IBM

Proven Practices and Design Templates for

Continuous Time Period Dimension Design

& Time-related (Variance) Analysis

with

IBM Cognos TM1

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Notices & Disclaimers

Document Version History

Date	Version	Author	Description
7/9/2014	1.0	Andreas Kugelmeier	First Version
11/18/2014	1.1	Andreas Kugelmeier	Convert numeric time period attr. to string attr. & modify rules accordingly
1/30/2015	1.2	Andreas Kugelmeier	Fix Time Period Attribute rule ('}ElementAttributes_Time Period.rux') that was preventing the 'IS YTD' etc. flags to properly calculate (due to the wrong rule, CY vs PY variance rollups were not maintained automatically).
4/8/2015	1.3	Andreas Kugelmeier	Fix Time period Attribute Rules for 'Is Prior QTD' and is 'Same QTD Prior Year'
6/18/2015	1.4	Andreas Kugelmeier	Fix Time Dimension weights for '<YYYYMM> YTD Variance' rollups
9/11/2015	1.45	Andreas Kugelmeier	Misc. updates
11/12/2015	1.5	Andreas Kugelmeier	Update design template (rules fix for TotalDays calc)
02/19/2020	1.51	Andreas Kugelmeier	Embed template download link

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1. About this Document

This document describes Proven Practices for the design and maintenance of Continuous Time Period dimensions as well as time period related analysis (YTD, MTD, QTD) and variance analysis (current vs Prior Month, Qtr, year, YTD, QTD etc.). The center-piece of this document is a TM1 time period dimension with proven practices rollups & hierarchies for time-based analysis (including variance analysis).

A design template for automatic time period maintenance and management, incl. Variance and other time related rollups, is included.

2. General Comments on calculating time period rollups and variances

The Time Period dimension rollups and related calculations modeled below for the most part will result in TM1 calculating the corresponding values by leveraging its built-in natural consolidation algorithm. In other words: the time period dimension that is the center piece of this document was designed such that the most common time related calculations and variances are calculated 'out-of-the-box' and with exceptional performance.

Note that % variances (such as CY vs PY variance %) will have to be calculated via C-Level (hence not requiring TM1 rule feeders). Also, please note that the time period dimension template is optimized for MTD data and its aggregation, not Balance-type data. It follows that using the design template, calculations related to Balance-Type data (such as Balance Sheet) will have to leverage Time Period attributes to determine the valid 'last' month for a QTD or YTD rollups for example. Alternatively, a separate dimension could be built for B/S type data, with time period element weights tailored specifically for B/S type data.

3. Processes to maintain/update Time Period Dimension

Use master process 'Manage Dimension – Time Period.pro' to update Dimension 'Time Period.dim':
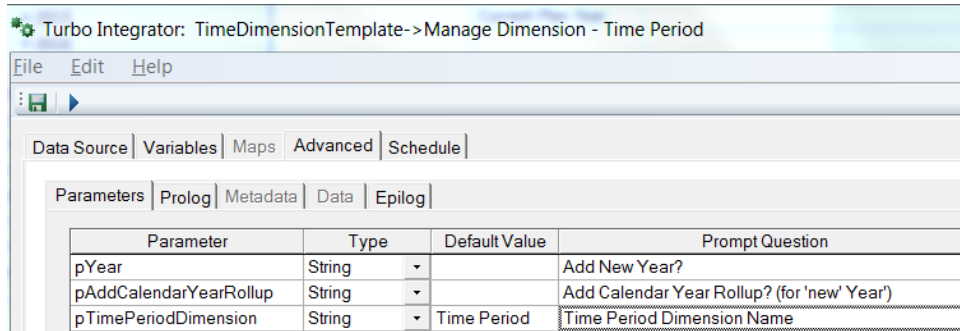
Parameters of 'Manage Dimension – Time Period.pro':

pYear:

pYear specifies the current (new) fiscal year. If <> '', then sub-process Manage Dimension - Time Period - Create New Year Hierarchy Branches.pro will run to create a new Fiscal year rollup for the specified year.

pAddCalendarYearRollup:

If = Y & pYear <> '', then sub-process Manage Dimension - Time Period - Create New Year Hierarchy.pro will run on pYear and on pYear + 1 to create a new Fiscal year rollup for the specified year. Then, a calendar year rollup will be created for pYear.

pTimePeriodDimension:

Name of time period dimention. Note: the Ti process does not build the time period dimension entirely from scratch. If needed, save the template (see below) to a new dimension name.

Process flow of '**Manage Dimension – Time Period.pro**':

1) If pYear <> '', will run sub-process 'Manage Dimension - Time Period - Create New Year Hierarchy Branches.pro' to create the following Time Period Rollups

   a. create a new Fiscal year rollup for the specified year:
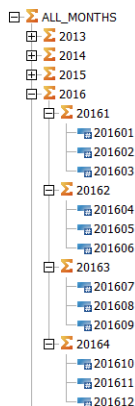
b. create Month YTD Rollups
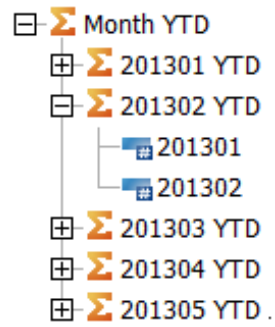
c. create QTD rollups
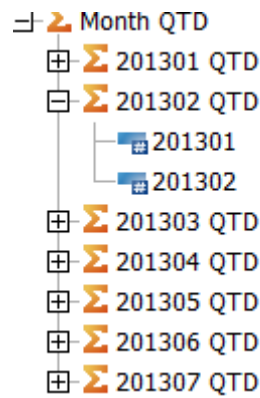
d. create YTD rollups
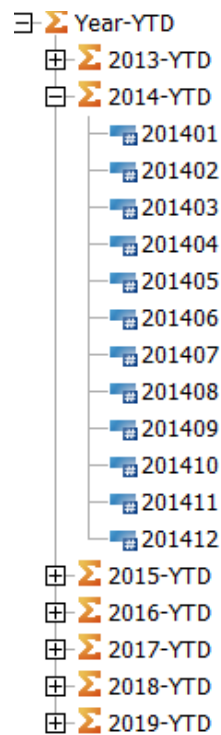
e.   create Variance Rollups

```
□ Σ Variances
  ⊞ Σ 201301 YTD Variance
  □ Σ 201302 YTD Variance
    □ Σ 201302 YTD
      ├─ 201301
      └─ 201302
    └─ 201202 YTD
  ⊞ Σ 201303 YTD Variance
  ⊞ Σ 201304 YTD Variance    .
```

f.   create YTD groupings

```
∃ Σ Year to Date Grouped
  ⊞ Σ 2013 Grouped
  □ Σ 2014 Grouped
    ⊞ Σ 201401 Grouped
    ⊞ Σ 201402 Grouped
    □ Σ 201403 Grouped
      □ Σ 201303 YTD
        ├─ 201301
        ├─ 201302
        └─ 201303
      □ Σ 201403 YTD
        ├─ 201401
        ├─ 201402
        └─ 201403
      □ Σ 201403 YTD Variance
        ⊞ Σ 201403 YTD
        ⊞ Σ 201303 YTD
    ⊞ Σ 201404 Grouped
    ⊞ Σ 201405 Grouped
```
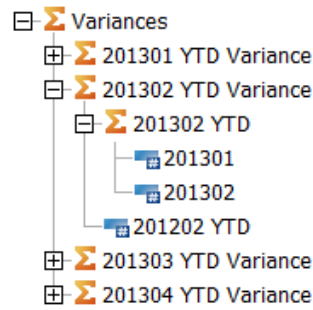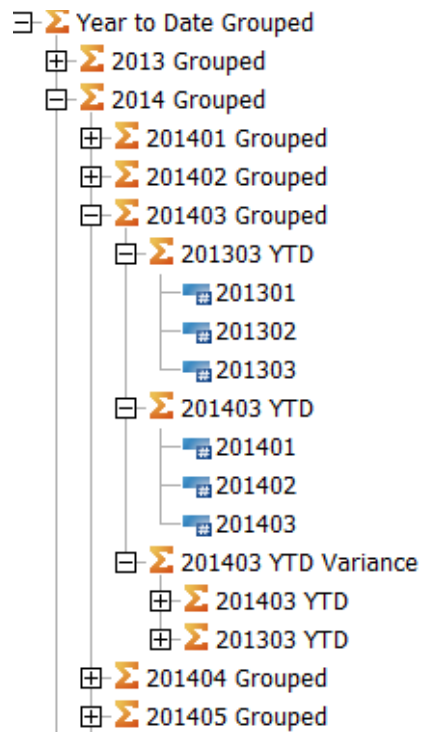
2) Will run sub-process 'Manage Dimension - Time Period - Update CY and PY Rollups.pro' which will update the CY and PY rollups, i.e. rollups under 'Months Grouped', 'Quarters Grouped', 'Years Grouped':

```
☐ Σ Months Grouped
  ☐ Σ Current Month
  ☐ Σ Prior Month
  ☐ Σ Prior Month Variance
  ☐ Σ Prior Month Variance (%)
  ☐ Σ Same Month Prior Year
  ☐ Σ Prior Year Variance
  ☐ Σ Prior Year Variance (%)
☐ Σ Quarters Grouped
  ☐ Σ QTD
  ☐ Σ Prior QTD
  ☐ Σ QTD Variance
  ☐ Σ QTD Variance (%)
  ☐ Σ Prior Year QTD Variance
  ☐ Σ Prior Year QTD Variance (%)
  ☐ Σ Same QTD Prior Year
☐ Σ Years Grouped
  ☐ Σ YTD
  ☐ Σ Prior YTD
  ☐ Σ YTD Variance
  ☐ Σ YTD Variance (%)
```

Sample rollups for current fiscal month = 201404:

```
☐ Σ Months Grouped
  ☐ Σ Current Month
    ─ 201404
  ☐ Σ Prior Month
    ─ 201403
  ☐ Σ Prior Month Variance
    ☐ Σ Prior Month
    ☐ Σ Current Month
  ☐ Σ Prior Month Variance (%)
  ☐ Σ Same Month Prior Year
    ─ 201304
  ☐ Σ Prior Year Variance
    ☐ Σ Same Month Prior Year
    ☐ Σ Current Month
  ☐ Σ Prior Year Variance (%)
☐ Σ Quarters Grouped
  ☐ Σ QTD
    ─ 201404
  ☐ Σ Prior QTD
    ─ 201401
  ☐ Σ QTD Variance
    ☐ Σ QTD
    ☐ Σ Prior QTD
  ☐ Σ QTD Variance (%)
    ☐ Σ QTD
    ☐ Σ Prior QTD
  ☐ Σ Prior Year QTD Variance
    ☐ Σ QTD
    ☐ Σ Same QTD Prior Year
  ☐ Σ Prior Year QTD Variance (%)
  ☐ Σ Same QTD Prior Year
    ─ 201304
☐ Σ Years Grouped
  ☐ Σ YTD
    ─ 201401
    ─ 201402
    ─ 201403
    ─ 201404
  ☐ Σ Prior YTD
    ─ 201301
    ─ 201302
    ─ 201303
    ─ 201304
  ☐ Σ YTD Variance
```

Notes:

- By using Time Period dimension element attributes ('}ElementAttributes_Time Period.rux') to flag elements both for hierarchy update (Attribute 'Is CY and PY Rollup' = Y) and to assign YYYYMM Elements to CY and PY rollups ('Is <Rollup Element Name>' = Y we are able to significantly simplify the TI process that updates the time period groupings: First, the TI removes the components (immediate children) of the elements with 'Is CY and PY Rollup' = Y, then it attaches all elements with Attribute 'Is <Rollup Element Name>' = Y to <Rollup Element Name> (with weight 1).

- The process leverages Time Period dimension attribute values (derived via Time Period dimension attribute rules '}ElementAttributes_Time Period.rux') to rebuild the Month, Quarters, and Year Group rollups based on the current month as entered in cube 'SYS_IBM_Control', parameter 'Current Month'_=> to update the Time Period dimension rollups to a new month, enter the current month in the control cube and then run the process.

- % variances need to be calculated via rule but do not need to be fed as the % variance is 'fed' via hierarchy rollup

3) Will run sub-process 'Manage Dimension - Time Period - Update Alias Names.pro' to update time period element alias names 'Calendar Period', 'Fiscal period', 'Calendar Period Name':

Time Period	Calendar Period Name	Calendar Period	Fiscal Period
-- ALL_MONTHS			
+ 2012	2012 F	2012 F	2012 F
-- 2013	2013 F	2013 F	2013 F
-- 20131	2013 Quarter 2 C	2013 Q2 C	2013 Q1
201301	2013 Apr	201304 C	201301
201302	2013 May	201305 C	201302
201303	2013 Jun	201306 C	201303
-- 20132	2013 Quarter 3 C	2013 Q3 C	2013 Q2
201304	2013 Jul	201307 C	201304
201305	2013 Aug	201308 C	201305
201306	2013 Sep	201309 C	201306
-- 20133	2013 Quarter 4 C	2013 Q4 C	2013 Q3
201307	2013 Oct	201310 C	201307
201308	2013 Nov	201311 C	201308
201309	2013 Dec	201312 C	201309
-- 20134	2014 Quarter 1 C	2014 Q1 C	2013 Q4
201310	2014 Jan	201401 C	201310
201311	2014 Feb	201402 C	201311
201312	2014 Mar	201403 C	201312
+ 2014	2014 F	2014 F	2014 F
+ 2015	2015 F	2015 F	2015 F
+ 2016	2016 F	2016 F	2016 F
+ 2017	2017 F	2017 F	2017 F

Cube Viewer: TimeDimensionTemplate->}ElementAttributes_Time Period->Default

File   Edit   View   Options   Help

Default   [Base]

}ElementAttributes_Time Period

4) If pYear <> '' and pAddCalendarYear = Y, will run sub-process 'Manage Dimension - Time Period - Create Calendar Year Rollups.pro' to create corresponding calendar year rollups:

-- CALENDAR_ROLLUP			
-- 2013 Calendar			
-- 20124	2013 Quarter 1 C	2013 Q1 C	2012 Q4
201210	2013 Jan	201301 C	201210
201211	2013 Feb	201302 C	201211
201212	2013 Mar	201303 C	201212
-- 20131	2013 Quarter 2 C	2013 Q2 C	2013 Q1
201301	2013 Apr	201304 C	201301
201302	2013 May	201305 C	201302
201303	2013 Jun	201306 C	201303
-- 20132	2013 Quarter 3 C	2013 Q3 C	2013 Q2
201304	2013 Jul	201307 C	201304
201305	2013 Aug	201308 C	201305
201306	2013 Sep	201309 C	201306
-- 20133	2013 Quarter 4 C	2013 Q4 C	2013 Q3
201307	2013 Oct	201310 C	201307
201308	2013 Nov	201311 C	201308
201309	2013 Dec	201312 C	201309

4. Time Period dimension attribute rules

`}ElementAttributes Time Period.rux`:There are various attribute rules in place for the Time Period dimension that will calculate attribute values. The following attributes are calculated by Rule:

- 'Calendar Period', 'Fiscal period', 'Calendar Period Name': Time Period Alias; <u>not calculated</u> (Alias Names are to be processed by TI); processed via '<u>Manage Dimension - Time Period - Update Alias Names.pro</u>'. TI process leverages calculated attributes 'Calendar Month Name', 'Calendar Period Text', 'Fiscal Period Text'.

- 'First Day of Calendar Month Serial Date' & 'Last Day of Calendar Month Serial Date': Serial Date format for time calculations; calculated

- 'First Day of Calendar Month' & 'Last Day of Calendar Month': Date format; calculated

- 'Next Calendar Period' & 'Prior Calendar Period': Next Cal Month & Prior Cal Month. Attribute value is calculated.

- 'Fiscal Period Text': Fiscal Period text Attribute, used to derive/build Fiscal Period Alias in TI '<u>Manage Dimension – Time Period – update Alias Names.pro'.</u> Attribute value is calculated.

- 'Calendar Period Text': Calendar Period text Attribute, used to derive/build Calendar Period Alias in TI '<u>Manage Dimension – Time Period – update Alias Names.pro'.</u> Attribute value is calculated.

- 'Fiscal Year', 'Fiscal Month', 'Calendar Year', 'Calendar Month': calculated

- 'Calendar Month Name': calculated

- 'EOP Calculation Month Non-Actuals': for C-Level Time Periods, the N-Level Time Period to use for End-if-Period (EOP) calculations. For Non-Actuals, the EOP calc. month is always the last month (Quarters or YTD rollup) or last quarter (for Years). Attribute value is calculated based on SYS_IBM_Control cube values. Attribute value is calculated.

- 'EOP Calculation Month': for C-Level Time Periods, the N-Level Time Period to use for EOP calculations. For Actuals, the EOP calc. month is always the last month of the period unless the month is not an actualized period in which case the current Actuals period is the EOP calc. month.[1] Attribute value is calculated.

- 'Is CY and PY Rollup': Determines which rollups need to be refreshed by Manage Dimension - Time Period - Update CY and PY Rollups.pro'; calculated

- 'Is Prior YTD': flags months that are Prior YTD months with a Y; calculated based on SYS_IBM_Control cube entries

- 'Is YTD': flags months that are Current YTD months with a Y; calculated based on SYS_IBM_Control cube entries

- 'Is Same QTD Prior Year': flags months that are 'Same QTD PY' with a Y; calculated based on SYS_IBM_Control cube entries

- 'Is Prior QTD': flags months that are Prior QTD with a Y; calculated based on SYS_IBM_Control cube entries

- 'Is QTD': flags months that are Current QTD with a Y; calculated based on SYS_IBM_Control cube entries

- 'Is Same Month Prior Year': flags the month that is the same Month PY with a Y; calculated based on Current Month in SYS IBM Control cube.

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[1] Actualization of a month is determined via attribute 'monthset'. If the value for 'monthset' is = 1, the period is considered 'actualized'.

- 'Is Prior Month': flags the Prior Month with a Y; calculated based on Current Month in SYS IBM Control cube.

- 'Is Current Month': flags the Current Month with a Y; calculated based on value in SYS_IBM_Control cube

- 'NumOfDays': number of days in a fiscal period; calculated

- 'TotalDays': number of YTD (cumulative) days up to fiscal period; calculated

- 'monthset': calculated; the attribute monthset is set to 1 (per rule) for all periods <= the current month[2]

- 'TotalNumOfDays': The 'monthset', 'NumOfDays' attribute values are used to derive the attribute value for TotalNumOfDays for Level 1 Consolidations; The 'TotalNumOfDays' attribute values for level 1 Time Period Consolidations are used to derive the attribute value for TotalNumOfDays for Level >1 Consolidations.[3] Attribute value is calculated.

Notes:
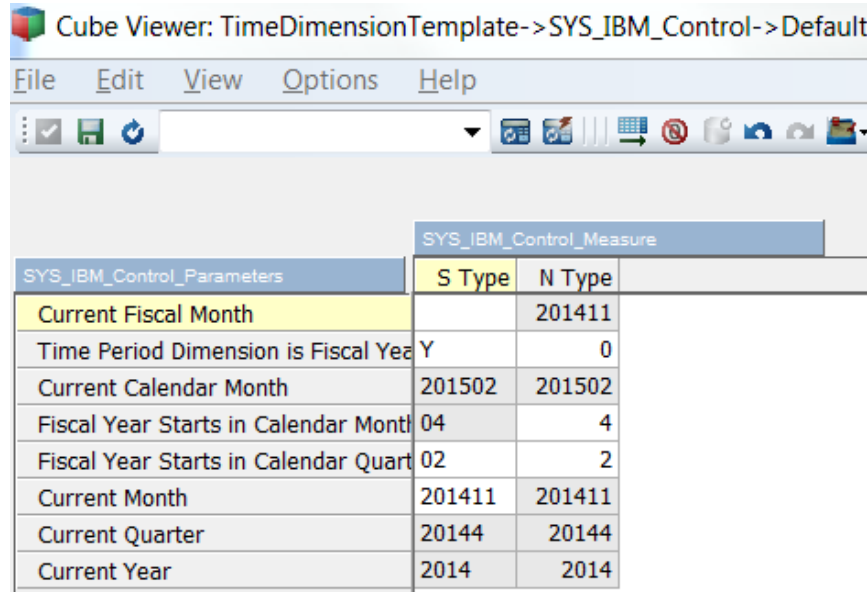
    (a) the current month is determined as per current month value in control cube 'SYS_IBM_Control.cub' (see below) and is used by attribute rules to determine months that are part of a CY and PY rollup.

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[2] The monthset attribute values can also be as a dynamic variable in AVG calculations in that the monthset attribute value indicates per multiplier (monthset attribute value = 1 or 0) if a particular month is to be included in an average calculation. Example rule: (AVG = Month1 $ * Month1 MonthSetValue + Month2 $ * Month2 MonthSetValue + …) / …

[3] Currently, the TotalNumOfDays calculations support C-Level Time Periods with up to 13 Descendants

5. System Control Cube Entries

The following entries in control cube 'SYS_IBM_Control.cub' are leveraged for time period dimension maintenance:

Cube Viewer: TimeDimensionTemplate->SYS_IBM_Control->Default

SYS_IBM_Control_Parameters	S Type	N Type
Current Fiscal Month		201411
Time Period Dimension is Fiscal Yea	Y	0
Current Calendar Month	201502	201502
Fiscal Year Starts in Calendar Montl	04	4
Fiscal Year Starts in Calendar Quart	02	2
Current Month	201411	201411
Current Quarter	20144	20144
Current Year	2014	2014

- **Time Period Dimension is Fiscal Year Based**: Y/N (if Y, determines that an element with value YYYYMM is interpreted as a fiscal period)

- **Current Month, Current Quarter, Current Year**: used for Time Period maintenance and other processes and rules to determine the current Month, Quarter, Year. Input into Current Month; current QTR and Yr are automatically calculated:

  - **Current Month**: current month (= Fiscal Month IF **Time Period Dimension is Fiscal Year Based = Y**); INPUT
  - **Current Calendar Month**: calculation (based on Current Fiscal Month)
  - **Current Fiscal Month**: calculation; derived from 'Current Month' input; is = Current Month if Time Period Dimension is Fiscal Year Based = Y
  - **Current Quarter**: calculation (derived from Current Month); = Fiscal Qtr IF **Time Period Dimension is Fiscal Year Based = Y**
  - **Current Year**: calculation (derived from Current Month); = Fiscal Year IF **Time Period Dimension is Fiscal Year Based = Y**

- **Fiscal Year Starts in Calendar Month**: INPUT
- **Fiscal Year Starts in Calendar Quarter**: INPUT

6. Appendix

6.1   Time Period Dimension Design Template

Under the following link one may download a zip archive containing a time period dimension, time period attributes & attribute values, TI processes, Control cube as outlined in this document: https://ibm.box.com/s/xd079tqhk0gudo0fxn67s6thet4hutsx

6.2   Sample Variance % and EOP calculation rules

```
['Actuals',{'201401 YTD','201402 YTD',...,'20141','20142',...,'YTD','Prior YTD','2014-YTD','2014',...,'201401 QTD','201402 QTD',...}] = C:
        IF ( ATTRS ('<AccountDimension>', !<AccountDimension>, 'Type')@= 'EOP',
                DB(...,ATTRS('Time Period',!Time Period,'EOP Calculation Month'),... ),
                continue);
[{'201401 YTD','201402 YTD',...,'20141','20142',...,'YTD','Prior YTD','2014-YTD','2014',...,'201401 QTD','201402 QTD',...}] = C:
        IF ( ATTRS ('<AccountDimension>', !<AccountDimension>, 'Type')@= 'EOP',
                DB(...,ATTRS('Time Period',!Time Period,'EOP Calculation Month Non-Actuals'),... ),
                continue);
[{'QTD Variance','Prior Year QTD Variance','YTD Variance','201401 YTD Variance','201402 YTD Variance',...}]= C:
        CONSOLIDATECHILDREN('Time');
['Prior Month Variance (%)'] = C:
        (['Current Month']-['Prior Month'])\['Current Month'];
['Prior Year Variance (%)'] = C:
        ( DB (...,ELCOMP ('Time Period','Prior Year Variance',1), ...)
        - DB (...,ELCOMP ('Time Period','Prior Year Variance',2), ...) )
        \ DB (...,ELCOMP ('Time Period','Prior Year Variance',1), ...);
['QTD Variance (%)'] = C:
        ['QTD Variance']\['QTD'];
['Prior Year QTD Variance (%)'] = C:
        ['Prior Year QTD Variance']\['QTD'];
['YTD Variance (%)'] = C:
        (['YTD']-['Prior YTD'])\['YTD'];
```

(no feeders)

6.3   Sample AVG calculation rules

```
[{'201401 YTD','201402 YTD',...,'20141','20142,...,'YTD','Prior YTD','2014-YTD',...}]= C:
        IF ( ATTRS ('<AccountDimension>', !<AccountDimension>, 'Type') @= 'AVG',
                IF( ELCOMPN ('Time Period',!Time Period )=1,
                        IF ( !Version @= 'Actuals',
                                DB(...,ELCOMP('Time Period',!Time Period,1),...)
                                * NUMBR ( ATTRS ('Time Period',ELCOMP('Time Period',!Time Period,1),'monthset')),
                        DB(...ELCOMP('Time Period',!Time Period,1),...)),
                IF( ELCOMPN ('Time Period',!Time Period )=2,
                        IF ( !Version @= 'Actuals',
                                ( DB(...,ELCOMP('Time Period',!Time Period,1),...)
                                        * NUMBR ( ATTRS ('Time Period',ELCOMP ('Time Period',!Time Period,1),'numofdays'))
                                        * NUMBR ( ATTRS ('Time Period',ELCOMP('Time Period',!Time Period,1),'monthset')
                                + DB(...,ELCOMP('Time Period',!Time Period,2),...)
                                        * NUMBR ( ATTRS ('Time Period',ELCOMP ('Time Period',!Time Period,2),'numofdays')
                                        * NUMBR ( ATTRS ('Time Period',ELCOMP('Time Period',!Time Period,2),'monthset'))
                                \ NUMBR ( ATTRS ('Time Period',!Time Period,'totalnumofdays')),
                                ( DB(...,ELCOMP('Time Period',!Time Period,1),...)
                                        * NUMBR ( ATTRS ('Time Period',ELCOMP ('Time Period',!Time Period,1),'numofdays'))
                                + DB(...,ELCOMP('Time Period',!Time Period,2),...)
                                        * NUMBR ( ATTRS ('Time Period',ELCOMP ('Time Period',!Time Period,2),'numofdays')))
                                \ ATTRN ('Time Period',!Time Period,'totaldays'),
                ... (for months 3-12)

[{'2014',...}]=c:
        IF ( ATTRS ('<AccountDimension>', !<AccountDimension>, 'Type') @= 'AVG',
                IF ( !Version @= 'Actual',
                        ( DB(..., ELCOMP ('Time Period',!Time Period | '-YTD', 1 ),...)
                                * ATTRS ('Time Period', ELCOMP ('Time Period',!Time Period | '-YTD',1),'numofdays')
                                * ATTRS ('Time Period', ELCOMP ('Time Period',!Time  Period| '-YTD',1),'monthset')
                        + DB(..., ELCOMP ('Time Period',!Time Period | '-YTD', 2 ),...)
                                * NUMBR ( ATTRS ('Time Period', ELCOMP ('Time Period',!Time Period | '-YTD',2),'numofdays'))
                                * NUMBR ( ATTRS ('Time Period', ELCOMP ('Time Period',!Time  Period| '-YTD',2),'monthset'))
                        + ...)
                        \ NUMBR ( ATTRS ('Time Period',!Time Period,'totalnumofdays')),
                        ( DB(..., ELCOMP ('Time Period',!Time Period | '-YTD', 1 ),...)
                                * NUMBR ( ATTRS ('Time Period', ELCOMP ('Time Period',!Time Period | '-YTD',1),'numofdays'))
```

```
                              +  DB(…, ELCOMP ('Time Period',!Time Period | '-YTD', 2 ),…)
                                        * NUMBR ( ATTRS ('Time Period', ELCOMP ('Time Period',!Time Period | '-YTD',2),'numofdays'))
                              + …)
                              \ NUMBR ( ATTRS ('Time Period',!Time Period,'totaldays')),
                    continue);

[{'201401 QTD','201402 QTD',…}] = C:
          IF ( ATTRS ('<AccountDimension>', !<AccountDimension>, 'Type') @= 'AVG',
                    IF ( ELCOMPN ('Time Period',!Time Period )=1,
                              DB(…,ELCOMP ('Time Period',!Time Period,1),…)*
                                        NUMBR ( ATTRS ('Time Period',ELCOMP('Time Period',!Time Period,1),'monthset')),
                    IF( ELCOMPN ('Time Period',!Time Period )=2,
                              (DB(…,ELCOMP('Time Period',!Time Period,1),…)
                                        * NUMBR ( ATTRS ('Time Period',ELCOMP('Time Period',!Time Period,1),'numofdays'))
                                        * NUMBR ( ATTRS ('Time Period',ELCOMP('Time Period',!Time Period,1),'monthset'))
                              + DB(…,ELCOMP('Time Period',!Time Period,2),…)
                                        * NUMBR ( ATTRS ('Time Period',ELCOMP('Time Period',!Time Period,2),'numofdays'))
                                        * NUMBR ( ATTRS ('Time Period',ELCOMP('Time Period',!Time Period,2),'monthset'))
                              + … )
                              \ ATTRN ('Time Period',!Time Period,'totalnumofdays'),
…;

(no feeders)
```