Using SAS® Stored Processes To Build a Calibration Tool
Using SAS® Stored Processes To Build a Calibration Tool

Anita Measey
Bank of Montreal

Objective

• Auditable
  The original spreadsheet allowed users to change the data. The Calibration Tool only allows the user to change parameter inputs.

• Replicable
  The original spreadsheet allowed users to change anything including data, formulas and parameters and there was no way to replicate. The Calibration Tool only allows parameter inputs to change and each change is captured in SAS tables and can be fully replicated.

• More Secure
  The Calibration Tool locks down input data and code allowing users to only change the input parameters.

Method

Data Preparation

• Storage
  The lowest level of data identified to be used throughout the process was segment intersect level, however this level of data was only used by one test. If this one test was ignored then the next (lowest) level identified was segment level (segment level data is 10 times smaller than segment intersect level). It was determined that because response time was more important to the user that data would be stored at both levels. This way 98% of the processing would use the segment level data and the one report would use the segment intersect level data. Although this increased storage it meant that the majority of processing would not have to pre-summarize the data for 98% of the processing and therefore speed up response time.

History Panel
  A stored process is launched when “run” is selected from the first stored process. Model and date macro variables are used to subset the history data then Proc Report is used to display output in the panel

Model and Date Selection
  A stored process is launched when “run” is selected from the first stored process. Model macro variable is used to determine the number of rows used in the form and Base SAS is used to generate the HTML form

Parameter Input Form
  A stored process is launched when “run” is selected from the first stored process. The model macro variable is used to subset the data and the most recent parameter inputs are incorporated to create tests results using Base SAS then Proc Report is used to display output in the panel

Test Result Panel
  A stored process is launched when “run” is selected from the first stored process. The model and date macro variables are used to subset the data and the most recent parameter inputs are incorporated to create tests results using Base SAS then Proc Report is used to display output in the panel

Conclusions

Calibration Tool is

• Auditable
  Data cannot be changed, code cannot be changed, parameter inputs can be traced.

• Replicable
  All results can be replicated with same source data and parameter input history

• Secure
  User cannot change source data or code and parameter input changes are retained

References

• http://support.sas.com/rnd/itech/doc9/dev_guide/datapass.html
• http://www.w3schools.com/html/html_forms.asp

Contact Information

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Abstract

In the past calibration was done using extremely complicated macros in Base SAS to create an excel workbook with multiple linked spreadsheets making it hard to audit, not reliably or replicable and open to user error. The task was to create a replicable, auditable and locked down application that allowed the user to change certain parameters and allowed them to see the impact of those changes without needing to code. SAS stored processes are used to generate a screen split into 3 sections, one showing static reporting, the second is a data driven custom input form and the third shows test results.

The most important part of the whole process is to know your data and understand what the user needs. For this application response time was the most important part of the process.
Initial Screen Seen by User

**General**

*model

Conditional Sales Contract - 03.1

*bal_month

October 2012
User selects Model and date using drop downs

- Personal Line of Credit - 03.0
- Conditional Sales Contract - 03.1
- Financial Linx - 03.1
- Homeowner LOC - 02.0
- Overdraft - 03.0
- Personal Demand Loan - 01.0
- Personal Line of Credit - 03.0
- Personal Loan Plan - 02.4
- Student Line of Credit - 02.0
- Credit Cards - 02.1

[Run]
User selects "Run" button
Application is launched.
Most recent version of parameters from the datamart are populated in the form
User can scroll through panels
### LGD History

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<thead>
<tr>
<th>LGD ID</th>
<th>Average Rate</th>
<th>Standard Deviation</th>
<th>Rate</th>
<th>Total Default</th>
<th>Balance at Default</th>
<th>Total Accounts</th>
<th>Rate</th>
<th>Total Default</th>
<th>Balance at Default</th>
<th>Total Accounts</th>
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### EAD Summary report for PLOC

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<th>Rate at 201301</th>
<th>Rate 201</th>
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### Economic Trend

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- CAR2013
- CAR2013
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- CAR2013
- CAR2013
- CAR2013
### EAD summary

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<th>Status</th>
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<th>Q2 KPI results</th>
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#### EAD Summary report for PLOC

- **2012 to 2003**

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<th>Validation</th>
<th>Economic Trend</th>
<th>Data/Model</th>
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**Update Rates**
## PD History

### 2012 to 2003

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## PD Confidence Interval test PLOC

### PD Conf Interval Data

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<th>Start Count at Q2</th>
<th>New Predicted Factor</th>
<th>Predicted Default Count</th>
<th>Actual Factor at Q2</th>
<th>Default Count</th>
<th>Lower Level/Confidence Interval</th>
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</table>
Average Rate and Standard Deviation are automatically populated based on historical results.
User does have the ability to change these numbers as well as input new parameters and descriptions.
User selects “Update Rates” to save the parameters entered to the datamart and update the tests.
This is the first screen which we chose to launch from a URL.
Following are the screens from the Stored Process Manager showing how this first stored process is configured.
This is prompt panel showing the set up for the 4 prompts used. Model and bal_month are selected by the user and bank and env are hidden from the user but passed through the process.
This is prompt panel showing the set up for the 4 prompts used. Model and bal_month are selected by the user and bank and env are hidden from the user but passed through the process.
This is prompt panel showing the set up for the 4 prompts used. Model and bal_month are selected by the user and bank and env are hidden from the user but passed through the process.
This is the code that is launched when the “RUN” button is selected. It launches 3 stored processes that creates the Calibration Tool.

```
data_null;
file workout;
put "&html;"
put "<frameset cols='75%,25%'>"
put "<frame name='static_rpt' scrolling='yes' target='static_rpt'>"
put "src='https://SASStoredProcess/do?_service=default&nxtr(s_debug)=0
&nxtr(l_program)="/Shared/Data/IRR/CARTOOL/PROC/Static_SP"
&nxtr(l_month)="&nxtr(bank)"&nxtr(bal_month)=&nxtr(&env)"%nxtr(&user)=&metauser'">
put "</frame>
</frameset>
</html>
";
run;
/* debug = 0 turns off 151 turns on log if a problem 128 turns on log full time*/
```
This is the code that is launched when the “RUN” button is selected. It launches 3 stored processes that creates the Calibration Tool.

1. Launch Static_SP and pass through model, bank, bal_month and env macro variables
This is the code that is launched when the “RUN” button is selected. It launches 3 stored processes that creates the Calibration Tool.

1. Launch Static_SP and pass through model, bank, bal_month and env macro variables

2. Launch Form_SP and pass through model, bank, bal_month and env macro variables
This is the code that is launched when the “RUN” button is selected. It launches 3 stored processes that creates the Calibration Tool.

1. Launch `Static_SP` and pass through model, bank, `bal_month` and `env` macro variables

2. Launch `Form_SP` and pass through model, bank, `bal_month` and `env` macro variables

3. Launch `Tests_SP` and pass through model, bank, `bal_month` and `env` macro variables
This is the code that is launched when the “RUN” button is selected. It launches 3 stored processes that creates the Calibration Tool.

1. Launch Static_SP and pass through model, bank, bal_month and env macro variables
2. Launch Form_SP and pass through model, bank, bal_month and env macro variables
3. Launch Tests_SP and pass through model, bank, bal_month and env macro variables
4. There is another Stored Process called Form_Update_Rate_SP that is launched when the run button created in the Form_SP is selected.
This is the code that is launched when the “RUN” button is selected. It launches 3 stored processes that creates the Calibration Tool.
This must run on the Stored Process Server and stream the results back to us.
The results must be streamed back to us.

This must run on the Stored Process Server.
Result of First Stored Process
1. Static_SP Stored Process creates the static report panel
Result of First Stored Process

1. Static_SP Stored Process creates the static report panel

2. Form_SP Stored Process creates the form
Result of First Stored Process

1. Static_SP Stored Process creates the static report panel

2. Form_SP Stored Process creates the form

3. Tests_SP Stored Process creates the reports
Result of First Stored Process

1. Static_SP Stored Process creates the static report panel

2. Form_SP Stored Process creates the form

3. Tests_SP Stored Process creates the reports

4. Form_Update_Rate_SP Stored Process will run when this button is selected
History Data at Segment Level

Data Storage

PD Parameters

EAD Parameters

LGD Parameters

History Data at Segment Intersect Level
Segment Level data used to populate 98% of reporting
Data Storage

Segment Intersect Level data used to populate 2% of reporting
Data Storage

Updated parameters versioned and stored
Data Storage

Most recent version of parameters used in test reporting
History Data at Segment Level

Data Storage

PD Parameters

EAD Parameters

LGD Parameters

History Data at Segment Intersect Level