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Using SAS Enterprise Guide As a Powerful Regulating Weapon

Xing Guo, China Banking Regulatory Commission, Beijing, P.R.China
Guangzhi Zhang, China Banking Regulatory Commission, Beijing, P.R.China
Olivia Wang, SAS China, Beijing

ABSTRACT

The ability to manipulate and analyze data from different banks in an effective manner is a big challenge for banking regulator. The purpose of this paper is to introduce how SAS Enterprise Guide and a powerful Enterprise Guide indicator calculation plug-in can help auditors to meet their complex regulating requirements especially data import from different databases and complex indicator calculation.

With some customization efforts from SAS consultants, SAS Enterprise Guide become a powerful regulating analysis weapon, and it meets our ever changing regulating analysis requirements no matter how data is structured and how we need to manipulate it. This paper provides a detailed introduction on how we import data and define indicators through Enterprise Guide in an innovative way.

INTRODUCTION

One of the main functions of China Banking Regulatory Commission is to conduct on-site examination and off-site surveillance of the banking institutions and take enforcement actions against rule-breaking behaviors.

From 2008, SAS was introduced to CBRC in on-site/off-site regulating area. Due to the different objective of our regulating projects, our requirements of data extraction and data manipulation changes all the time. A flexible and extensible platform which can help us collect and analyze data from all banking institutions gave rise to higher requirement.

With SAS, we now can collect all kinds of data from different banks no matter what format it is, and we can define complex indicators by ourselves based on individual bank's regulating objective and get the calculation result almost in real-time without IT development. SAS Enterprise Guide is the powerful front end tool which provide us the agility in enhancing supervision and risk monitoring.

This paper is divided into two sections:

1. Use SAS Enterprise Guide 4.3 to load data from different data sources (third party DBMS and flat file) in a more effective way. This section will introduce our data import requirements and challenges, our data import design method and the Enterprise Guide data import project flow.
2. How SAS Enterprise Guide 4.3 calculation plug-in can meet complex indicator calculation requirements. This section will introduce our indicator calculation requirements and challenges, what is Enterprise Guide calculation plug-in, how to use Enterprise Guide calculation plug-in to define and calculate the indicators, how SAS Enterprise Guide functions are used in indicator definition.

DATA IMPORT**DATA IMPORT CHALLENGES**

The data import challenges we are facing is the data we required is from different banks in different format: DB2, Oracle, SQL Server, flat file etc. And due to different Regulating project's objective, the data we need is also different, from general ledger to customer profile to transaction. To meet with this ever changing data collection requirement, we designed a flexible data loading project based on Enterprise Guide 4.3. This makes our data collection job very flexible and effective.

DATA IMPORT PROJECT FLOW

To meet with our ever changing data collection requirements, we developed an Enterprise Guide project to the data import, the whole ETL process contains 5 steps:

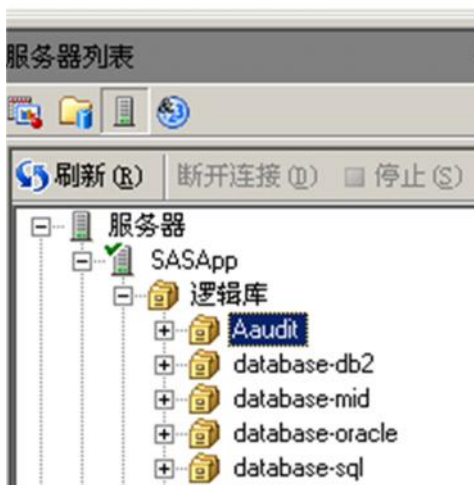
1. Use spreadsheet to maintain our ETL requirements (ETL metadata)

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Source_Table	Target_Table	Table_Description	Column_Name	Column_Label	Format	Transformation
General Ledger	General Ledger	月总帐	orgno	机构代码		
General Ledger	General Ledger	月总帐	acc	币别		
General Ledger	General Ledger	月总帐	item	科目代码		
General Ledger	General Ledger	月总帐	mDATE	日期	yymmdd10.	datepart(mdate)
General Ledger	General Ledger	月总帐	v1	期初借方余额	comma21.2	
General Ledger	General Ledger	月总帐	v2	期初贷方余额		
General Ledger	General Ledger	月总帐	v3	本期借方发生额		
General Ledger	General Ledger	月总帐	v4	本期贷方发生额		
General Ledger	General Ledger	月总帐	v5	期末借方余额		
General Ledger	General Ledger	月总帐	v6	期末贷方余额		
CICIFC11	Customer Info	对公客户信息主档	cicif_ll	表长度		
CICIFC11	Customer Info	对公客户信息主档	ci_cust_no	客户编号		
CICIFC11	Customer Info	对公客户信息主档	cicif_db_timestamp	时间戳		
CICIFC11	Customer Info	对公客户信息主档	ci_cust_typ	客户类别		
CICIFC11	Customer Info	对公客户信息主档	ci_chn_name	中文名称		
CICIFC11	Customer Info	对公客户信息主档	ci_reg_birdy	注册/出生日期	yymmdd10.	

- Source_Table: Souce Table name
- Target_Table: Target Table name, if we would like to rename it , we define our expected table name here
- Table_Description: This will be the SAS table label in our system
- Column_Name: The required column from source table
- Column_Label: This will add Chinese label to each column in our system
- Format: The expected data format
- Transformation: The data transformations functions we use in our data loading, such as datepart().

2. Define the source libraries in SAS Management Console (DB2, Oracle, SQL Server)



3. Import the data loading metadata spreadsheet from Enterprise Guide 4.3 by using "Import Data" Wizard

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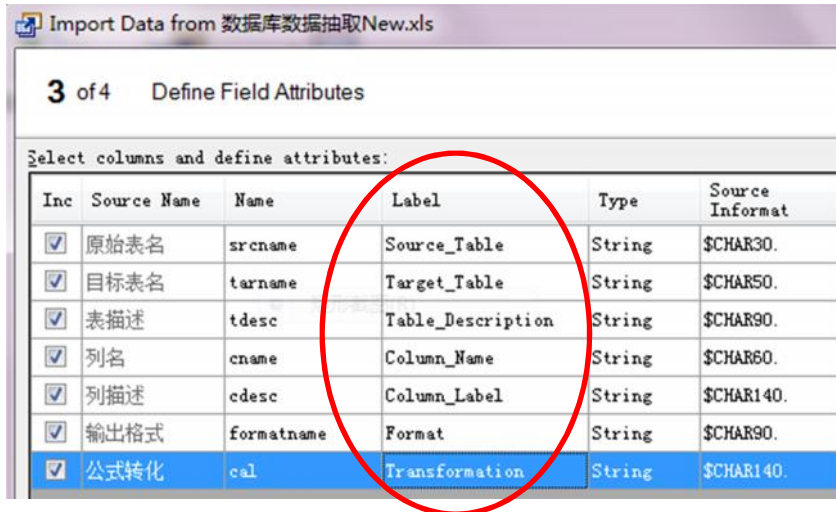
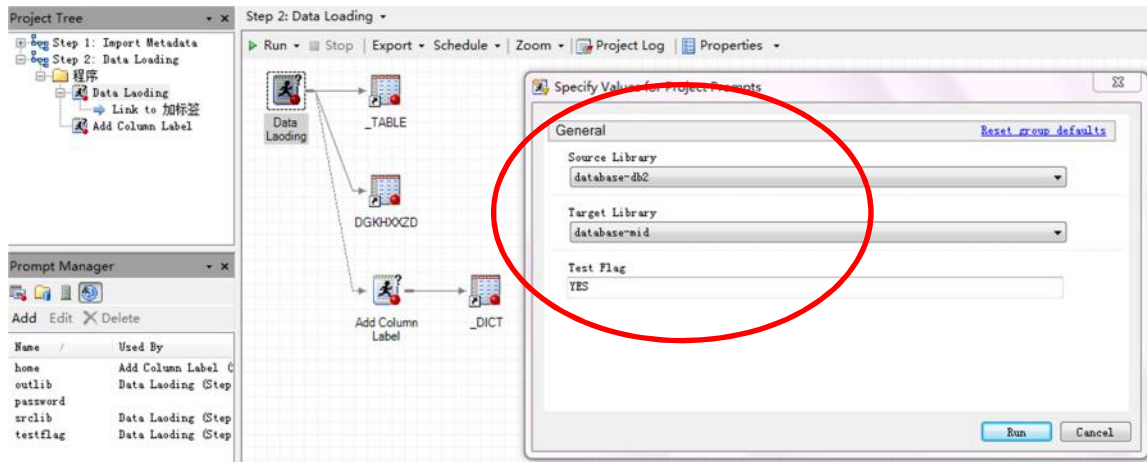


Figure 3. Loading Metadata from Spreadsheet

4. Execute data loading code from Enterprise Guide with prompt
 - Source Library: Data Source defined in SAS Management Console
 - Target Library: Data loading target library defined in SAS Management Console
 - Test Flag: When set to "YES", we will extract 10 records from source table to test the result first.



RISK MONITORING

RISK MONITORING CHALLENGES

We had defined a series of monitoring indicators which can help us to identify the overall risks of each financial institution. These indicators are calculated based on financial institution's general ledger, balance sheet, income statement, cash flows statement and risk management reports, since different institution has different report structure, and each institution changes their report structure frequently each year (such as chart of account of general ledger changes every year), the calculation formula of our monitoring indicators have to be changed frequently, to reduce the developing effort of IT departments and generate monitoring indicator results quickly based on the changes, with SAS China's help, we developed an Enterprise Guide plug-in to help us define, modify and calculate

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the indicators by ourselves, no matter how business rule changes, we can define and modify our indicator accordingly without IT development efforts, and get the result quickly.

INDICATOR DEFINITION REQUIREMENT

We had defined 100+ indicators based on financial institution's general ledger, balance sheet, income statement, cash flows statement and risk management reports. Below are samples of our monitoring indicator formulas based on general ledger:

I_1	Indicator 1	$I_1 = C5600 + C5610$
I_2	Indicator 2	$I_2 = [D5730 - C5730] + [(D5680 + D5690) - (C5680 + C5690)] + [(D5710 + D5720) - (C5710 + C5720)] + [D5210 - C5210] + [D7210 - C7210] + [D5050 - C5050]$
I_3	Indicator 3	$I_3 = (D1110 + D1115 + D1120 + D117010 - C217020) / D11901$

Note:

D=Debits balance in general ledger; C=Credits balance in general ledger;

D1110 = Credits balance of account code =1110 (Cash) in general ledger;

C5600 = debits balance of account code = 5600 (Settlement Revenue) in general ledger

Below is the sample general ledger structure :

Account Name	Account Code	Debits	Credits
Asset			
Cash	1110	233,677,533.51	0.00
Undeposited Cash	1115	233,200,579.86	0.00
Industrial liquidity loans	1230	35,792,291.55	0.00
Agricultural liquidity loans	1231	158,411,064.69	0.00
Real estate liquidity loans	1232	14,520,000.00	0.00
Liability			
Security Deposits	2000	0.00	327,346,230.24
Other Payables	2710	0.00	37,554,025.05
Equity			
Intra Settlement	3150	128,537,105.26	12,367,234.82
FX Settlement	3163	307,853,994.25	212,795.92
Revenues			
Settlement Revenue	5600		921,169.21
Credit Card Revenue	5610		2,575,762.92

From our indicator sample and general ledger structure, you may find out, our indicators are not simple column level calculations, but also **CELL level calculations**. Normally, these kind of indicators are calculated by IT developing efforts based on our requirements, but due to the frequent changes of "chart of accounts", "reporting items" and business rules, we need to define and modify the indicators by ourselves and get the result quickly without tedious developing efforts. With SAS China's help, a fantastic Enterprise Guide plug-in called "indicator calculation" can meet all our requirements.

INDICATOR DEFINITION METHODOLOGY

In order to have flexible and extensible indicator formula definition function, we split every complex indicator into elements, For example

Indicator Code	Indicator Name	Indicator Formula
I_1	Indicator 1	$C5600 + C5610$

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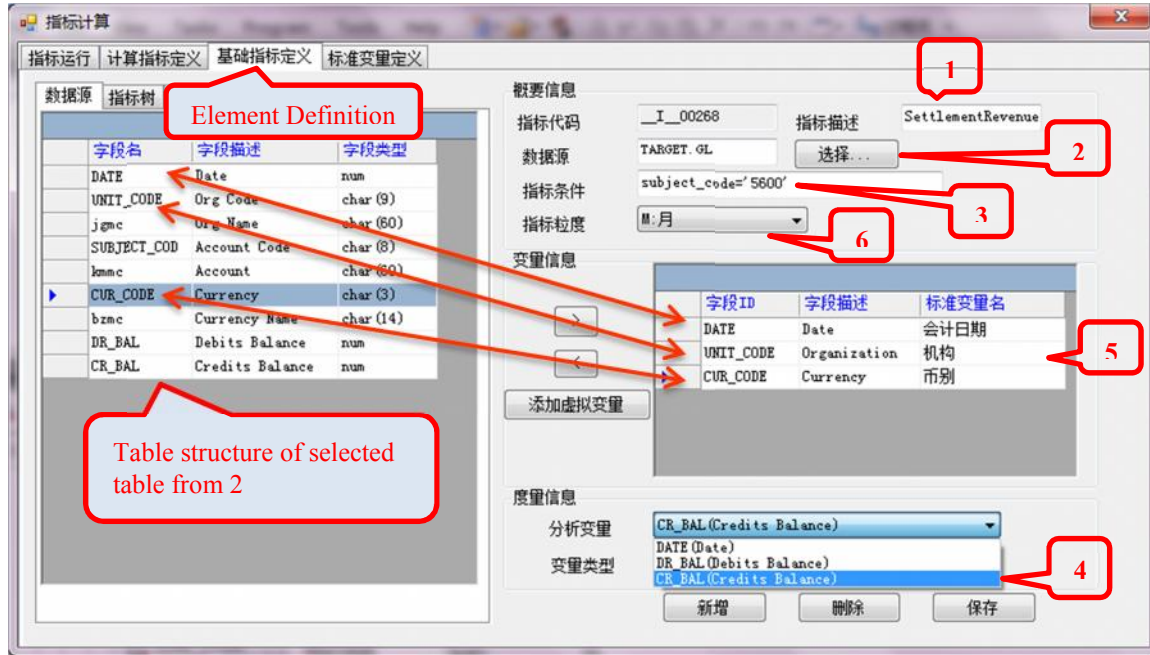
In above sample, "Indicator 1" consists of two elements : C5600 and C5610. So, we need two steps to define an indicator formula:

Step 1: Define Formula Elements. In this sample, we need to define C5600 (Settlement Revenue) and C5610 (Credit Card Revenue) separately.

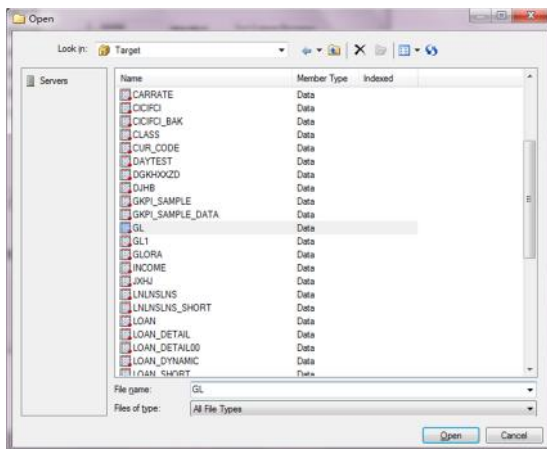
Step 2: Define indicator formula . In this sample, we define " I_1= C5600 + C5610".

STEP 1: ELEMENT DEFINITION

This is the formula element definition screen, in this example, we showed how to define C5600 .



1. Element name: Settlement Revenue
2. Choose Element 's base table from SAS server, we can choose any table in the SAS Server, in this example, we choose table "GL(General Ledger)" table from "Target" library.



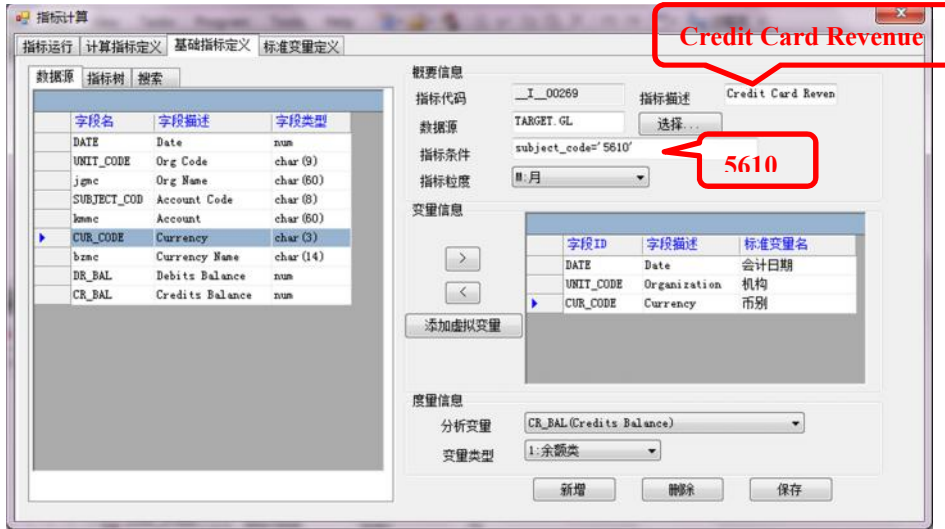
After choose the "GL" table from "Target" library, the general ledger table structure appears on the left panel .

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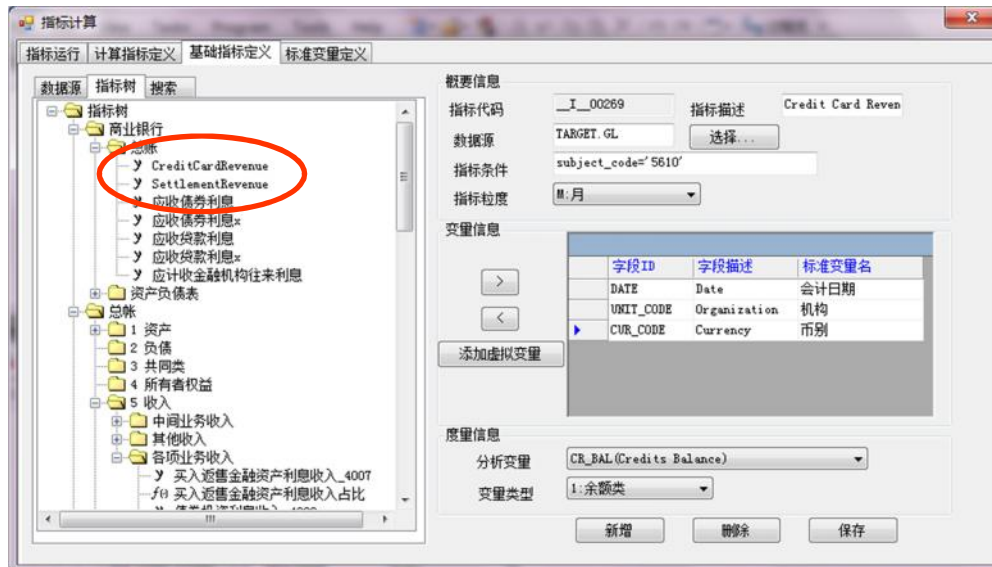
3. Element row definition: from row level, we defined subject_code(Account Code)='5600'
4. Element column definition: from column level, we defined column "Credits Balance"
5. Element dimension definition: drag dimension column from left panel to right to define calculation dimensions such as currency, date, organization.
6. Element granularity: we can choose day, month, quarter or year , since the base table "GL" is monthly general ledger table, we choose "Month".

With above steps, we defined the **CELL** element "**C5600**" (**Settlement Revenue**) we would like to use in indicators and it's calculation dimension.

Repeat step 1-6, we can defined the element "**C5610**" (**Credit Card Revenue**) as well.



From the indicator tree, we can see defined two elements **Settlement Revenue** and **Credit Card Revenue** as below.

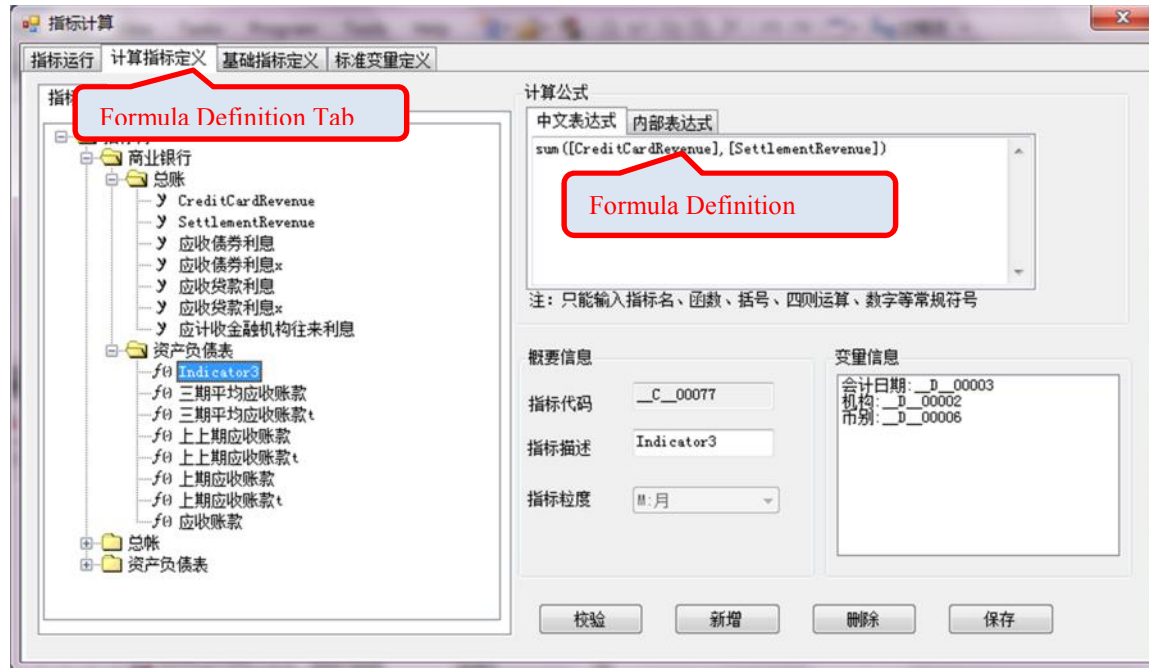


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STEP 2: FORMULA DEFINITION

The second step is to define indicator based on elements , in the “Formula Definition” window, we can use all SAS provided functions, in this example, we defined

Indicator3 = sum([CreditCardRevenue], [SettlementRevenue]) , with SUM() function, we can get right result if one of the element is null.



INDICATOR DEFINITION EXAMPLE

We also defined our own function **PrevPeriod()** to get previous period result, combine with SAS provided functions, we can define complex indicator based on our own requirements.

Below is the sample of combine our own function and SAS provided function in indicator definition. We need to calculate average of two periods, so we use our own function **PrevPeriod()** , for example, we would like to have Previous Period of Settlement Revenue , so we define :

$Prv_Settlemt_Rev = \text{PrevPeriod}(\text{SettlementRevenue})$

To calculate average of two periods, we define:

$Avg_Settlemt_Rev = \text{Sum}([Prv_Settlemt_Rev], [\text{SettlementRevenue}])/2$

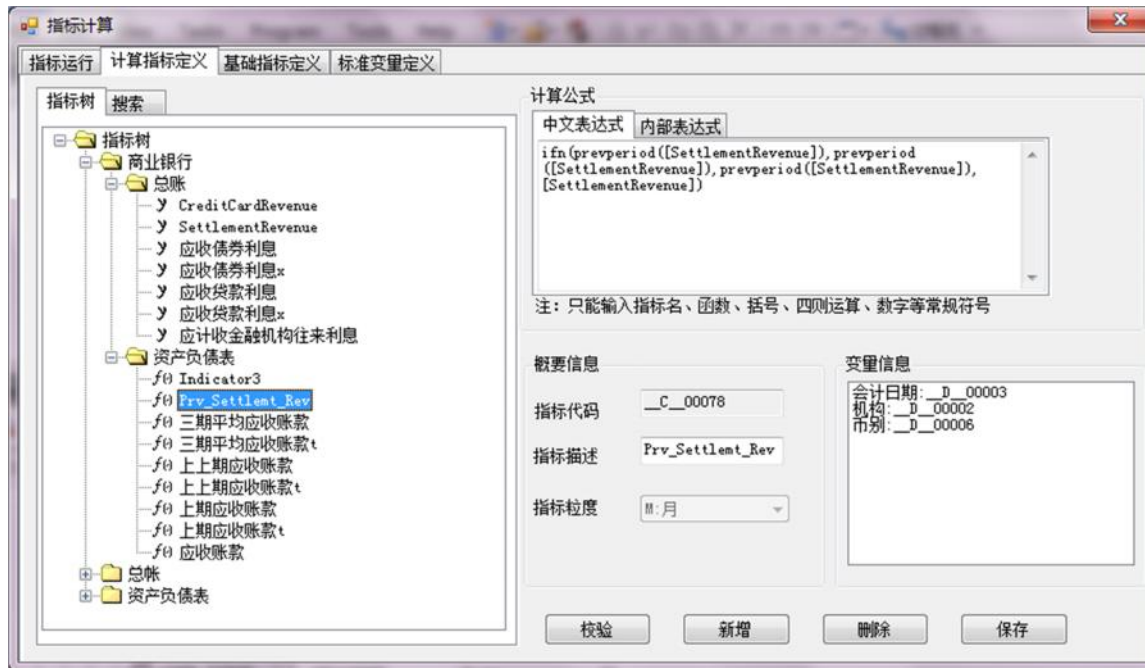
To solve the null data problem when previous period data is missing from the table, we use SAS provided function:

$\text{IFN}(\text{logical-expression}, \text{value-returned-when-true}, \text{value-returned-when-false} <, \text{value-returned-when-missing} >)$

$Prv_Settlemt_Rev = \text{IFN}(\text{PrevPeriod}([\text{SettlementRevenue}]), \text{PrevPeriod}([\text{SettlementRevenue}]), \text{PrevPeriod}([\text{SettlementRevenue}]), [\text{SettlementRevenue}])$

This function enable us to use current period data instead of previous period data when it's missing and get more accurate average result.

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CONCLUSION

Enterprise Guide is a powerful analytical tool which provide powerful functions to support our daily analytical work, with customized SAS code and Enterprise Guide plug-in, we can get data we need and get analytical result almost in real time.

CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author at:

Name: Guangzhi Zhang
 Enterprise: China Banking Regulatory Commission
 Address: Jia N0.15 Financial Street, Xicheng District, Beijing, 100140
 City, State ZIP: Beijing , P.R China
 Work Phone: 8610 - 66278547
 Fax: 8610 - 66299296
 E-mail: zhangguangzhi@cbrc.gov.cn
 Web: <http://www.cbrc.gov.cn/english/index.html>

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