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# Using SAS® Marketing Optimization as a Forecasting Tool

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## ABSTRACT

The purpose of this paper is to discuss a methodology for using SAS® Marketing Optimization for business forecasting.  In 2009 a team was formed to explore using SAS® Marketing Optimization to better forecast for one of AEGON Direct Marketing Services' largest programs.  The primary goals of the project were to create a single decision point for all campaigns included in the process to facilitate streamlined campaign development and selection, and to design a data driven process to select names for a marketing program.

The forecast allows for:

- More precise financial projections

- Advance purchase of creative materials at a reduced price

- Marketers to shift focus from daily rollout programs to new initiatives

- Better resource planning within the inbound call center

This paper contains an overview of the process for determining a solution and meeting the forecasting needs of marketing. Topics covered include:

- Business Problem

- Case study:  Overview of Current Marketing State

- Case study:  Steps in Development of Forecasting Process

    - Step 1 – Planning

    - Step 2 – Forecasting

    - Step 3 -- Production

- Tips and Tricks

## INTRODUCTION

### FORECASTING IN MARKETING

Marketing organizations frequently plan campaigns based solely on the expected results of the individual campaign. This provides little consideration for the optimal offer for each person.  Marketers often apply intuitive and analytical methods to select records for inclusion in the campaign that meet the business' overall objectives for the single campaign.  In this instance, the campaign forecast is simply the sum of the expected revenue or profit from the single campaign and the forecast for the specified time frame (e.g. annually) is the sum of the single campaigns.  The campaign is included or excluded from the annual forecast based solely on the expected value of the specific campaign and on its contribution to the marketing objectives for the coming year.  The product yielding the most revenue or profit from the specific person being marketed is not considered.  The marketer manually adjusts for expected performance changes due to file penetration and market conditions.

This approach is only marginally successful at helping the business develop an accurate forecast, meet that forecast and maximize potential overall revenue or profit.   Ultimately the company sacrifices revenue and profit because of an outdated and manual process.  While accurate predictive models are helpful in improving the forecasting accuracy for a single campaign, the problem of how to maximize revenue or profit over time is ignored.  A different methodology is needed in order to maximize revenue or profit from a single offer to an individual and also to review the expected results for the entire year combined.  In this new methodology, the marketer makes decisions based on the combined results of every anticipated offer after reviewing the financial potential from the available market for the year.  This methodology maximizes the target (usually revenue or profit), and improves forecasting similar to the way that optimization improves a campaign.

**FORECASTING AT AEGON DIRECT MARKETING SERVICES**

The forecasting situation within AEGON Direct Marketing Services (ADMS) closely resembled the description listed above. Annually the business unit prepared a financial forecast outlining the expected results and revenue from the department. However, the forecast was not analytically rigorous and it lacked the ability to consider the best offers based on an individual's characteristics. It also lacked the flexibility to view campaigns in the context of marketing for the entire year. In addition to the forecasting effort within this project, it was also necessary to examine and modify the existing campaign flow in order to achieve the benefits of the improved forecast. The objective of this project was to develop a streamlined process with a single decision point (the forecast) providing to marketing the best information possible for decision making.

**CASE STUDY (OVERVIEW OF CURRENT MARKETING STATE)**

1) Marketers typically make decisions about campaigns independently of each other considering only the revenue and other financials associated with a single campaign.

2) Marketing makes no attempt to determine the optimal number of times to contact a customer or prospective customer to maximize the company's revenue and profit. In fact, marketing someone in one campaign is independent of their likelihood to be marketed in a subsequent campaign.

3) Since the overall goals of the business unit require campaigns to be profitable, they typically remove all unprofitable marketing campaigns from the schedule. Because they remove the entire campaign, instead of just the unprofitable portion, revenue is reduced, opportunity is lost and subsequent marketing to the new customers is limited.

**EXAMPLE 1:**

One example of a non-optimized approach is a product prioritization. When one product is prioritized over another, no consideration is given to the person's product preference. In this example (see Figure 1 below), Prod 1 has the most volume and a profitable expected outcome, leaving Prod 2 with very little volume at an unprofitable level and Prod 3 and 4 with volumes determined too small to market. The forecast including this campaign would fall short of marketing potential and ultimately the company would forfeit potential revenue and profit.

| Product Prioritization | | | | | | |
|---|---|---|---|---|---|---|
| Product | Leads | % Leads | Expected Sales | Expected Resp Rate | Expected Revenue | Profit Index |
| Prod 1 | 153,113 | 96% | 2,402 | 1.676% | $ 223,337 | 22% |
| Prod 2 | 7,092 | 4% | 27 | 0.394% | $ 4,196 | -22% |
| Prod 3 | N/A | | | | | |
| Prod 4 | N/A | | | | | |
| | 160,205 | | 2,430 | | $ 227,534 | 22% |

**FIGURE 1:**
**Un-optimized Product Priority**

**CASE STUDY:  STEPS IN DEVELOPMENT OF FORECASTING PROCESS:**

**STEP 1:  PLANNING.**

An old proverb says "He who fails to plan, plans to fail."

**PROJECT SCOPE**

During the planning phase, ADMS began by developing a project scope which included information and input from all impacted areas of the business. These areas included: Marketing, Campaign Processing, Analytics, and Print Production. Each group participated in the discussions concerning the scope and timing of the project.

During the planning phase the team outlined the project scope to include the following:

- Purpose and goals of the project

- Measures of success

- Definition of a customer

- Marketing campaigns to be included and excluded

- Diagram of the process flow for the new program

- Products to be included in marketing

- List of models to be developed and details associated with those models

- Responsibilities for various aspects of the project

- Objectives of optimization

- Exclusions

## INCLUSIONS AND EXCLUSIONS

The team discussed various marketing efforts (campaign, subset of the universe, etc.) to determine which to include or exclude. A few that required extensive and time-consuming efforts were evaluated based on their potential to increase revenue and the cost of the delay to include them. Any effort eliminated was included in the list of exclusions. The team was then able to focus on the areas deemed appropriate to include in the process.

## BUSINESS RULES

Names selected for marketing can come from various sources, so the team needed to determine guidelines to apply to customers used for forecasting. These guidelines included how frequently a customer could be marketed to and how a customer would be defined across the business unit. The project team divided the records into two groups, separating records with existing contact rules from those without. Analytics then developed contact rules for the records without existing rules and had them approved by Marketing. The existing contact rules for the other group of records could not be changed, as they were externally defined.

## EXAMPLE 3

The project team determined the attributes that make a unique customer (customer definition). The definition splits the universe into two groups depending on the external restrictions to contacts. In optimization, the contact policies were applied to these customers through the max/min contact policies. This constraint used the offer subgroups defined in the communication table to set the number of times an offer could be repeated to a specific group. This example shows that three offers from offer subgroup P1 are possible over the course of the evaluation period.
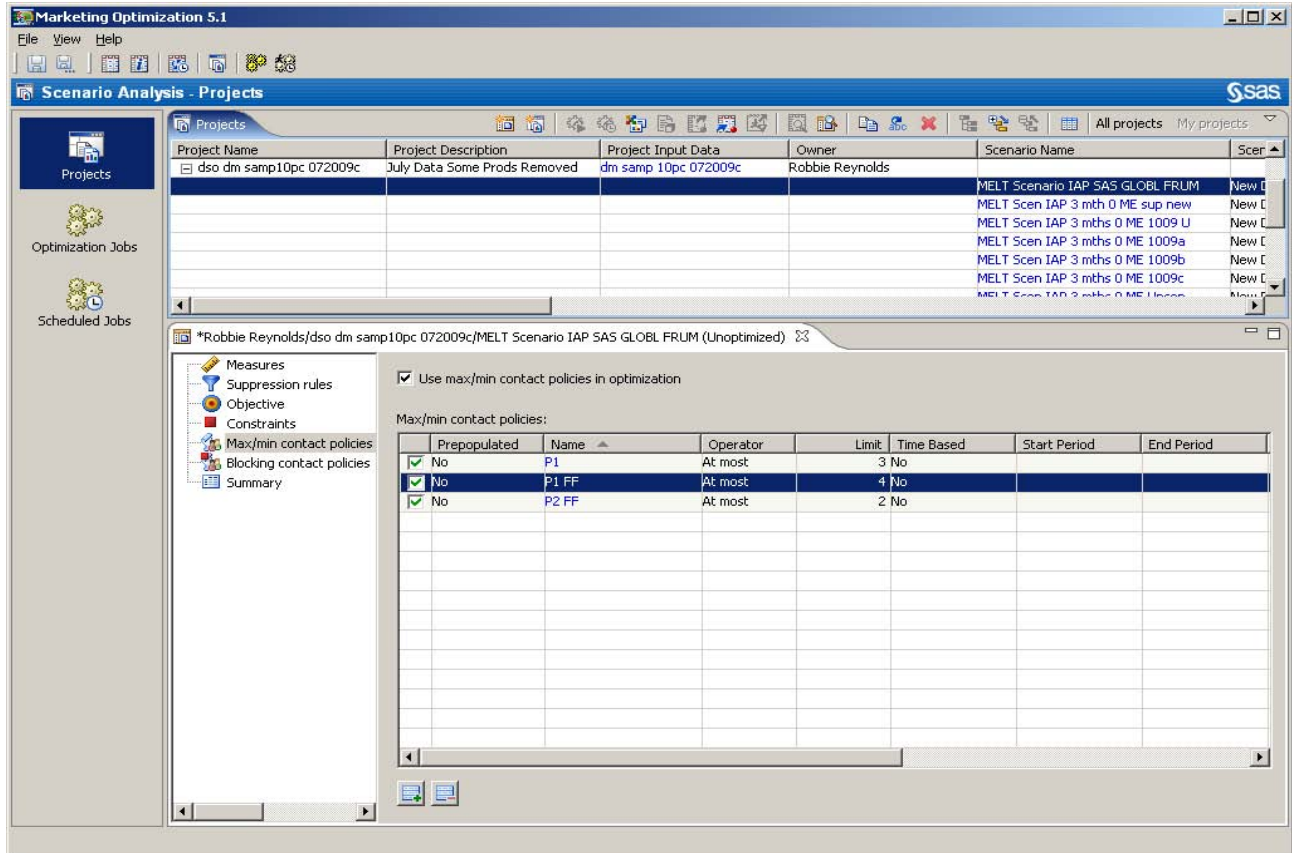
**FIGURE 3:**
**SAS® Marketing Optimization Screen Shot of Max/Min Contact Policies**

**FIGURE 4:**
**SAS® Marketing Optimization Screen Shot of a filter in Max/Min Contact Policies**

### STEP1: OPTIMIZATION PLAN

Based on previous optimization experience and conversations with SAS®, the project team developed the plan for selection of the marketable universe and optimization. Products available to each customer or prospect in the marketable universe were identified. SAS® Marketing Optimization then determined which offers to make over the course of the optimization period. Specifically, because of variation in the business rules, the universe was divided into two groups based on the customer definition and the contact rules for the customer and prospects. Within SAS® Marketing Optimization a separate contact policy was applied to each group to satisfy the restrictions. In addition we assembled all financial assumptions required for the optimization tables (i.e. premium by product, anticipated rates for non-modeled values, profit multiplier) to calculate the financial values used in the optimization process (see example below). Since the forecasting covered an extended timeframe but was taking place at a point in time, the optimization had to simulate the impact of contact rules over the forecasting timeframe. The team also reviewed the possible optimization targets and recommended an appropriate value to accurately measure the impact to marketing objectives. Finally a set of initial scenarios was identified to begin the optimization process.

## EXAMPLE 2

Below is an example of the communications table (an input to SAS® Marketing Optimization) with several values supplied from marketing.  Note that when the "Paidrate" column contains a one, that value is supplied by a model, and when it contains a value other than one, that the value is an assumption supplied by Marketing.  In addition, the grouping used in the "offer_subgroup" column will be used to apply contact policies during optimization.

| campaign_cd | communication_cd | comm_desc | product | channel_cd | offer_subgr | Periodic Amt | Resprate | Paidrate |
|---|---|---|---|---|---|---|---|---|
| CMA | prod1_cma1 | prod1 | prod1 | DM | P1 | 40.000 | 1.000 | 0.850 |
| CML | prod1_cml1 | prod1 | prod1 | DM | P1 | 40.000 | 1.000 | 0.800 |
| NEW | prod1_new1 | prod1 | prod1 | DM | P1 | 40.000 | 1.000 | 0.750 |
| ACQ | prod2_acq1 | prod2 | prod2 | DM | P1 | 1.000 | 1.000 | 0.850 |
| CMA | prod2_cma1 | prod2 | prod2 | DM | P1 | 38.000 | 1.000 | 0.782 |
| CML | prod2_cml1 | prod2 | prod2 | DM | P1 | 1.000 | 1.000 | 0.759 |
| NEW | prod2_new1 | prod2 | prod2 | DM | P1 | 38.000 | 1.000 | 0.730 |
| ACQ | prod3_acq1 | prod3 | prod3 | DM | P1 | 1.000 | 1.000 | 0.850 |
| CMA | prod3_cma1 | prod3 | prod3 | DM | P1 | 37.000 | 1.000 | 1.000 |
| CML | prod3_cml1 | prod3 | prod3 | DM | P1 | 37.000 | 1.000 | 1.000 |
| NEW | prod3_new1 | prod3 | prod3 | DM | P1 | 1.000 | 1.000 | 1.000 |
| ACQ | prod4_acq1 | prod4 | prod4 | DM | P1 | 1.000 | 1.000 | 0.790 |
| CMA | prod1_cma1 | prod1 | prod1 | DM | P2 | 40.000 | 1.000 | 0.850 |
| CML | prod1_cml1 | prod1 | prod1 | DM | P2 | 40.000 | 1.000 | 0.800 |
| NEW | prod1_new1 | prod1 | prod1 | DM | P2 | 40.000 | 1.000 | 0.750 |

**FIGURE 2:**
**Communications Sheet Input to SAS® Marketing Optimization**


## DECISION SCIENCES INPUT

Analytics developed a list of models needed and a list of instances where an alternative data driven solution was necessary because modeling was not possible.  Few existing predictive models were available for use in this process.  The models that were available performed only marginally and needed to be replaced quickly after implementation of the project.  Priority was assigned to developing models for programs where none existed.  The analyst reviewed the availability of data to develop models and programs were split into two types.

Type 1: Model should be developed immediately.

Type 2: Model should be developed soon, but timing or data limitations would prevent that from occurring for the initial phase.

Type 2 programs required a data driven solution outside of standard modeling practices.  Marginally performing models and models built on limited data were utilized if necessary.

The time the team spent planning was time well spent.  During planning sessions, the team reviewed topics raised and judged them to be either in or out of scope.  This prevented the project from taking on a life of its own and becoming unmanageable.  Success would have been unlikely without this step.


## STEP 2:  FORECAST

Is forecasting the final step of planning or the first step of implementation?  Step 1 (listed above) included planning to forecast, or planning to plan, as the team outlined how to complete a forecast which could be placed into action during the production phase.  In Step 2 the plans were enacted.

The marketing department at ADMS began the forecasting process by submitting campaign plans for the forecasting period.  During the planning step the team determined products to include in the forecast, as well as any tests desired.  Next the campaign processing team selected the universe for forecasting, utilizing marketing plans and customer definitions identified during planning.  At this point, the team reviewed a set of reports with marketing to ensure the records met expectations.

Once the initial reports were approved, Analytics completed the tables needed for optimization based on the financial assumptions determined during planning and selected a random sample of the universe.  Based on the optimization plan, a scenario was developed using the agreed upon measures and utilizing the maximum and minimum contact policies to determine the optimal product for each available contact over the forecasting period.  This scenario

included a suppression rule used to exclude any unprofitable offers.  Next optimization was completed on the random sample and post-optimization reports were reviewed with Marketing to illustrate the impact of scenario selection on financial performance over the six-month forecasting timeframe.

Marketing determined which scenario most closely aligned with their goals. They also determined which programs did not have sufficient volume to meet mailing efficiency guidelines.  Optimization using the "preferred" scenario was completed on the entire potential universe for the six-month forecasting timeframe.  Analytics prepared financial reports on the optimized file and reviewed them with Marketing.

## EXAMPLE 4

Forecasting reports look very much like optimization reports.  For our project we determined to randomly divide the offers over the forecast period to achieve consistency. The reports shown below demonstrate the result of a forecasting cycle.

| 6 Month Forecast | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Segment | Product | Month | Offers | Customer | Paids | RIP Rate | Revenue | Cost | IRR |
| ACQ | All | All | 10,644,980 | 3,862,670 | 37,100 | 0.349% | $ 6,914,999 | $ 4,168,574 | 50% |
| CEA | All | All | 174,340 | 74,230 | 580 | 0.333% | $ 156,684 | $ 61,018 | 41% |
| CEL | All | All | 1,000,840 | 430,950 | 3,420 | 0.342% | $ 934,422 | $ 350,300 | 38% |
| CMA | All | All | 4,914,020 | 1,046,360 | 14,800 | 0.301% | $ 3,314,518 | $ 1,720,740 | 61% |
| CML | All | All | 4,409,500 | 119,762 | 11,320 | 0.257% | $ 2,393,352 | $ 1,607,740 | 46% |
| EMA | All | All | 1,768,820 | 246,530 | 8,280 | 0.468% | $ 1,553,603 | $ 607,160 | 52% |
| EML | All | All | 4,456,380 | 598,070 | 15,960 | 0.358% | $ 3,943,680 | $ 1,504,840 | 47% |
| HIS | All | All | 1,190,920 | 559,720 | 9,660 | 0.811% | $ 1,403,529 | $ 546,020 | 63% |

**FIGURE 5:**
**Optimized Product Selection**

| 6 Month Forecast | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Segment | Product | Month | Offers | Customer | Paids | RIP Rate | Revenue | Cost | IRR |
| ACQ | Prod 1 | All | 6,386,988 | 3,512,843 | 19,991 | 0.31% | $ 2,962,707 | $ 2,407,894 | 52% |
| ACQ | Prod 2 | All | 851,598 | 723,858 | 3,168 | 0.37% | $ 596,080 | $ 425,799 | 55% |
| ACQ | Prod 3 | All | 212,899 | 149,029 | 528 | 0.25% | $ 253,055 | $ 89,418 | 38% |
| ACQ | Prod 4 | All | 3,193,495 | 2,395,121 | 13,413 | 0.42% | $ 3,103,157 | $ 1,245,463 | 41% |
| TOTAL | All | All | 10,644,980 | 3,862,670 | 37,100 | 0.349% | $ 6,914,999 | $ 4,168,574 | 50% |

**FIGURE 6:**
**Optimized Product Selection Drill Down 1**

| 6 Month Forecast | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Segment | Product | Month | Offers | Customer | Paids | RIP Rate | Revenue | Cost | IRR |
| ACQ | Prod 1 | Month 1 | 1,064,498 | 585,474 | 3,332 | 0.31% | $ 493,784 | $ 401,316 | 52% |
| ACQ | Prod 1 | Month 2 | 1,064,498 | 585,474 | 3,332 | 0.31% | $ 493,784 | $ 401,316 | 52% |
| ACQ | Prod 1 | Month 3 | 1,064,498 | 585,474 | 3,332 | 0.31% | $ 493,784 | $ 401,316 | 52% |
| ACQ | Prod 1 | Month 4 | 1,064,498 | 585,474 | 3,332 | 0.31% | $ 493,784 | $ 401,316 | 52% |
| ACQ | Prod 1 | Month 5 | 1,064,498 | 585,474 | 3,332 | 0.31% | $ 493,784 | $ 401,316 | 52% |
| ACQ | Prod 1 | Month 6 | 1,064,498 | 585,474 | 3,332 | 0.31% | $ 493,784 | $ 401,316 | 52% |
| ACQ | Prod 2 | Month 1 | 141,933 | 120,643 | 528 | 0.37% | $ 99,347 | $ 70,967 | 55% |
| ACQ | Prod 2 | Month 3 | 141,933 | 120,643 | 528 | 0.37% | $ 99,347 | $ 70,967 | 55% |
| ACQ | Prod 2 | Month 4 | 141,933 | 120,643 | 528 | 0.37% | $ 99,347 | $ 70,967 | 55% |
| ACQ | Prod 2 | Month 6 | 141,933 | 120,643 | 528 | 0.37% | $ 99,347 | $ 70,967 | 55% |

**FIGURE 7:**
**Optimized Product Selection Drill Down 2**

**STEP 3:  PRODUCTION**

Once the forecast was complete, many of the steps for the campaign were in place.  There was still work needed for the implementation steps, such as printing, which occurs later in the process than forecasting.  Also remaining were decisions on how to best achieve the financials anticipated by the forecast since the universe would be updated monthly.  It was determined that each month the universe would be selected, scored and optimized.  This allows for the maximum number of people to be assigned to a product based on their score.  In addition, rules were put in place in the SAS**®** program, which takes place after optimization to account for anyone optimized into a campaign that, due to size, was only being marketed a limited number of times over the course of the forecasting period.

**CONCLUSION**

SAS® Marketing Optimization can be used effectively as an integral part of a forecasting strategy.  To do so effectively, proper planning and communication between interested parties is key.  Throughout the process of installing optimization and moving to this process of forecasting, we learned a great deal.  Listed below are some of our key learnings.

**TIPS AND TRICKS**

1.      When trying to suppress certain offers and not records, use a suppression rule, instead of a constraint.  Constraints can be used to suppress a person who meets criteria on any offer.

2.      Add a new line in the communications table for each repeat, when there are multiple repeated offers.  Add a sub-group column to apply different contact policies to each group.

3.      Always start with an unconstrained scenario.  It provides a basis to compare subsequent constrained scenarios.

4.      Test the entire process including steps leading to optimization and optimization on a small sample file.  We found this works better than the "Solve problem on a sample" option  inside of SAS® Marketing Optimization as it tests all the steps on something that will run quickly, not just the part inside of Optimization.

5.      If unexpected results are encountered, call in the cavalry, a.k.a. the SAS**®** Helpdesk.

**CONTACT INFORMATION**

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