

Consistency = Success: Using SAS Software to Develop Sales *Forecasts* and *Targets*

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Abstract

In most large companies sales and revenue *forecasts* are developed by a centralized economics/statistics group to support financial planning, resource planning, and other strategic business decisions. In contrast, the Marketing department usually develops sales targets. As different groups within the organization develop forecasts and targets, it is a rare occurrence when the assumptions and data used to develop forecasts and targets are derived from the same sources or yield similar results.

This paper describes how a proprietary SAS/AF application, the ATLAS System, generates sales projections that can be used for centralized strategic business decisions, as well as to establish sales targets across geographic and market dimensions. Consistency is guaranteed because all information resides in a unified data and analysis warehouse, where individual market dimensions sum to company totals.

ATLAS uses a series of SAS macro variables to uniquely identify each market dimension, and iterative %do loops to store, process and analyze data within and across selected dimensions. A SAS/EIS reporting tool then summarizes sales projection information at any level required by decision-makers. A unified, consistent set of sales forecasts and targets can be developed by creatively applying ATLAS's market segmentation design process.

Introduction

In the middle of a planning cycle, one might overhear conversations such as those in Figure 1. No, these managers are not talking to one another—but they probably should be. As should Sally and Steve. Instead, they are scrambling as usual to generate their *forecasts* and *targets*. Aren't forecasts and targets the same? The answer is: typically not.

Figure 1: Planning Cycle Blues



"Hi Sally...where are the five-year sales forecasts? We have to get the projections to Financial Planning by 5 PM so they can finish the Business Plan."



"Hi Steve...where are next year's district sales targets. We have to get the estimates to Headquarters by 5 PM so they can finish the Marketing Plan."

As illustrated in Table 1, a market forecasting or economic studies group that supports financial planning, resource planning, and other strategic business decisions usually develops sales and revenue forecasts.

Table 1: Overview of Forecasts and Targets

Component	Forecasts	Targets
Horizon	< 1 year 1 - 5 years > 5 years	< 1 year 1 - 5 years
Aggregation	Aggregated	Aggregated & Disaggregated
Developed By	Market Forecasting Economic Studies	Marketing Regional Sales Offices Regional Managers
Clients	Strategic Planning Financial Planning Resource Planning	Market Planning Human Resources

In contrast, sales *targets* typically have shorter horizons, are more disaggregated, and are often developed in a decentralized fashion by sales force managers. In some instances corporate marketing will establish overall targets and regional or market managers set individual goals.

As forecasts and targets are almost always developed by different groups using within an organization, it is a rare occurrence when the assumptions and data used to develop forecasts and targets are derived from the same sources or yield the same results. Moreover, these projections likely contain information that would be useful to one another.

The local or "micro" data employed by marketing and regional sales offices likely contains valuable information that could be used to develop better predictive models of customer behavior. And the forecasting models often capture structural market changes or constraints that cannot be gleaned from the trend analysis approaches used to establish target.

Consider AAA Telephone Company, depicted in Table 2. The forecasts and targets both require sales projections over the next year by product and customer segment. One might think that a single set of projections would meet the needs of all company clients. However, the requirements of the target's audience extend to group and individual performance, so the forecasts would

have to provide information at the regional office level to support the target setting process. Marketing and the regional sales offices therefore ignore the forecast. Why should Marketing base its target projections on a forecast that they perceive as too aggregate to be of assistance?

Forecast consistency is only achieved through a negotiating process. Market Forecasting and Marketing are forced to sign off on a set of "second best" projections that deviate from their preferred approaches.

Why doesn't Market Forecasting further disaggregate their models? First, Marketing is probably comfortable with its current target development approach and isn't pushing for support from other parts of the organization. Second, the database and model development effort that is required to support unified projections is not inconsequential.

Until recently Management rightfully believed that such an undertaking would cost-prohibitive, and would not provide enough of a return to be worthwhile.

Table 2: Sales and Forecasts at AAA Telephone Company

Component	Forecasts	Targets
Horizon	Monthly, annually over the next five years	Monthly over the next year
Aggregation	By product and customer segment for the entire company	By product, market segment, region and employee
Developed By	Market Forecasting	Marketing with input from regional sales offices
Purpose	Input into financial models and cost/benefit analyses	Establish group and individual goals for performance-based compensation
Approach	Econometric analyses and other statistical approaches	Trend Analysis
Data Sources	Historical sales, demographic and economic variables over several years; macroeconomic forecasts	Last year's performance, Judgment

Impact of the IT Revolution

Today's hyper-competitive markets are combining with the ongoing information technology and delivery revolution to change the conventional wisdom about such investments. Companies can no longer afford to have vast amounts of information reside in separate databases where it takes weeks or months to process data, perform analyses, and support the decision making process. Software from the SAS Institute Inc. and other IT leaders can be used to quickly integrate disparate databases from internal and external sources, and improve analyses and information delivery throughout the organization. In many instances this can be accomplished in less time than it normally takes to complete a Business or Marketing Plan cycle.

This remainder of this paper describes how a proprietary SAS/AF application, the ATLAS System, generates sales projections that can be used for centralized strategic business decisions, and to establish sales targets across geographic and market dimensions. Consistency is guaranteed because all information resides in a unified data and analysis warehouse, where individual market dimensions sum to company totals.

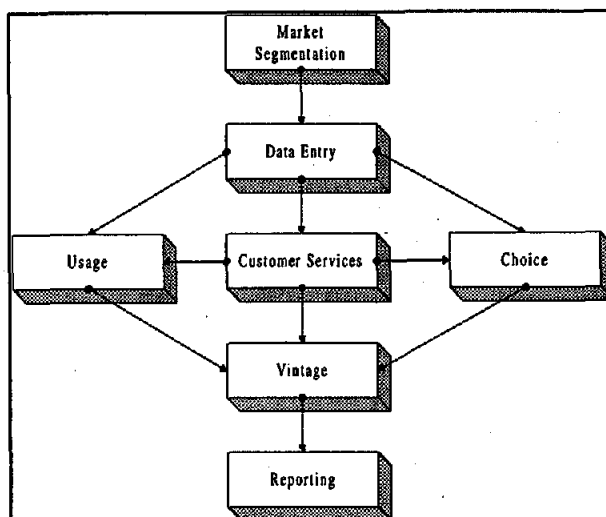
Overview of ATLAS

ATLAS is a market segmentation and sales projection system originally developed for infrastructure industries—electric, gas, and water utilities. It addresses the following types of issues:

- Impacts from changing product prices and other variables that influence customer choices and product demands;
- Sales, and revenue projections associated with alternative future “what if” scenarios; and
- Access to market segment and product-specific information such as volumes, market shares, customer counts, revenues, etc.

The ATLAS System structure is summarized in Figure 2. Each rectangle corresponds to a module. The Market Segmentation module

Figure 2: ATLAS System Structure



provides the ability to specify demand in a variety of ways or dimensions. This feature is the key to generating forecasts and targets. The Market Segmentation module is described in more detail in the next section.

The other modules refer specifically to the forecasting techniques used by the ATLAS System to forecast infrastructure industry demands. Within each module ATLAS uses a series of SAS macro variables to uniquely identify each market dimension, and iterative %do loops to store, process and analyze data within and across selected dimensions. This design allows ATLAS to work with a nearly infinite set of market segmentation alternatives. The Appendix contains a portion of the model code to illustrate this process.

The Usage module tracks the ongoing use of a given type of equipment after it is purchased. For example, in energy markets the usage module often tracks and forecasts the fuel consumption of furnaces, water heaters, and other household appliances.

The Choice module forecasts consumer decisions relating to the selection of available products. These involve “long-run” or capital/time intensive decisions that influence short-run usage over many periods. Examples include the choice

of electric or gas water heaters, and the selection of electric, gas, or oil furnaces.

ATLAS's Usage and Choice modules combine to capture a customer's total demand for products and services from economic and statistical perspectives. The Customer Services module reflects "what if" scenarios where sufficient historical data are not available to estimate econometric impacts. It gives analysts and decision makers the ability to override historically-based model outputs and view the results of alternative market share and usage assumptions (i.e., new targets) on sales and revenue projections.

The Vintage module combines Usage, Choice, and Customer Services information with other data necessary for the total forecast:

- Number of customers in each market segment, and associated growth and decay rates; and
- Physical, economic, or contract life of equipment and products.

After combining all relevant information for the selected scenario, the Vintage module produces market share, sales, and revenue projections for each market segment and product.

The Reporting module summarizes the forecasts across all dimensions through a customized SAS/EIS application. These SAS/EIS objects are rich in multidimensional information, and can summarize forecast information at any level required by decision-makers. Aggregate information (i.e., forecasts) can be provided to Finance, and disaggregate information (i.e., targets) can be provided to Marketing.

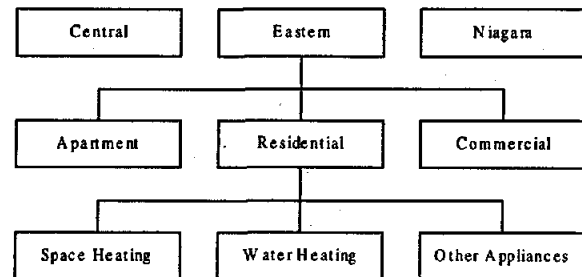
Market Segmentation

The primary goal of any market segmentation design is to disaggregate the overall market into chunks of customer types that behave similarly in terms of their product demands, and have relatively homogeneous, distinguishing characteristics such as income or family size.

The first two dimensions of the ATLAS system define a market segment, and the third dimension

defines the products and services marketed to that segment. A common segmentation strategy, used in this instance by Consumers Gas of Toronto, is illustrated in Figure 3.

Figure 3: Consumers Gas ATLAS Market Segmentation Design

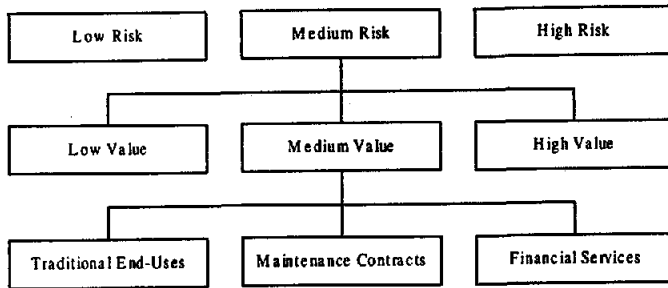


The first dimension is geographic area, and the second dimension is customer type. The third dimension separates customer demands into energy end-uses. Each geographic area can have one or more customer types, and each customer type can have one or more end-use or product areas. Furthermore, the number customer types per area and products per customer type need not be symmetric. For example, the Central area in Figure 3 could further divide commercial customers into offices, restaurants, hospitals, etc. Each company customizes ATLAS's market segment definitions to fit the organization's needs and preferences.

Consider the Company in Figure 4. This segmentation design considers customer behavior in a newly deregulated electricity market. The first dimension, risk, refers to the likelihood of customers switching suppliers. The second dimension, value, relates the margin or profit provided various customer types to their risk of switching suppliers.

This market segmentation flexibility is achieved by separating ATLAS's underlying SAS models from the SAS datasets used to generate sales projections. *Business logic* (the part of the

**Figure 4: Risk-Value Based ATLAS
Market Segmentation Design**



ATLAS system comprised by the programming code and user interface) is stored and managed in a different location than the *business data* that is unique to each forecast and Company.

A Company can have more than one market segmentation design. The utility with the risk/value segmentation design also has a rate class oriented segmentation scheme to generate more traditional forecasts until electricity deregulation becomes a reality.

Effective Use of Dimensionality: The Key to Producing Forecasts and Targets

To generate forecasts and targets within the same system one must effectively use the available dimensions. No sales projection system, including ATLAS, can provide an unlimited number of market dimensions.

We have employed the following process to devise segmentation strategies and associated sales projections that meet multiple objectives and provide necessary information across the organization.

1. Invite key personnel from Finance, Forecasting, Marketing, Regional Sales Offices, and Strategic Planning and other groups that can potentially benefit from the system to a "brainstorming" session. Explain the concept of merging data and objectives in a unified sales projection system.

2. Establish ground rules for accepting or rejecting desired dimensions. One very useful rule designed to encourage camaraderie and future support of the system is to get all ideas on the table before accepting or rejecting a single one. Cast a wide net initially and catch all possible dimensions regardless to feasibility.

3. After the discussion moves to feasibility be sure to address the issue of data availability. If existing or future data cannot support a dimension, it is probably best to eliminate it. A related issue is *optimization*: choose dimensions and enough sub-segments within each dimension to provide answers to important questions. This yields the following data availability corollary: don't create sub-segments just because you do have the data to support the break out.

4. The process almost always produces more dimensions than the system can apparently handle. Suppose the team identifies five key dimensions and you only have three to work with in the model. Don't worry. Start to think *horizontally* instead of *vertically*. Consider the following dimensions which resulted from a brainstorming session at Consumers Gas:

- a. Geographic area
- b. Customer type
- c. Building type
- d. Energy end use
- e. Size of energy end use

In this instance we simply collapsed dimensions b and c, and dimensions d and e. This was accomplished by horizontally extending the second and third dimensions:

- a. Geographic area
- b. Customer type and building type
- c. Type and size of energy end use

This formulation allowed the modeling code to work properly, and the initially hierarchy from the brainstorming session was preserved by modifying report objects.

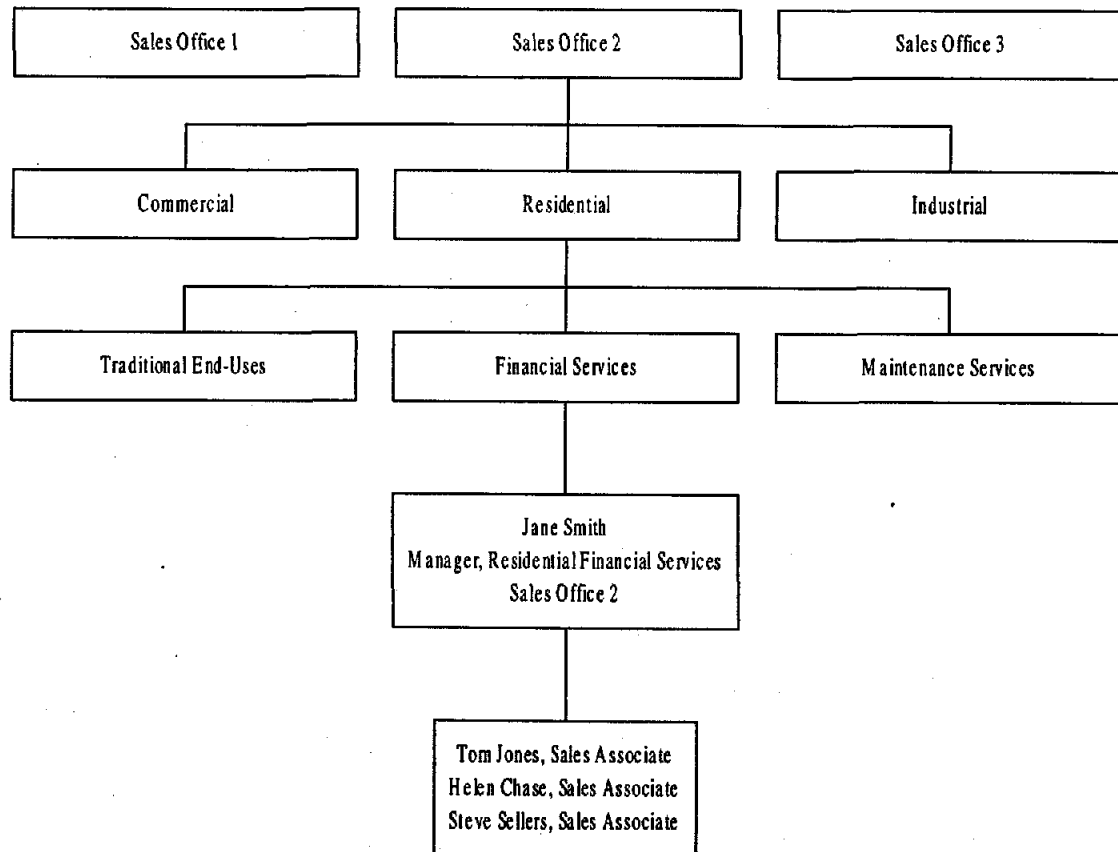
Figure 5 depicts a segmentation design to provide forecasts and targets. In this example Finance is primarily interested in total sales and revenues aggregated by dimensions 1 and 2.

Meanwhile, Jane Smith, Manager of Residential Financial Services in Sales Office 2, can retrieve her group's targets and provide feedback on the assumptions and analyses.

Furthermore, any changes in forecast assumptions or "what-if" scenarios are

automatically reflected in the ATLAS analysis and data warehouse. Impacts of various strategies on sales, revenues, and size and distribution of the sales force can be readily observed and communicated.

Figure 5: Forecast and Target Market Segmentation Design



Conclusions

This paper has shown how sales, revenue, and other market projections can be provided across a variety of important business dimensions. As illustrated by the ATLAS System, SAS software can capture the hierarchy of key issues, ensuring

that projections—forecasts and targets—are consistent across user defined dimensions.

Figure 6 illustrates what managers might say in the planning cycle after they have implemented a SAS-based sales projection system with these features.

Figure 6: Planning Cycle Success



"Hi Sally...thanks for getting the five-year baseline sales forecast to me so fast. Can you run the high and low cases and break the results out by district so we view the effects of our assumptions on next year's district targets? You already have the district breakouts? Great, I'll see you at the meeting."



"Hi Steve...we've got Management's buy-in on next years targets, and we've developed the assumptions for their aggressive marketing scenario. Can you work with Sally to estimate the effects on the targets and the five-year revenue forecast? Great, I'll see you at the meeting."

Appendix: ATLAS Macro Variables and Iterative %Do Loops

Market segmentation flexibility in the ATLAS System is created by the use of SAS macro variables that uniquely identify each market segment, product, and scenario. These variables allow the model to correspond exactly to the desired segmentation strategy without having to re-program SAS or SCL code. Table A summarizes the macro variables associated with ATLAS's primary market dimensions.

Table A: Primary ATLAS Dimensions and Associated Macro Variables

Dimension Name	Macro Variable	Lower Limit	Upper Limit ¹
Dimension 1	Z	1	999
Dimension 2	B	1	999
Dimension 3	N	1	999
Scenario	S	10	99

Iterative %do loops store, process, analyze and report data within and across selected dimensions. These loops rely on the user-defined market segmentation macro variables and provide a logical sequence for performing necessary data step and analysis routines.

The following SAS programming code examples demonstrate the key elements of this process in the ATLAS System:

```
/* Define key market segmentation macro variables */
```

```
data _null_;
```

```
set basic.dimens;
```

```
/* The dataset dimens in the basic library contains the
core elements of the user's market segmentation
strategy */
```

¹ The number of potential market segment classifications within the first three dimensions must sum to five digits. For example one can have 1 digit allocated to dimension 1 (up to 9), 2 digits for dimension 2 (up to 90), and 2 digits for dimension 3 (up to 90). Alternatively, one could assign 2 digits to dimension 1 (up to 90), 2 digits to dimension 2 (up to 90), and 1 digit for dimension 3 (up to 9). Other combinations are also feasible.

```
call symput ('dimen1l',left(dimen1l));
```

```
/* If dimen1 has 9 or fewer segments then dimen1l = 1
(1 digit reserved). If it has between 10 and 90
segments, then dimen1l = 10 (2 digits reserved). If it
has 91 or more segments then dimen1l = 100 (three
digits reserved). The same process applies to dimen2
and dimen3, with the sum of digits across the three
dimensions constrained to equal 5 */
```

```
call symput ('dimen2l',left(dimen2l));
```

```
call symput ('dimen3l',left(dimen3l));
```

```
call symput ('d1adder',left(d1adder));
```

```
/* The "adder" macro variables are used later by the
do loops to ensure that each loop runs from the
minimum to the maximum */
```

```
call symput ('d2adder',left(d2adder));
```

```
call symput ('d3adder',left(d3adder));
```

```
run;
```

Suppose the following parameters are assigned within the dataset basic.dimens:

- Dimen1l = 1
- Dimen2l = 10
- Dimen3l = 10
- D1adder = 0 (always assigned when dimen_1 = 1)
- D2adder = 9 (always assigned when dimen_1 = 10)
- D3adder = 9 (always assigned when dimen_1 = 10)

The following iterative %do loops demonstrate how this information is used to perform operations on each market segment and product:

```
data _null_;
```

```
set basic.intro;
```

```
call symput ('dimen1', dimen1l); /* number of
dimension 1 segments */
```

```
call symput ('years', years); /* years in forecast */
```

```
call symput ('baseyr', baseyr); /* base year of
forecast */
```

```
run;
```

```
%do z = &dimen1l %to (&dimen1 + &d1adder);
```

```
/* The macro variable z uniquely identifies members
of dimension 1 so operations can be performed on
each Dimension 1 (Z) segment. Dimen1l is equal to 1
in this example, and d1adder is equal to 0. If the
```

```

number of dimension 1 segment is equal to 5, then the
loop is %do z = 1 %to (5 + 0) or %do z = 1 %to 5 */
data _null_;
set basic.z (where=(dimen1id="&Z"));

```

```

/* &Z is the ID number assigned to Zth segment */

```

```

/* The data set basic.z contains information about the
number of dimension 2 segments within each Z
segment */

```

```

call symput ('dimen2', dimen2); /* number of
dimension 2 segments in Z */
run;

```

```

%do b = &dimen2l %to (&dimen2 + &d2adder);

```

```

/* The data set basic.zb contains information about the
number of dimension 3 segments within each ZB
segment. The macro variable b uniquely identifies
members of dimension 2 within segment Z so
operations can be performed on each Dimension
1/Dimension 2 (ZB) segment. Dimen2l is equal to 10
in this example, and d1adder is equal to 9. If the
number of dimension 2 segments in the first Z
segment (&Z= "1") is equal to 16, then the loop is
%do b = 10 %to (16 + 9) or %do b = 10 %to 25.
Notice that the loop will then execute 16 times */

```

```

data _null_;
set basic.zb (where=(dimen1id="&z" and
dimen2id="&b"));

```

```

/* &z is the ID assigned to Zth segment and &b is the
ID assigned to Bth segment within &Z */

```

```

call symput ('dimen3', dimen3); /* number of
dimension 3 segments in ZB */

```

```

/* The following statements concatenate the market
segment (ZB) and assign a macro variable for further
operations */

```

```

zb = "&z" || "&b";
call symput ('zb', zb);

```

```

run;

```

More SAS programming statements.....

```

/* This is where data step, analysis, and reporting
operations at the second dimension are conducted*/

```

```

/* The macro variable n uniquely identifies members
of dimension 3 within each ZB segment so operations
can be performed on each Dimension 1/Dimension
2/Dimension 3 (ZBN) segment. Dimen2l is equal to
10 in this example, and d1adder is equal to 9. If the
number of dimension 3 segments in the first ZB
segment (&Z&B = "110") is 7, then the loop is %do n
= 10 %to (7 + 9) or %do b = 10 %to 16. Notice that
the loop will then execute 7 times */

```

```

%do n = &dimen3l %to (&dimen3 + &d3adder);

```

```

data _null_;

```

```

/* The following statements concatenate the market
segment/product (ZBN) identifiers and assign a macro
variable for further operations */

```

```

zbn = "&z" || "&b" || "&n";
call symput ('zbn', zbn);

```

```

run;

```

More SAS programming statements.....

```

/* This is where data step, analysis, and reporting
operations at the third dimension are conducted */

```

```

%end; * n;
%end; * b;
%end; * z;

```