The Use of SAS in Revenue Management and Related Applications at ANC Rental Corporation

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ABSTRACT

ANC Rental Corporation is an independent company recently spun off from AutoNation, Inc. and comprises Alamo Rent A Car, National Car Rental, and CarTemps USA. In this talk we will present how SAS reports and analytical tools are used in support of revenue management at ANC. We will also discuss other related applications such as datamining and city clustering that utilize SAS.

INTRODUCTION

In this paper we discuss how SAS is used in relation to revenue management and related areas. ANC Rental Corporation has been recently spun off from AutoNation, Inc. and is a public-traded company. It consists of Alamo Rent-a-Car, National Car Rental, and CarTemps USA. In late 1996 and early 1997, AutoNation (known as Republic Industries then) acquired Alamo, National and a few other smaller car rental companies and began to consolidate them into the car rental division of AutoNation. While the brands retain their individual identities (Alamo traditionally caters mainly to the leisure market, National to the corporate market, and CarTemps is the result of the merger of several smaller companies that specialized in the insurance replacement market), many business functions have been consolidated for economies of scale as well as strategic reasons. We will discuss how SAS is being used in this consolidation process in areas such as revenue management, performance monitoring, fleet planning, datamining, and city clustering.

REVENUE MANAGEMENT AT ANC

REVENUE MANAGEMENT

Revenue management, also known as yield management, refers to the practice of changing prices and inventory controls in response to variations in demand. Some basic ideas of revenue management are similar to those in traditional inventory management in that supply is to be matched to demand to maximize revenue or profit. One major difference is that capacity or inventory cannot, for the most part, be changed easily and hence the only way to match supply with demand is by changing demand via pricing and inventory controls. Another underlying assumption in revenue management is that the product is inherently perishable in that if it's not purchased and consumed within a given timeframe then its value is lost. For this reason revenue management is sometimes referred to as perishable asset management. Examples of a perishable asset are airline seats, hotel rooms, rental cars, concert tickets, etc. Once an airplane takes off, the value of an empty seat (for that flight) becomes zero. The same goes for an empty hotel room or rental car, if they are not rented by the late evening hours then their value for the day becomes zero. The term perishable asset is confusing to some people, since airline seats, hotel rooms, and cars are not particularly perishable, it's only when a time element is introduced that they become perishable. On the other hand, the management of really perishable items such as fruits and vegetables falls under the realm of inventory management, not revenue management.

In its simplest form, revenue management involves the forecasting of *unconstrained* demand of different products, which represents the total demand including that which will be turned away due to pricing and inventory controls, the changing of prices to stimulate or curtail demand to better match capacity, and finally the use of inventory control mechanisms to allow some products to be sold while keeping others from being sold. An example of an inventory control mechanism in the car rental industry is to allow only reservations with a certain length of rent to be taken while not allowing other reservations with other lengths of rent to be booked.

THE OPERATIONS RESEARCH TEAM

The ANC Operations Research (OR) team resides within the Information Technology (IT) organization and its primary responsibilities are to support the various mathematical and statistical modeling aspects of the revenue management and related systems. The team serves as internal consultants to other business units in various quantitative areas. The team started with Alamo and after the merger expanded its role to both brands.

NATIONAL RMS

Prior to becoming part of AutoNation (later ANC), both Alamo and National maintained revenue management departments where analysts, known as revenue controllers, at corporate headquarters worked with managers at the rental locations to set prices and inventory controls. Revenue controllers also worked with personnel from sales and marketing departments to further understand the *contracted* side of demand. An example of contracted demand is corporate customers who rent cars at fixed, pre-negotiated rates and are not subject to the pricing controls that retail customers are.

In the mid-1990's both Alamo and National, still independent companies and in fact competitors, decided to develop systems dedicated to revenue management. National was the first to embark on such a project, soliciting the help of an outside consulting firm to perform a revenue audit of the department, then a joint effort between internal National personnel and the consultants led to the development of the first revenue management system (RMS) specifically designed for a car rental company. The system was client-server based and was developed mostly in C with Oracle as the database. Data was fed from the operational systems to update the summary tables in RMS. Examples of data included reservations, rentals, and fleet. The National RMS used historical as well as current booking information to forecast unconstrained demand. Turndown information (reservations that did not materialize due to inventory restrictions) was also used in the unconstraining process. An optimization process was then used to make pricing and inventory recommendations. Revenue controller would then review such recommendations through a graphical user interface and accepted recommendations would then be transferred to the reservations system to be processed. By and large the National RMS was a success, the only shortcoming, through no fault of the system itself, was the lack of forecasting and statistical experts at National to fully understand the underlying mathematical models and to provide expert help to the controllers in interpreting results and making appropriate adjustments to the forecasts.

ALAMO RMS

The Alamo RMS was developed two years later by, quite coincidentally, the same consulting firm that developed National's system. One difference was that input from the Alamo Operations Research team was incorporated into the underlying models, a luxury that National did not have. At about the same time SAS was brought to Alamo for the first time to aid in the analysis of data pertinent to RMS. One such example was booking pace analysis. Booking pace refers to the percent of reservations taken as a function of the number of days until arrival and is an integral part of the forecasting procedure. It was generally known by the revenue controllers that the shape of the booking curve depends on the type of customers (also known as market segment) and other factors. SAS procedures were developed to help the controllers to quantify such differences.

PERFORMANCE MONITOR

Shortly after both Alamo and National were acquired by AutoNation, an effort was embarked on the integration of the two separate Revenue Management departments. Revenue controllers from one brand were trained on systems used by controllers from the other. Since the two brands were using totally different systems this was a daunting task (aside from the differences in the RMS's, the reservation and rental systems were also quite different, National had decided to go with a new client-server system, and Alamo was using a mainframe legacy system). It was therefore decided that common tools were necessary to achieve the goals of the integrated department. Towards that end a "revenue backcasting" team was formed to concentrate on analyzing historical data to determine lost opportunities. The name of the team distinguishes it from the revenue controllers, where the emphasis is on the forecasting of future demand and revenue.

To develop a tool for the backcasting team, a new system known as the Performance Monitor (PM) was developed by the internal IT team with the help of the outside consultants who developed the earlier RMS's. Information at the transactional level (including rentals, no-shows, cancellations and turndowns) was extracted for both brands and an optimization was used to determine those transactions that should have been accepted to maximize revenue. In additional to the optimization, various SAS reports were also developed to analyze the transactional data. Such SAS procedures as TTEST and REG were used to aid the backcasting analysts in identifying trends lost opportunities.

INTEGRATED REVENUE MANAGEMENT SYSTEM

After the successful development and deployment of the Performance Monitor, management decided to integrate the two existing RMS's into one single platform and application. Data was to be extracted and aggregated from the reservations and rental systems of both brands. In addition to the C and COBOL programs developed, SAS procedures were used extensively in the aggregation and validation processes.

OTHER APPLICATIONS OF SAS AT ANC

FLEET PLANNING

The success of revenue management depends for a large part on the accuracy of the fleet capacity numbers provided by the Fleet Planning department since such numbers are used by the optimization to determine pricing and inventory recommendations. Fleet planning is a very complex procedure involving strategic and tactical decisions complicated by nonlinear leasing cost structures, uncertainty in the delivery quantities and times by the manufacturers, and penalty costs for keeping cars beyond the contractual time and mileage. A prototype fleet planning tool based on a network model was developed by the OR team using SAS/OR and has been presented to the business users.

DATAMINING

Datamining was started at Alamo at around the same time of the merger. At that time SAS Enterprise Miner was not yet available, and another datamining product was chosen by the business users from Sales and Marketing. That product, however, did not have many tools for the preprocessing of data and SAS was used in the data cleansing and transformation stages. Earlier this year Enterprise miner was procured as the new datamining solution and a new mining study will be underway shortly.

CITY CLUSTERING

Traditionally, rental locations for both Alamo and National have been grouped together for reasons of fleet planning, budgeting and other management issues. The only criteria used for grouping was proximity. In late 1998 management decided to revisiting the grouping strategy and decided aside from proximity other criteria such as location size, business mix and seasonal demand variation should also be taken into account. Data was collected by Sales and Marketing personnel and a methodology was developed by the Operations Research team in calculating dissimilarity coefficients between locations. The SAS procedure CLUSTER was then used to determine new groupings. The results were presented to upper management and the plan was adopted.

CONCLUSION

This paper outlines the different uses of SAS at ANC Rental Corporation. It demonstrates the versatility of SAS in the different applications involved. It serves as an invaluable tool in the repertoire of the Operations Research team.

CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author at:

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