Tips and Tricks for Producing Time-Series Cohort Data

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Introduction

- *Time-Series Cohort* = group of people defined by some time-related event.
  - *All customers who opened a checking account in 1/17*.
- Goal: track people over time, compare to other cohorts.
  - *All customers who opened a checking account in 2/17, 3/17, ...*
- We track activity relative to the event in question.
  - *Activity in the $1^{st}/2^{nd}/3^{rd}$ month after opening the account*.
- We find the date each customer opened the account, then collect data for that customer relative to that specific date.
- Lots of programming, but these tips and tricks let the programs do the work for us.

Use Macros

- We need to apply *the exact same process* to each cohort.
- This is what macros were made for!

%collectCohortData Macro

```
%MACRO collectCohortData( cohortDate );

  [CODE FOR COLLECTING DATA FOR THIS COHORT]

%MEND collectCohortData;
```

Use Macros

- How we would collect data for January and February 2017:

```
%collectCohortData( 17m1 )
%collectCohortData( 17m2 )
```

- Using `YYmM` for month `M` and year `YY` makes it easy to calculate the start date of our cohort.

Months

```
%LET month = %SCAN( &cohortDate, 2, m );
%LET year = %EVAL( 2000 + %SCAN( &cohortDate, 1, m ) );
%LET cohortStart = %SYSFUNC( MDY( &month, 1, &year ) );
```

- Above should all be *local* macro variables.

Divide the Code into Macro Units

- Divide our code into macro units that describe a specific function:

```
%collectData;
%graphData;
%makeForecasts;
%graphForecasts;
```

- For example:

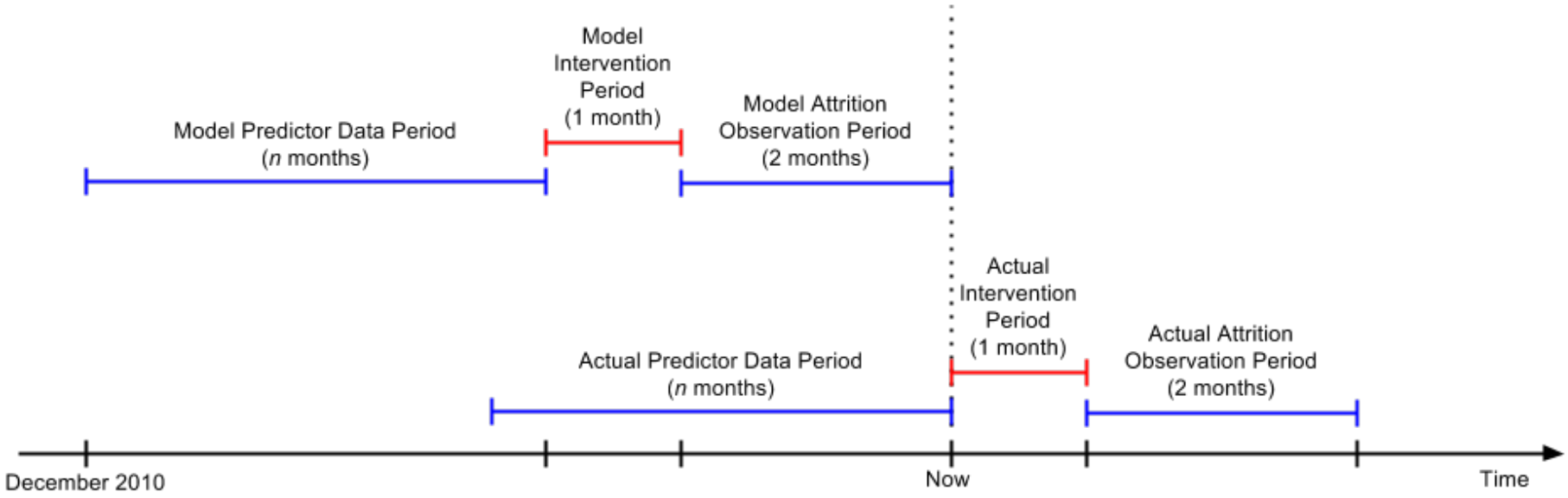
%collectData Macro

```
%MACRO collectData;

  %collectCohortData( 17m1 );
  %collectCohortData( 17m2 );
  %collectCohortData( 17m3 );
  %collectCohortData( 17m4 );

%MEND collectData;
```

Define Dates in Terms of Specific Dates



Define Dates in Terms of Specific Dates

- We *never* want to hard code our dates!

%prepareData Macro

```
%MACRO prepareData( dataSet );

  %IF &dataSet = modeling %THEN %DO;
      %LET predictorStartDate = &startDate;
      %LET predictorEndDate = %EVAL( &now - 84 );
      %END;
    %ELSE %IF &dataSet = scoring %THEN %DO;
      %LET predictorStartDate = %EVAL( &startDate + 84 );
      %LET predictorEndDate = &now;
      %END;
    ...

%MEND prepareData;
```

Define One Month as Four Weeks

Months are messy.

- Inconsistent number of days, almost never multiple of 7.
- Some months have more Saturdays (or other days) than others.
  - Months with 5 Saturdays typically have higher retail sales.
  - Months with 5 Sundays typically have higher church attendance.
  - ...
- This is a *weekly seasonality effect*.
- Avoid all this by defining a month as four weeks.
  - Holidays are still a problem, but lesser so.

Caveats

- This only applies for *generic* months.
- Inconsistency issues for 10+ months, since 10 months $\neq$ 40 weeks.
- Explicitly mention that we're doing this.

Use Date/Time Functions and Formats

- `INTCK`: Calculates the number of intervals between two date/datetime values.
- `INTNX`: Calculates the date/datetime of the start of the interval a specified number of intervals from the interval that contains a given date/datetime.
- Calculate the last day of the month:

```
%LET cohortEnd =
  %SYSFUNC( INTNX( month, &cohortStart, 0, end ) );
```

Empirically Calculate End Dates

- Don't assume what the end date is.
- The end date has the most important data.

%prepareData Macro

```
PROC SQL NOPRINT;
  SELECT MAX( effectiveDate )
    INTO :end1
    FROM accounts;
  SELECT MAX( transactionDate )
    INTO :end2
    FROM transactions;
QUIT;

%LET end = %SYSFUNC( MIN( &end1, &end2 ) );
```

Further Resources

Too many to list–see the paper!

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