans available from a variety of sources, including *banks*; *credit unions*; *manufacturers*, such as Ford Motor Credit or Toyota Financial Services; and *specialized lenders*, such as AmeriCredit (subprime) or e-Car (Internet). The business is highly fragmented, with auto loans available from hundreds of small banks and credit unions nationwide.

Auto loans can be obtained through three different channels. The *direct channel* involves going directly to a bank or credit union and arranging a car loan. For example, a customer

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might go to a local Bank of America branch and apply for a loan to purchase a new Toyota Prius. That loan could be used only to purchase a Prius and would be secured by the car. This channel is called *direct* because there is no middleman between the lender and the borrower.

A second channel is the *indirect channel*, by which a loan is arranged through the finance and insurance (F&I) department of a dealership. Typically, a customer who shows interest in buying a car at a dealership will be asked, "Are you interested in financing?" If the customer says "yes" (or sometimes even if she says "no"), she will be taken to an office where the F&I manager will check her credit and electronically poll different banks and specialty lenders. Assuming that at least one of them is willing to extend credit to the customer, the F&I manager will quote her a rate. The final rate may be negotiated between the dealership and the customer and may end up higher or lower than the rate offered by the lender. If the agreed-upon rate is higher, the dealership typically keeps the difference between that rate and the lender rate. If it is lower, the dealership loses money on financing but (presumably) makes it up in the sales price of the car.

The third channel is the *Internet*, where a customer who is contemplating an automotive purchase can apply online for a loan. e-Car lends exclusively through this channel.

Many manufacturers offer promotional rates for auto loans on certain models, in certain regions, for certain periods of time—for example "1.9% financing on all Chevrolet trucks in Northern California in July." These promotional rates are available only through the indirect channel—that is, they are not available to customers taking out a loan from their bank or through an Internet lender such as e-Car.

The e-Car Lending Process

e-Car is a specialized online auto lender: its only business is offering car loans via the Internet. Some customers come directly to the e-Car website. Others click through from an e-Car partner website, for example, AutoCompare.com, which allows comparison shopping of used-car prices. On the AutoCompare website, an e-Car ad is displayed to customers who express interest in purchasing a car. Other customers may get to e-Car by clicking from an auto-loan comparison website, such as LendingTree.com.

A customer who arrives at the e-Car website and is interested in a loan is asked to fill out an application. An example application is shown in Exhibit 1. The application specifies the name, social security number, and address of the applicant as well as the make, model, and year of the car and some information about the applicant, such as monthly income.

One important piece of information is the loan type. A loan can either be for a new car, a used car, or a refinance. In the case of a refinance, the loan is used to pay off the balance of an existing auto loan. Typically, a borrower will refinance to obtain a lower monthly payment on their loan.

e-Car uses the information on the application to determine whether to extend credit to a customer and, if so, at what APR. The name, social security number, and address of a customer allow e-Car to access the applicant's *FICO score*. The FICO (Fair Isaac Corporation) score is a proprietary score that ranks the applicant's credit risk on a scale from 350 to 850, where a low score indicates a risky customer and a high score a less risky customer. Customers who are judged too risky will not be offered a loan from e-Car. Note that the decision to offer a loan may not be based entirely on the customer's FICO score. For a customer with a FICO score of 620, e-Car might agree to lend $5,000 for a Toyota costing $25,000 with good resale value, but not lend $15,000 for a Chevrolet costing $20,000 with lower expected resale value.

If a customer's application is accepted by e-Car, the next step is to determine the rate (APR) that e-Car will charge for the loan. During the period covered by the data, e-Car based its rates on three aspects of the prospective loan:

- The *term*: that is, the number of months over which the loan will be paid. e-Car uses five terms (36 months, 48 months, 60 months, 66 months, and 72 months).
- The *type of loan:* that is, whether the loan is for a new or used car or for a refinance.
- The *risk band* of the customer. e-Car categorizes loans into four bands (1, 2, 3, 4), depending upon e-Car's estimation of the risk of the loan. The bands are numbered in order of increasing risk: 1 is the least risky and 4 the most risky. e-Car's pricing scheme meant that on any given day, any two customers in the same risk band, asking for a loan of the same type with the same term would typically be quoted the same APR. e-Car's quotes are firm—that is, there is no negotiation allowed on a quoted rate. During the period covered by the data, e-Car varied its prices occasionally in order to respond to changes in funding rates (e.g., the prime rate) and perceived changes in competition. They also ran some rate experiments to help them understand how their customers responded to different APRs.

Once a customer has been quoted a rate, he can either accept the loan or not. Customers have 45 days following approval to accept the loan. A loan that is accepted is said to be *funded.* A loan that is not accepted in 45 days is a *lost sale.*

The e-Car Dataset

The e-Car dataset consists of 208,085 records representing the outcome of all *approved* applications from January 1, 2002, to December 1, 2002. The fields are described in Exhibit 2 (The Data Dictionary).

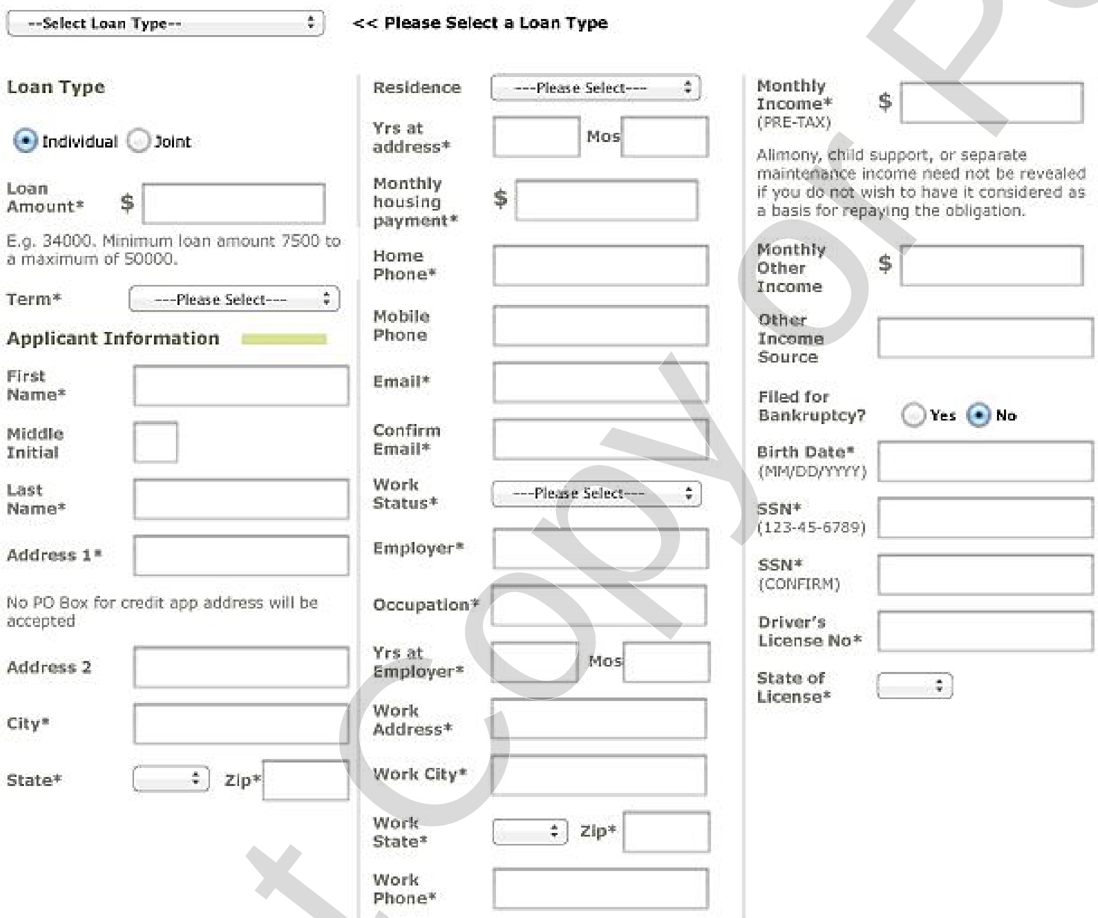
Preparing and Analyzing the Dataset

Nomis Solutions founders Bob Phillips and Simon Caufield received the auto loan dataset from e-Car and started analyzing the data right away. As a first step, they made sure that the data was "clean"—that is, that there were no missing or clearly incorrect values. Now the real test was about to start: How could they highlight potential inefficiencies in e-Car's current practices and convince Peter Thompson and his e-Car colleagues that there was value to be captured?

Exhibits

Exhibit 1

Loan Application Form



--Select Loan Type-- << Please Select a Loan Type

Loan Type

Individual Joint

Loan Amount* $

E.g. 34000. Minimum loan amount 7500 to a maximum of 50000.

Term* ---Please Select---

Applicant Information

First Name*

Middle Initial

Last Name*

Address 1*

No PO Box for credit app address will be accepted

Address 2

City*

State* Zip*

Residence ---Please Select---

Yrs at address* Mos

Monthly housing payment* $

Home Phone*

Mobile Phone

Email*

Confirm Email*

Work Status* ---Please Select---

Employer*

Occupation*

Yrs at Employer* Mos

Work Address*

Work City*

Work State* Zip*

Work Phone*

Monthly Income* (PRE-TAX) $

Alimony, child support, or separate maintenance income need not be revealed if you do not wish to have it considered as a basis for repaying the obligation.

Monthly Other Income $

Other Income Source

Filed for Bankruptcy? Yes No

Birth Date* (MM/DD/YYYY)

SSN* (123-45-6789)

SSN* (CONFIRM)

Driver's License No*

State of License*

Source: Nomis Solutions.

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Exhibit 2
Data Dictionary: e-Car Data Set

No.	Data Field	Description
1	Tier	Segmentation based on FICO scores. Defined by the auto finance company. Takes 4 values: 1, 2, 3, 4.
2	FICO	FICO score
3	Approve Date	Date the customer's application was approved (1/1/03 to 9/9/04)
4	Term	Term of the loan (in months)
5	Amount	Loan amount approved in $ ($5K to $100K)
6	Previous Rate	Previous APR for a customer who is refinancing—populated only for refinance applications
7	Car Type	N=New-Finance, U=Used-Finance, R=Refinance
8	Competition Rate	Published Competitor's Rate (2.99 to 6.45)
9	Outcome	1 if customer takes the loan, 0 otherwise
10	Rate	APR quoted to the customer (2.45 to 15.53) by e-Car
11	Cost of Funds	Cost of Funds (1.02 to 2.127)
12	Partner	Segmentation based on partners. 1: Direct auto finance company; 2: Partner A; 3: Other Partners

Source: Nomis Solutions.

Endnote

[1] For more details on this process, see the movie *Repo Man* (1984).

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