SAS® Capital Planning and Management 2.2
Insurance Framework User's Guide

Contents

C H A P T E R
1

Introduction

Introduction

This document provides an overview of the SAS Capital Planning and Management 2.2 Insurance Framework. For detailed information about the tasks described in this book, see the SAS Financial Management 5.5 documentation, which is available at:

http://support.sas.com/documentation/onlinedoc/fm

Note: The SAS Financial Management product documentation page is password-restricted. You can find the user name and password in the pre-installation checklist, in the Instructions.html file, or by contacting SAS Technical Support at:

http://support.sas.com/techsup

SAS Capital Planning and Management Framework Overview

For the last few years, insurers within the European Union (EU) have been preparing for a new regime from the Solvency II Directive.

The Solvency II framework consists of three main areas (also called pillars):

- **Pillar 1**—addresses the capability of an insurer to prove that it has adequate financial resources in place to meet all of its liabilities. Pillar 1 consists of the quantitative requirements (for example, the amount of capital an insurer should hold).

- **Pillar 2**—sets the requirements for the governance and risk management framework that identify and measure the risk against which capital must be held and specifies the requirements for the effective supervision of insurers

- **Pillar 3**—focuses on disclosure, reporting, and transparency requirements around risks and capital requirements.

Until now the insurers have focused mainly on Pillar 1 (calculation of capital requirement by using a standard or an internal model approach) and Pillar III (mainly regulatory reporting).

Although the deadline for the new regime of the Solvency II Directive has been postponed until January 1, 2016, the European Insurance and Occupational Pensions Authority (EIOPA) expects national authorities to introduce a preparatory phase. One of the requirements of the preparatory phase is that insurers must perform a Forward Looking Assessment of Own Risk (FLAOR) beginning by January 1, 2014. Consequently, FLAOR reporting periods are expected in most countries at the beginning of 2015.

FLAOR is expected to be performed by the insurers who represent at least 80% of the market share within each country.

In September 2013, the EIOPA published guidelines for FLAOR, which has been adopted by most national authorities. In June 2014, EIOPA also published the *Consultation Paper on the Proposal for Guidelines on System of Governance and Own Risks and Solvency Assessment*. This consultation paper provides an update on the final regime requirements, which are scheduled to begin in January 2016.

It is not the purpose of this document to explain the scope of FLAOR in detail. However, Figure 1 does provide a high-level overview of FLAOR.

Figure 1-1 Overview of FLAOR
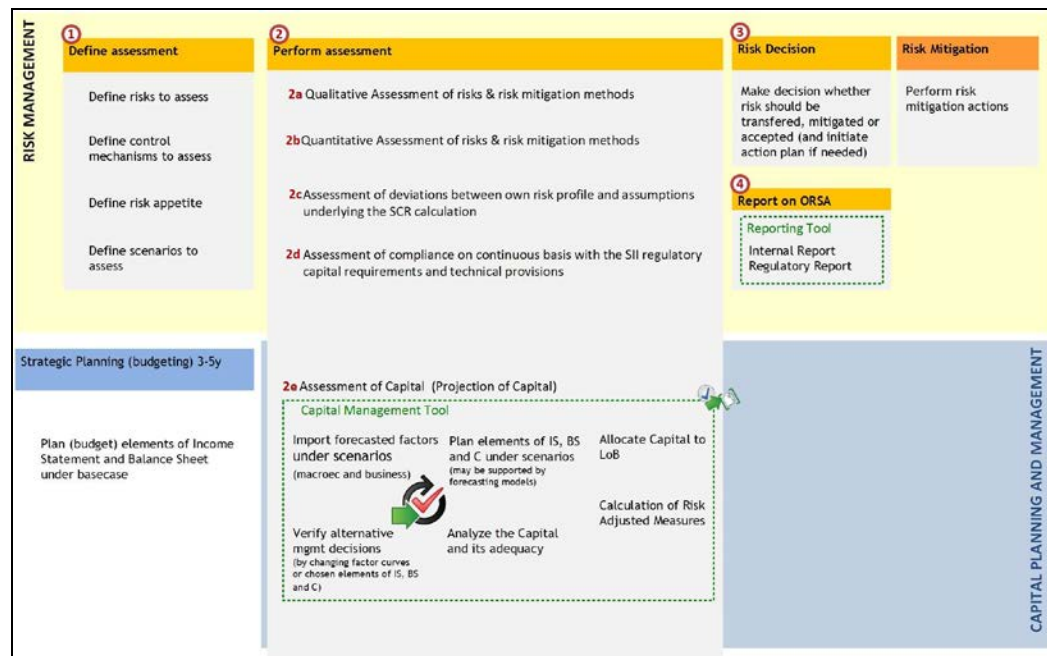
The primary conclusions that an IT vendor should draw from the Solvency II framework guidelines are that:

- An assessment should concern not only risks and risk mitigation methods, but also the assessment of deviation between the own risk profile and assumptions underlying Solvency Capital Requirement (SCR) calculations (performed in Pillar I) and the assessment of capital (based on its projection within planning horizon).

- An assessment of capital requires a strong cooperation between risk management and strategic planning, which is typically performed by a finance department.

- Forward-looking assessment of the risk of an undertaking is also used as means for assessing any major decisions, the material effect on the risk, and the position on own funds.

- It is up to the insurer to decide the reasonable methods, assumptions, parameters, dependencies, and levels of confidence to use in the projections of capital. This means that a standard approach to projection cannot exist.

Note: Regarding qualitative or expert quantitative assessment of risks and methods, together with the initial steps of defining the risks, the final steps of making decisions, and the definition and monitoring of action plans), should be addressed by the SAS Enterprise GRC (governance, risk, and compliance).

SAS assumes that the SAS Capital Planning and Management Insurance Framework focuses only on *capital projections*. Nevertheless, in the case of the small and medium-sized (SME) customer, who cannot afford both solutions (SAS Enterprise GRC and SAS Capital Planning and Management), SAS can offer some basic qualitative assessments by using SAS Capital Planning and Management as well.

The Capital Planning Process

Business requirements determine your capital planning process. This chapter describes how the capital planning process is shaped.

Solvency II requires that a regular Forward Looking Assessment of Own Risks (FLAOR) assessment (formerly known as Own Risk and Solvency Assessment [ORSA] to be performed. The expectation of the FLAOR assessment is that the capital planning process includes the projection of regulatory capital requirements and the own funds over the business planning period, and might include the need to raise more own funds.

After reviewing the elements of FLAOR, one can extrapolate the following list of business requirements:

- The projection of capital requirements and own funds (both quantity and quality) over the business planning period.

- Regular stress tests, reverse stress tests, and scenario stress tests to assess the resilience of the business.

- Business strategy and strategic decisions that influence the risk and regulatory capital requirement must be considered. This means that a simplified model of how management decisions affect risk and the position on own funds must be created. In addition, the model should include a projection of the income statement and the balance sheet.

However, regulators give insurers the freedom to decide what methods, assumptions, parameters, dependencies, and levels of confidence to use in their projections. This freedom results in there being many different approaches to the process. For example, from a deterministic process to a stochastic process, performing precise calculations by using tools provided by Pillar I, proxy methods to enable strategic risk-based decision making, and projections performed on an aggregated or on a detailed level.

Based on customer interviews and analyzing available materials, SAS began business process with a deterministic approach based on proxy functions.

These proxy functions might be defined by using several approaches, including the following:

- Driven by strategic planning, extended with risk elements, and based on expert judgment.

- The results of a curve fitting or of a least squares Monte Carlo (LSMC) approach.

    Note: The LSMC approach is particularly appealing for the projection of Best Estimate (BE) of life liabilities.

SAS chose the first approach, where the business model that is used for projection of capital is defined by using expert formulas, where the elements of the income statement and the balance sheet are somewhat based on formulas that are used in strategic planning. Within the business model, there is an example of using a proxy polynomial function to represent the sensitivity against change in one economic factor.

If the customer is able to calculate the balance sheet and the Solvency Capital Requirement (SCR) (by running Pillar 1 tools for $t=1..n)$, it is possible to upload those values for the base case and use the values as a benchmark for values that are obtained by using proxy formulas.

In addition, in some cases, the calculations for some risks under certain scenarios can be performed by using tools that exist in the IT infrastructure of a customer site and the results uploaded and used as a benchmark. However, it would be a rare case to perform projections for each scenario and for each management decision by using the Pillar I tools.

Figure 1-2 Process for Deterministic Approach to Capital Projections

Step 0	Step 1	Step 2	Step 3	Step 4	Step 5
Define model (risks, factors, formulas)	Prepare input data @t=0	Define scenarios	Define risk appetite	Projection	Analyze alternatives
Define economic factors - ***Equity index chng*** - ***Interest rate curves*** - ***Property index chng*** Define business factors - **Chng in mortality rates** - **Chng in disability rates** - **Chng in pandemics pattern** - **NB Ratio** - **Business mix** - **Expense ratio** - **Assets mix** - .. Define which factors may be used as tool for management Define formulas for projections incorporating the Define forms, reports and processes	*Upload Business Planning: IS,* *Upload SII* ***Balance Sheet*** *Upload* ***SCR*** *and* ***MCR*** *Upload* ***Own Funds***	Define scenarios as time-vectors of values of all risk factors. They can be uploaded as result of external models: - **Econometric models** - **Actuarial models** - **Combined models** Or entered manually. **Result:** Forecasted values of risk factors for each scenario and time period	Define Risk appetite	Project (for each scenario, each time-period): - **Income Statement** - **Balance Sheet** - **SCR, MCR** - **Own Funds**	Test alternative management decisions by changing mgmt decision factors, recalculate and analyze their influence on final measures (SCR_cover ratio)

It is important that risk factors are properly defined. It is also important to determine which of them function as risk factors (the basis for the definition of scenarios) and which of them will function as management decision factors (the basis for analyzing alternative versions of decisions and their influence on risk-adjusted performance). In addition, it is important to note that you should complete the Pillar I calculations before the capital projections because the Pillar 1 number (elements of BS, SCRs, and OF) act as initial input data for capital projections.

Depending on the IT infrastructure of a customer, scenarios can be defined by using several methods, including the following:

- Manually entered by adequate user.

- Uploaded from external tools (for example, the Economic Scenario Generator tool or the Risk Governance system).

- Generated by SAS tools based on econometric models and actuarial models that are defined in SAS Risk Dimensions.

The SAS Capital Planning and Management Insurance Framework supports the first method. The solution provides a predefined, dedicated form-set that enables the adequate user to enter the values of risk factors under each of scenario.

Risk appetite might be defined by using different measures. However, it is important to be able to compare the measures against measures that are calculated based on projected numbers. The basic measure that is being used to define risk appetite is SCR cover ratio (Basic Own Funds [BOF]/SCR).
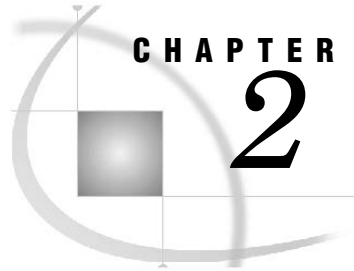
All of the above puts certain requirements on integration of the SAS Capital Planning and Management Insurance Framework solution with those addressing other elements of Solvency II, Strategic Planning, or Business Planning.

Figure 1-3 Possible Integration with Existing Tools in a Customer IT Infrastructure
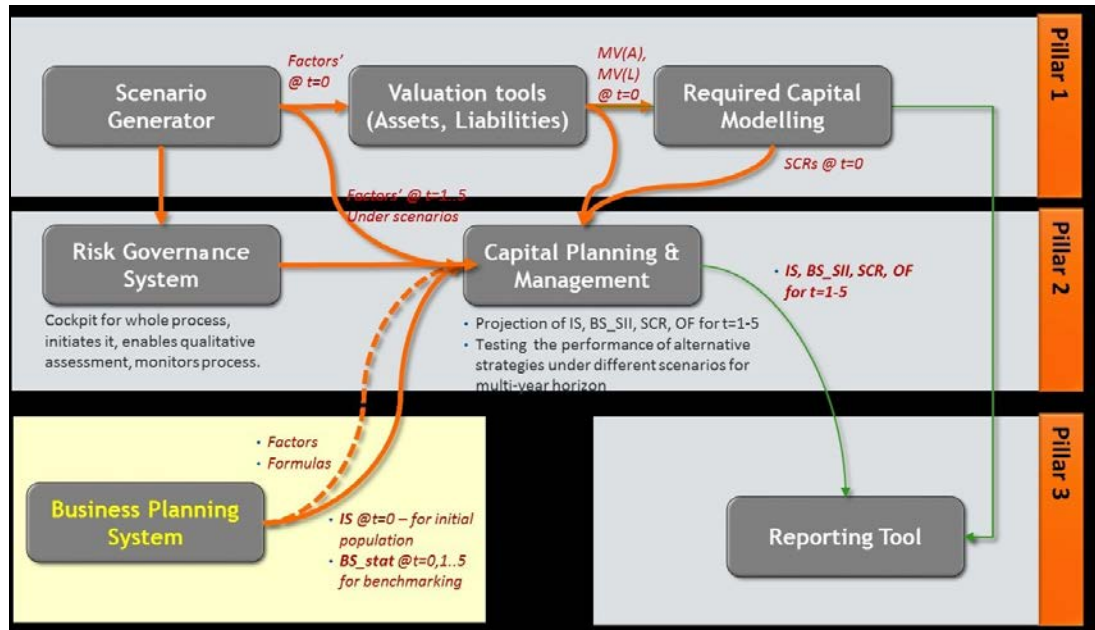
Note that the details of a sample integration might change depending on the elements involved, including the following:

- Customer's IT infrastructure.

- General approach (stochastic versus deterministic).

- Approach to use proxy methods (for example, the integration with regression tools is needed for Curve-Fitting [CF] and Least Squares Monte Carlo [LSMC]).

- Approach to ensuring compliance with Pillar I calculations (upload of BS, SCR, and OF for base-case might be required).

CHAPTER 2

Dimensions

Overview

The SAS Capital Planning and Management Insurance Framework is organized into a single cycle that is named CPnM. The CPnM cycle includes the following dimension types:

Code	Dimension Type	Description
CPnM Account	ACCOUNT	Stores list of elements of income statement, balance sheet, capital requirements, own funds, and other measures (intermediary ones or resulting ones).
CPnM Analysis	ANALYSIS	Differentiates the historic data, real data (ACT), and versions of projections. It is assumed that there is one version without any changes and then several additional versions that represent the outcomes and influence of alternative management decisions.
CPnM LoB	BUSINESS	Represents line of business (LoB). Right now – Solvency II LoBs are defined. The projection of income statement and some elements of BS are performed on the LoB level.
CPnM	CURRENCY	Represents monetary currency.

Code	Dimension Type	Description
Currency		**Note:** SAS Capital Planning and Management 2.2 Insurance Framework does not use this dimension. However, the dimension is included for possible future use when most of the case projections are done in reporting currency.
CPnM FinFund	FINFUND	Represents financial fund. The FinFund dimension is introduced because EIOPA requires that many reports and calculations are performed in division for ring fenced funds and other funds. **Note:** This column is not populated in the SAS Capital Planning and Management 2.2 Insurance Framework.
CPnM Organization	INTORG	Represents the organizational structure of the capital group.
CPnM Misc	MISC	Currently defines the questions of a qualitative assessment.
CPnM Risk	RISK	Currently represents different types of risks and sub risks.
CPnM Scenario	SCENARIO	Enables running projections for different scenarios (for example, regulatory ones and internal ones).
CPnM Time	TIME	Yearly periods. ORSA is expected to be performed annually.
CPnM ValueMeth		Enables you to differentiate between different valuations approaches (for example statutory or Solvency II). All projections are done for "Solvency II Value," but if you upload the values for statutory BS for benchmarking, then they will be differentiated by other members in this dimension ("Statutory" or "IFRS").
Trader		Currently, this is yet a system embedded dimension that will be used within the insurance framework for adequate scoping of formulas.

As seen in the Figure 3-1, each dimension within the SAS Capital Planning and Management Insurance Framework is prefixed with CPnM.

Figure 2-1 SAS Capital Planning and Management Dimensions Workspace
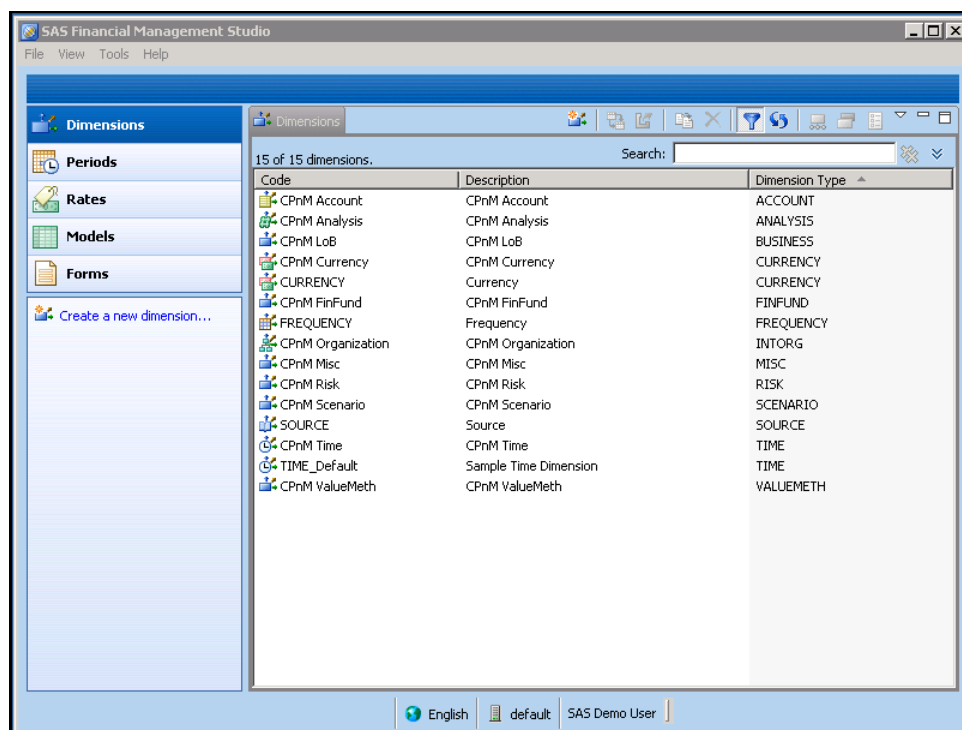
Each of the CPnM dimensions are described in further detail in the following sections of this chapter. In the SAS Capital Planning and Management Insurance Framework, each CPnM dimension is a flat dimension, which means that it has only one hierarchy.

SAS Capital Planning and Management supports the following Solvency II requirements:

- Projection of Capital

- Qualitative Assessment

By using one cycle, the SAS Capital Planning and Management Insurance Framework combines quantitative and qualitative information within one report.

- Projection of capital is done within the following CPnM dimensions:

- Organization

- LoB

- Scenario

- Analysis

- FinFund

- ValueMeth (future)

- Account

- Time
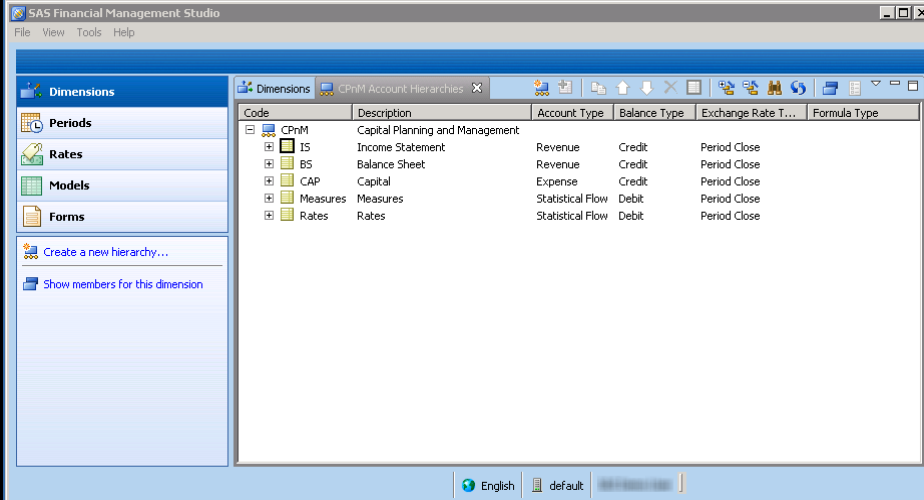
Qualitative assessment is done within:

- Organization

- Risk

- Misc (used for definition of criteria for qualitative assessment)

- Account

- Time

CPnM Account

The CPnM Account dimension comprises the various financial accounts. In addition, the CPnM Account dimension contains the greatest amount of formula logic within the capital planning framework.

Figure 2-2 Account Dimension Members

The Account dimension consists of the following five "sections" of members:

- Income Statement—members are prefixed with "IS"

- Balance Sheet—members are prefixed with "BS"

- Capital—members are prefixed with "C"

- Measures—members are prefixed with "M"

- Rates—members prefixed with "R"

Income Statement Members

Income statement members begin with the prefix "IS."

The structure of accounts differ from country to country. Therefore, when the SAS Capital Planning and Management Insurance Framework is implemented, the list is customized.

Figure 2-3 Income Statement Members

IS	Income Statement
IS_Income	Income
IS_NEP	Net Earned Premium
IS_FeeInc	Fee and commission income
IS_NInvInc	Net investment income
IS_NRGI	Net realized gains (losses) on inve…
IS_IIBLL	Income from investments backing l…
IS_OInc	Other income
IS_SurrCharges	Surrender Charges
IS_ICE	Expenses
IS_NL_LAE	Net Losses and loss adjustment ex…
IS_GL	Claims and movements in insuranc…
IS_CL	Claims and movements in insuranc…
IS_PAE	Policy acquisition and other under…
IS_IntE	Interest expense
IS_AdmExp	Administration Expenses
IS_MILP	Movements in insurance liabilities …
IS_InvExp	Investment Expenses
IS_OthExp	Other Expenses
IS_ITE	Income Tax expense

Balance Sheet Members

Balance sheet members begin with the prefix "BS."

The SAS Capital Planning and Management Insurance Framework incorporates the Solvency II structure of accounts of balance sheet.

Figure 2-4 Balance Sheet Members

BS	Balance Sheet
BS_A	Assets
BS_A_Goodwill	Goodwill
BS_A_DAC	Deferred acquisition costs
BS_A_IntA	Intangible assets
BS_A_DTA	Deferred tax assets
BS_A_PBS	Pension benefit surplus
BS_A_PropOth	Property, plant & equipment held f…
BS_A_Inv	Investments (other than assets fo…
BS_A_UL	Assets held for index-linked and u…
BS_A_Loans	Loans & mortgages
BS_A_ReRec	Reinsurance recoverables from:
BS_A_DepCed	Deposits to cedants
BS_A_InsInt	Insurance & intermediaries receiva…
BS_A_ReReceiv	Reinsurance receivables
BS_A_Receiv	Receivables (trade, not insurance)
BS_A_OS	Own shares
BS_A_OFCalled	Amounts due in respect of own fu…
BS_A_Cash	Cash and cash equivalents
BS_A_Oth	Any other assets, not elsewhere s…
BS_L	Liabilities
BS_L_TP_nl	Technical provisions – non-life
BS_L_TP_l	Technical provisions - life (excludin…
BS_L_OTP	Other technical provisions
BS_L_ContL	Contingent liabilities
BS_L_OthProv	Provisions other than technical pro…
BS_L_PBO	Pension benefit obligations
BS_L_DepoReins	Deposits from reinsurers
BS_L_DTL	Deferred tax liabilities
BS_L_Der	Derivatives
BS_L_D2CI	Debts owed to credit institutions
BS_L_FinLiabOth	Financial liabilities other than debt…
BS_L_IIPayab	Insurance & intermediaries payables
BS_L_ReinsPayab	Reinsurance payables
BS_L_PayabTrade	Payables (trade, not insurance)
BS_L_SubLiab	Subordinated liabilities
BS_L_Oth	Any other liabilities, not elsewhere…

Capital Members

Capital members begin with the prefix "C."

There are two categories of capital account members:

- **Required Capital (C_ReqC)**—contains various formulas that enable a calculation of regulatory capital. Initially, SCR and MCR are calculated by using the standard approach that is specified by Solvency II.
- **Own Funds (C_OF)**—Basic Own Funds (C_BOF) and its classification into tiers.

Figure 2-5 Capital Members

Measures Members

Measures members begin with the prefix "M."

Measure members include a reporting formula to summarize and display various key measures in context of capital planning.

Figure 2-6 Measures Members

There are two categories of measures.

One category is *Risk Appetite* measures (M_RiskApp). Risk Appetite measures are provided by a user or uploaded from an external tool. The other category is *Calculate* measures (M_Calc). Calculated measures are projected measures and are compared to the expected ones.

Rates Member

Rates members being with the prefix "R."

Most rates members are also defined as a driver rate type and exist as an account member for display and override purposes.

Figure 2-7 Rates Members

Rates are grouped by their purpose:

Group	Used for
MgmtRates	List of risk factors used for definition of management decisions
InsRiskFactors	List of insurance risk factors
Returns	Return indexes
Allocations	Rates used for allocation percentages
EcRiskFactors	List of economic risk factors
HelpRates	Rates, measures used as intermediary variables to ease the process of calculations
CapitalRates	Rates used for capital calculations (for proxy methods)
DriverRates	Factors depending on driver rates
QualRates	Used for qualitative assessment

CPnM Account Custom Properties

The Account dimension contains the following custom properties:

CPnM_HeaderOnly—Cosmetic feature property. It is a Boolean property that is set to "true" for account members that should not have any value. These members function as only a header or name of certain group of accounts.

CPnM_ShockRate—Boolean property set to "true" for account members that should be treated as risk factors for which shocks are defined in terms of basis points. This property is assigned to members of dimension "CPnM Account," but it is used within formula scoping rules for members of "CPnM Analysis" and in the "Shocked Index" formula to properly disclose the value of shocked risk factor.

> *Caution*
> As a result of this formula, the SAS Capital Planning and Management Insurance Framework presents expected values in a form-set. In modeling formulas it is important to re-define the entire shock step (cannot refer to the father only).
>
> **For example:**
>
> Account member "R_LapseRatio" has CPnM_ShockRate=True. The "Shocked Index" formula enables it to be presented in form-set equal to R_LapseRatio_Base*(1+R_LapseRatio_Shock). However, in the modeling that uses the lapse ratio, the framework cannot refer to father (R_LapseRatio). Instead, the entire step must be provided as follows: R_LapseRatio_Base*(1+R_LapseRatio_Shock).

CPnM Analysis

The CPnM Analysis dimension identifies the version of the data that is being analyzed.

Figure 2-8 CPnM Analysis Dimension Members
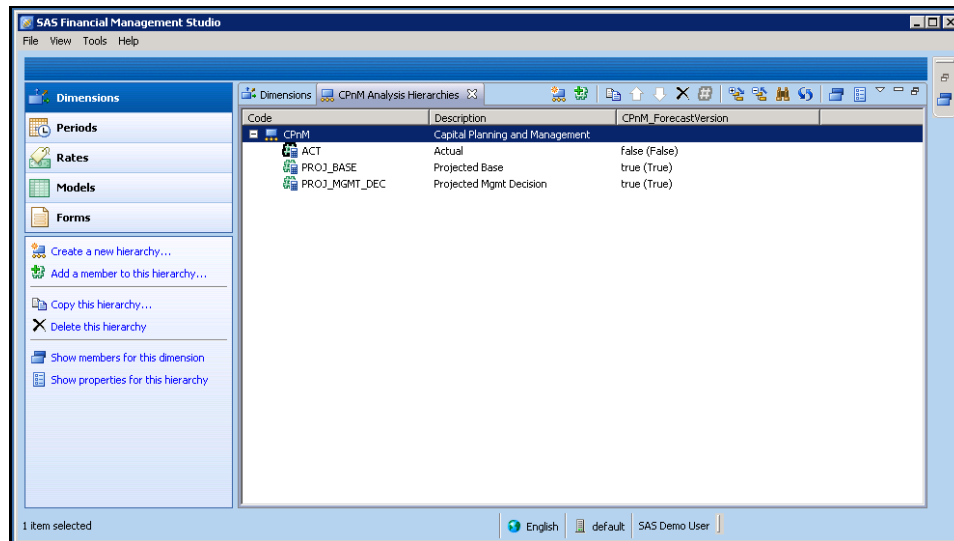
The CPnM Analysis dimension contains the following members:

- **Actual**—Stores the actual values (real values; populated only for historical years).
- **Projected Base**—Stores projected values if no decision or change is taken. The projected base is the result of the "initial analysis" step.
- **Projected Mgmt Decision**—Analysis that is performed after the initial analysis. The results of the "Projected Base" are copied to the "Projected Management Decision" and enable the business users to change the values of factors that represent management decisions. When values are changed, the system performs recalculations and the user can see what effect the management decision had on the risk condition.

CPnM Analysis Custom Properties
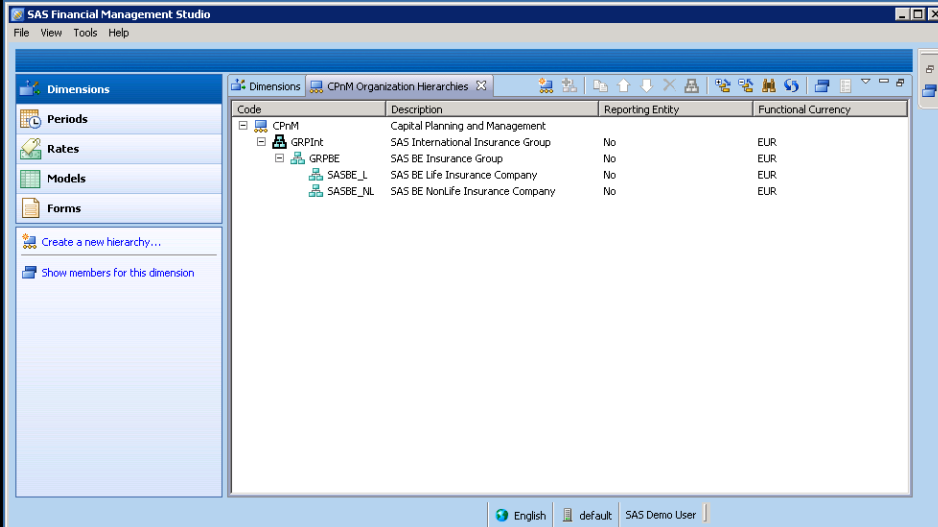
The Analysis dimension contains the following custom property:

CPnM_ForecastVersion (Forecast Version)—Boolean property set "true" for analysis members that represent projected values (for example Projected Base). This property is used within formula scoping rules to identify that a formula is used for projecting values.

CPnM Organization

The Organization dimension represents the organization structure of an insurance capital group. Within the insurance framework, each member of the CPnM Organization dimension represents a reporting entity with functional currency of EUR.

Figure 2-9 Organization Dimension Members

Note: The Organization dimension must be reconfigured for each customer.

CPnM Time

The CPnM Time dimension comprises yearly time members.

Figure 2-10 Time Dimension Members

CPnM Time Custom Properties

The Time dimension contains the following custom properties:

CPnM_TimePerspective (Perspective)—Character property used for reporting and formula scoping purposes. Many formulas are scoped to only execute on monthly members that are identified as projected time periods. There are two possible values: *Historic* or *Projected*. Every member must belong to either one of the two possible values.

CPnM_InitialPlanningPeriod (Initial Planning Period)—Boolean property set true for a single monthly time member that represents the first planning period. Used within formulas to establish starting balances going forward for each version and scenario.

CPnM Currency

The Currency dimension is preloaded with some initial currency members. Each member uses the standard ISO 4217 standard currency code.

Within the SAS Capital Planning and Management Insurance Framework, the assumption is that everything is performed within EUR. That is also the reason why no exchange rates have been loaded for any time periods.

To use a currency other than the default currency (EUR) a valid set of exchange rates must be loaded.

CPnM Lines of Business

The Lines of Business dimension defines the business unit hierarchy as well as product portfolios. Product portfolios are identified as children of business units.

Figure 2-11 Lines of Business Dimension Members
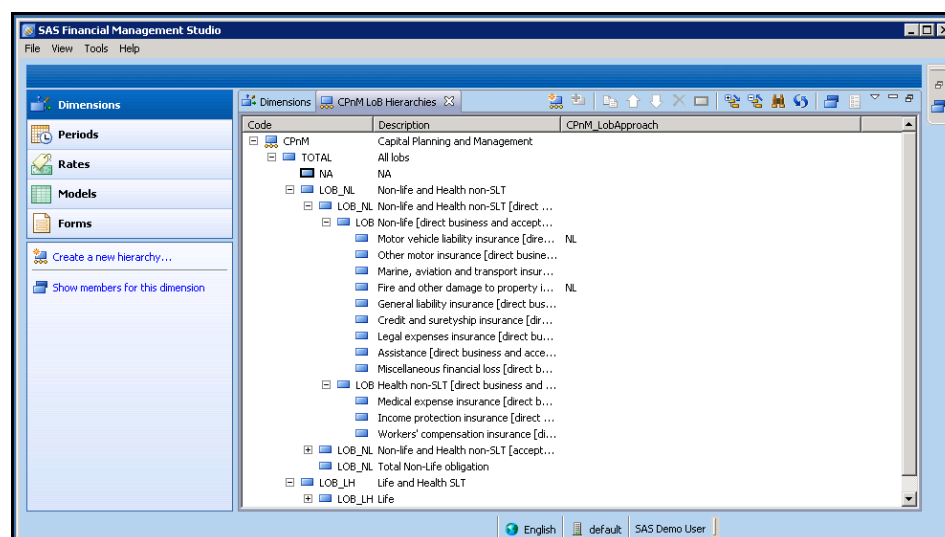
CPnM LoB Custom Property

The LoB dimension contains the following custom property:

CPnM_LobApproach—Guides the approach to projections that are performed on level of LoB. Currently, SAS Capital Planning and Management Insurance Framework supports the following two approaches that are represented by two possible values of this custom property:

- **NL**
  LoBs that have this value for the property are projected after the "non-life projections." This method influences how the value of some members of income statement and balance sheet are calculated.
- **UL**
  LoBs that have this value for the property are projected following the "unit-linked projections." This method influences how the value of some members of income statement and business statement are calculated.

CPnM Scenario

The Scenario dimension provides details for each planning scenario. In a capital planning process, an insurance company creates a capital projection for a number of scenarios that are perceived as the most important for them.

Figure 2-12 Scenario Dimension Members
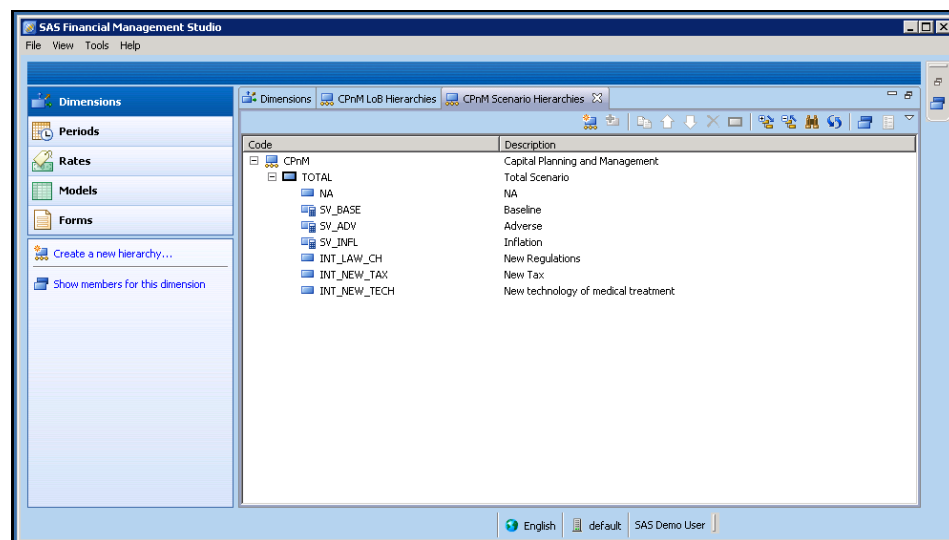
The following members have been included in the Scenario dimension:

- New Requlations
- New technology of medical treatment
- Adverse
- Baseline

- Inflation
- Total Scenario

The list of members might include a set of regulatory scenarios, in addition to internally defined scenarios. Demonstration data and form-sets are prepared to enable definition and perform calculations for scenarios that are defined here as supervisory ones.

CPnM Scenario Custom Property

The Scenario dimension contains the following custom property:

CPnM_Supervisory—Boolean property that indicates whether the given member (scenario) is a supervisory one or not. This property is currently not used.

Note: Currently, this property is currently not used.

CPnM Risk

The Risk dimension is a "placeholder" dimension to capture optional risk type details.

Figure 2-13 Risk Dimension Members
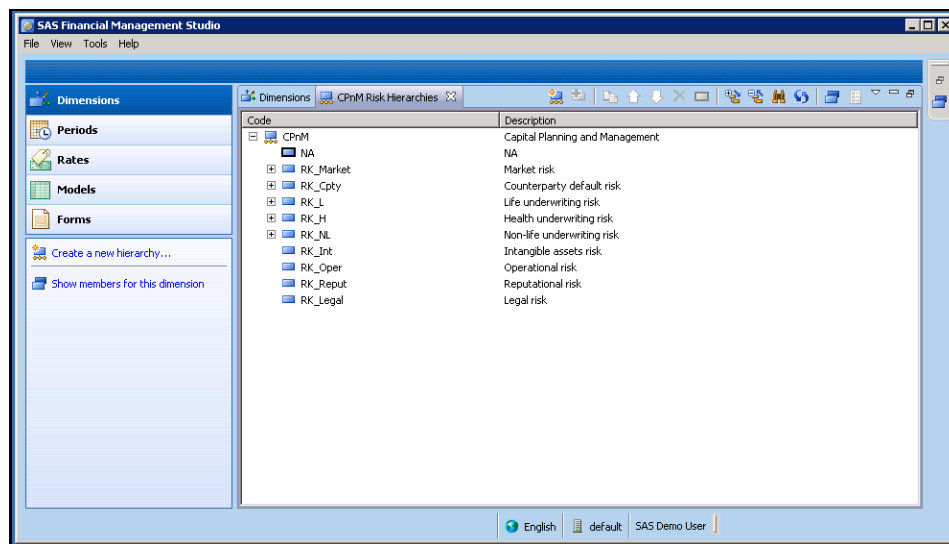
CPnM Risk Custom Property

The Risk dimension contains the following custom property:

CPnM_ComparisonLevel—Boolean property that indicates whether a given member (risk) represents the level [of risk definition] for which users should provide qualitative assessments of maturity of risk management process and for which the estimation of risk requirements should be provided (or calculated by the system) as well.

CPnM FinFund

The Financial Fund (FinFund) dimension is a placeholder dimension to capture optional financial fund details.

Figure 2-14 Financial Fund Dimension Members
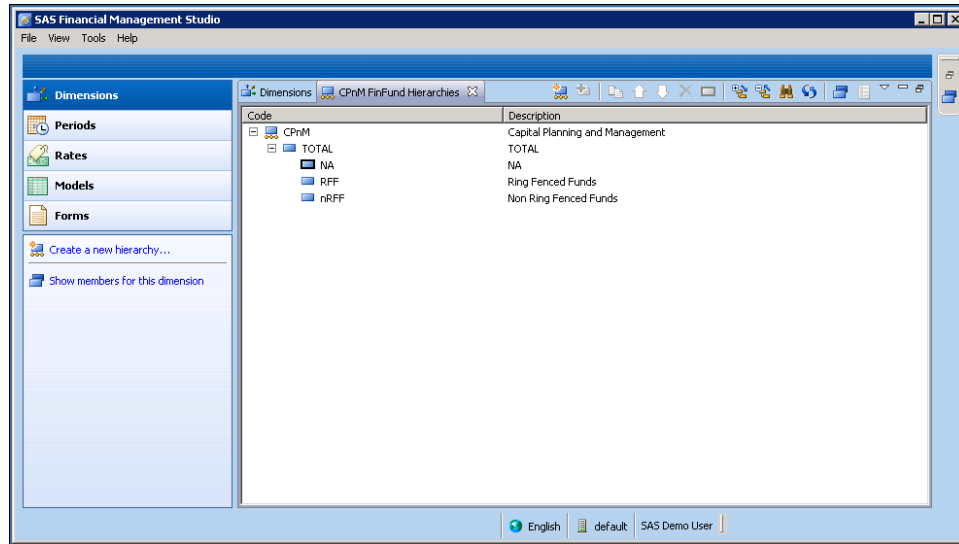
The Not Applicable (NA) member is defined as the default member.

In demo data and a generic model provided within the SAS Capital Planning and Management Insurance Framework, only the default value is used (for scoping of formulas, definitions of form-sets). However, the initial definition of other members are prepared, because in the future (or within specific implementations) it can be expected to have some specific projections of assets (and more rarely – liabilities) performed in a division by FinFund.

CPnM ValueMeth

The CPnM Valuation Method (ValueMeth) dimension is a placeholder dimension to separate different approaches to calculations.

Figure 2-15 ValueMeth Dimension Members
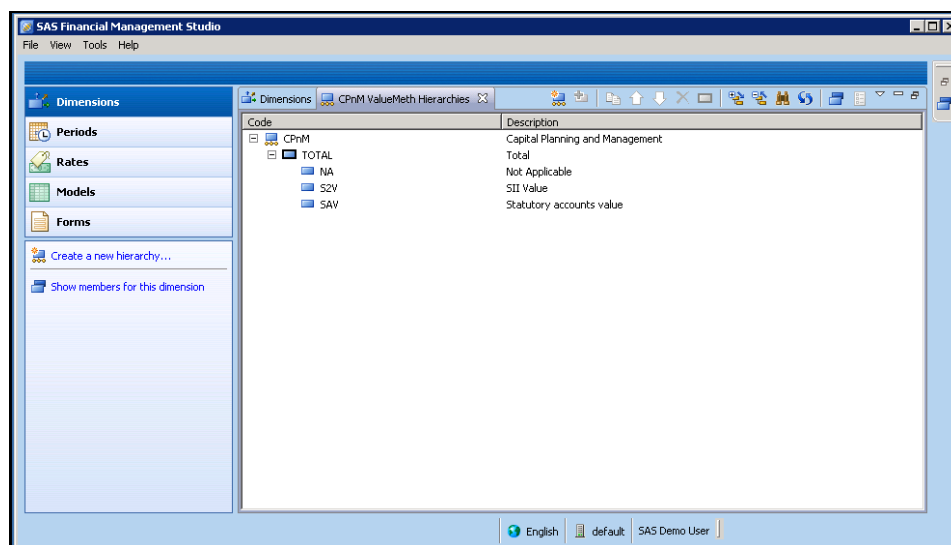
A generic model implemented within the SAS Capital Planning and Management Insurance Framework assumes that all projections are performed on "SII Value." However, there might be situations where "Statutory accounts value" will be uploaded from the Strategic Planning tool and used as a benchmark for projections.

CPnM Misc

The CPnM Miscellaneous (Misc) dimension is a placeholder dimension to capture optional details.

Figure 2-16 Misc Dimension Members
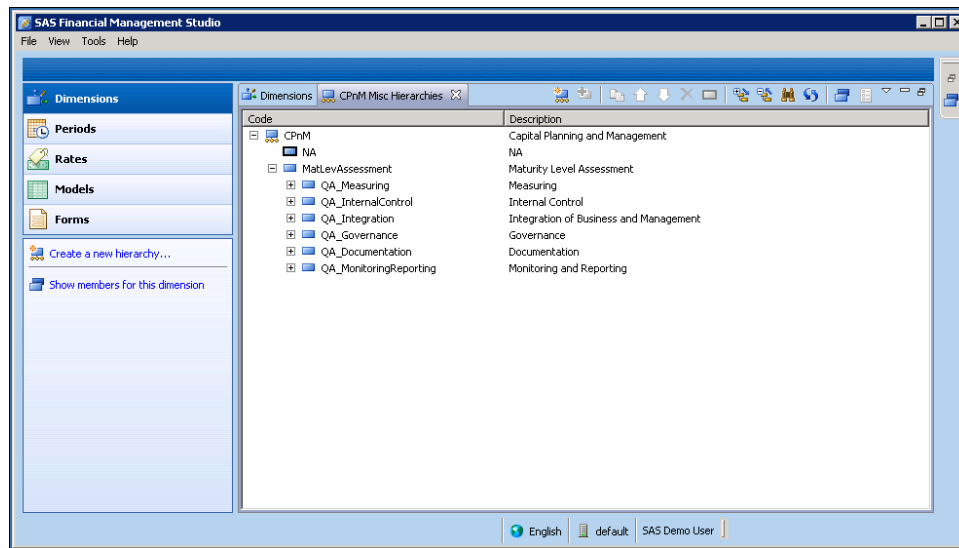
Currently, the Misc dimension stores the definitions of questionnaires that are used for qualitative assessment of risk management process.

Source

The Source dimension is a system-embedded dimension. Its content is not changed within the SAS Capital Planning and Management Insurance Framework. However, the content of the Source dimension is used for proper scoping of formulas.

The assumption is that all data within the insurance framework on a solo level (whether uploaded using SAS Data Integration jobs or entered by using data entry form-sets) is stored under the FormData member.

Trader

The Trader dimension is a system-embedded dimension that is currently used within the insurance framework for proper scoping of formulas.
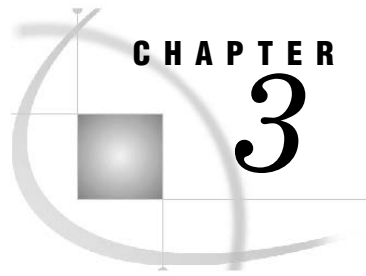
C H A P T E R

3

Parameters

Overview

The SAS Capital Planning and Management Insurance Framework performs projections based on the following:

- **Input data**—uploaded by using SAS Data Integration jobs and in most of the cases representing values at t=0.
- **Factors**—which are classified as follows:
  - **Risk factors**, which are the subject of shocks applied in different scenarios. Business users provide risk factors by using form-sets.
  - **Management factors**, which might differ for alternative management strategies that are represented by the members of SAS Capital Planning and Management Insurance Framework (Analysis dimension). Business users provide management factors by using form-sets.
  - **Parameters** that stay constant through the analysis task.

Types of Parameters

There are several types of parameters that are used within the CPnM model. These parameters include the following:

- Line of Business (LoB) parameters, which do not change during the projected time. These parameters include:

Parameter	Description
BenPaidOutShare	Percentage of benefits to be paid for universal life insurance (UL).
PH_BondAllocPerc PH_EQAllocPerc	Average allocation percentages of policy holders into bonds and equities (defined for UL).
MortCover	Mortality cover for given UL product.
ClPaidEB ClPaidNB	How much of claims from existing business is paid within a given year and how much of new business is to be paid within a given year (defined for non-life).

Parameter	Description
UPPRatio	Ratio of "Change in Unearned Premium Provision" in Gross Written Premiums (GWP).
UPRGWPRatio	Ratio of "Unearned Premium Provision" in GWP
TaxRatio	Ratio used to calculate the tax based on income statement.
Sens_IRShock	Parameter of proxy function obtained by means of Least Squares Monte Carlo (LSMC) or another model.

- Capital requirements parameters, including:
  - Minimal Capital Requirement (MCR) parameters, such as absolute floor MCR (AMCR) (AMCR, MCR_*)
  - Operational Risk (Oprisk) parameters (OP_*)
  - Correlation matrix used for Basic Solvency Capital Requirement (BSCR) (RCM_*)
  - IntAsssetsRatio
  - Risk margin ratio

Qualitative assessment parameters, including Q_GradePoints (points for level of maturity of process).

Implementing Parameters as Driver Rates

There are at least two methods that you can use to define parameters:

1. As members of the CPnM Account dimension. This method enables users to see and edit the values of parameters by using form-sets.

2. As driver rate sets. This method enables users to run a completely new analysis by applying a different set of driver rates. Users cannot provide values of driver rates by using form-sets, but they can see them.

After an initial analysis, the assumption is that the parameters that are mentioned above are defined as driver rates, which are grouped into driver rate sets. The values of driver rates are populated based on input data sets, which are in Microsoft Excel format.

The SAS Capital Planning and Management Insurance Framework provides one driver rate set (CPnM drivers), which is defined as seen in Figure 3-1.

Figure 3-1 CPnM Driver Rate Set
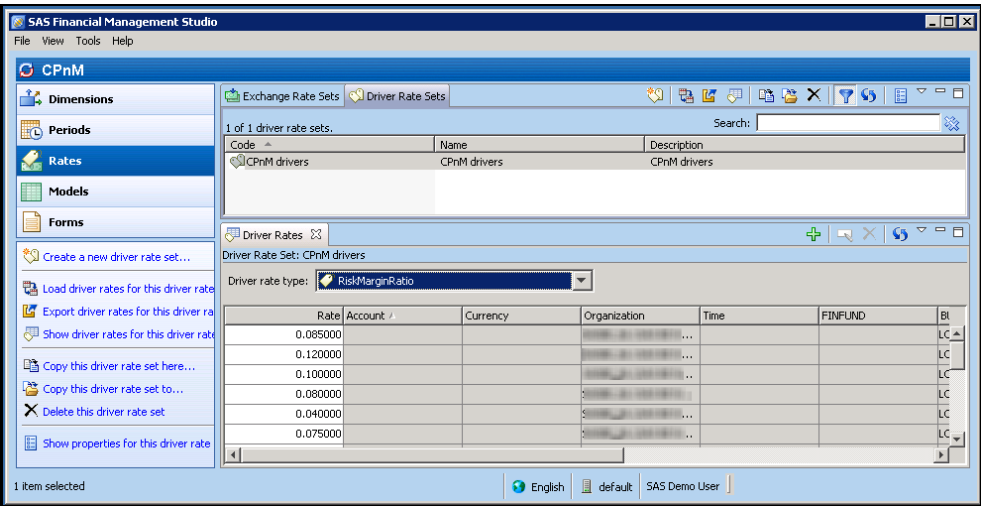
Within the CPnM model definition, the driver rate set has been assigned to each member of the CPnM Analysis dimension.

Figure 3-2 Assignment of the Driver Rate Set to the Analysis Member

C H A P T E R

4
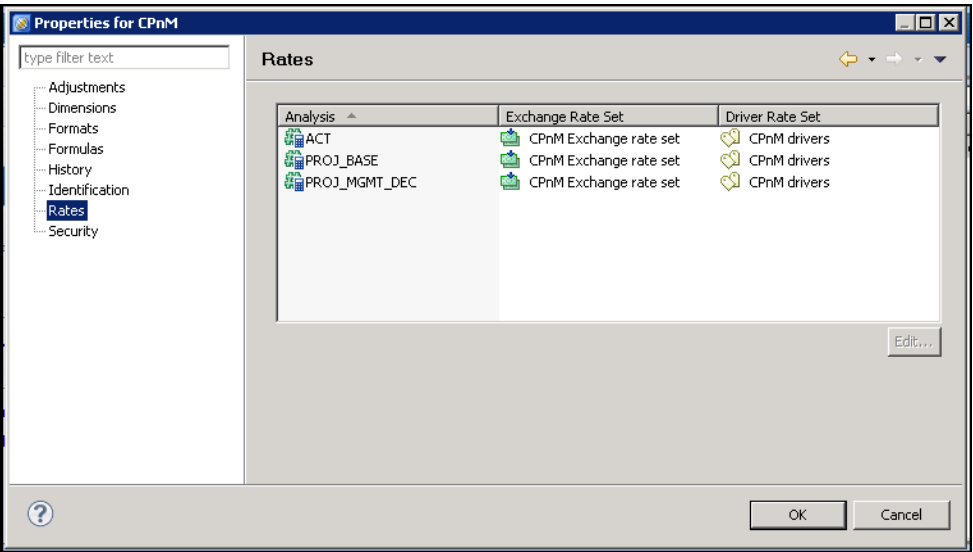
The Capital Projections Process

Overview

The capital projection process (see Figure 4-1) is defined within SAS Capital Planning and Management Insurance Framework by using the process manager function of the SAS Financial Management web application.

Figure 4-1 Capital Projection Process

The first few tasks of the definition ensure that all of the data that is initially needed is uploaded and that the time of projections is set adequately:

Task or Task Group	Description
Import actual data	Runs the jobs that upload data from the staging area (StageFM) to the solution database.
	Note: Before this task can be performed, the initial data must be prepared and uploaded to the StageFM.
Specify First Projected Period	Ensures that the correct default time (t=0) is set for the process.
	Note: This task is performed manually.
Load Driver Rates	Runs the job that uploads data from StageFM to the solution database.
	Note: Before this task can be performed, the initial data must be prepared and uploaded to the StageFM.

Before proceeding, it is important to emphasize that the projections are performed on two levels, as illustrated in Figure 4-2.

Figure 4-2 Two-Level Approach to Projections
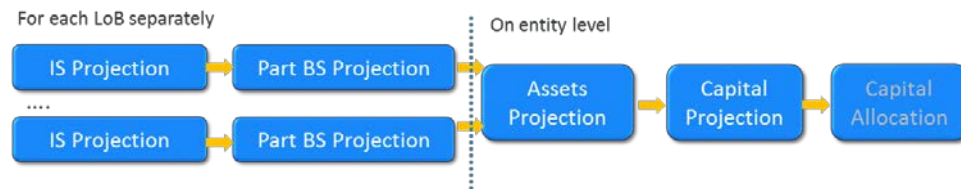
The capital projections process starts with the projections of elements of income statement (IS) and balance sheet (BS), which can be defined on the level of line of business (LoB). Once the projections are complete, the values are aggregated to the entity level, where the projection of rest of balance sheet (most of assets) and capital occurs.

Defining Scenarios

One of the first steps of the deterministic approach is to define scenarios. As mentioned before, users can use several methods to define scenarios. For example, a scenario can be defined by using one of the following methods:

- Manually entered by an adequate user. Figure 4-3 is an example of the form that a user can use to manually define a scenario.

  Note: The SAS Capital Planning and Management Insurance Framework supports the manual entry by an adequate user by default.

- Uploaded from external tools and then presented to the users only as read-only.

- Generated by SAS tools and then populated to the data model of SAS Financial Management and presented to the users as read-only or with the option of editing (in the case of treating the econometric model as a suggestion rather than final definition).

Figure 4-3 Two-Level Definition of Risk-Factors

Scenario definition

CPnM Organization … SAS BE NonLife Insurance Company
CPnM Analysis … Projected Base

	Baseline					Adverse					Inflation				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Economic Risk Factors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest Rate	1.92%	1.92%	1.92%	1.92%	1.92%	4.00%	4.00%	4.00%	4.00%	4.00%	3.90%	3.90%	3.90%	3.90%	3.90%
Interest Rate Base	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%
Interest Rate Shock	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	66.50%	66.50%	66.50%	66.50%	66.50%	62.50%	62.50%	62.50%	62.50%	62.50%
Credit Spread High Yield	1.19%	1.19%	1.19%	1.19%	1.19%	1.38%	1.38%	1.38%	1.38%	1.38%	1.00%	1.00%	1.00%	1.00%	1.00%
Credit Spread High Yield Base	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Credit Spread High Yield Shock	19.15%	19.15%	19.15%	19.15%	19.15%	38.30%	38.30%	38.30%	38.30%	38.30%	0.00%	0.00%	0.00%	0.00%	0.00%
Credit Spread Investment Grade	0.58%	0.58%	0.58%	0.58%	0.58%	0.66%	0.66%	0.66%	0.66%	0.66%	0.50%	0.50%	0.50%	0.50%	0.50%
Credit Spread Investment Grade Bas	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Credit Spread Investment Grade Sho	15.70%	15.70%	15.70%	15.70%	15.70%	31.40%	31.40%	31.40%	31.40%	31.40%	0.00%	0.00%	0.00%	0.00%	0.00%
Equity Index Shock	-7.50%	-7.50%	-7.50%	-7.50%	-7.50%	-15.00%	-15.00%	-15.00%	-15.00%	-15.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Residential Property Index Shock	-12.50%	-12.50%	-12.50%	-12.50%	-12.50%	-25.00%	-25.00%	-25.00%	-25.00%	-25.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Commercial Property Index Shock	-3.80%	-3.80%	-3.80%	-3.80%	-3.80%	-11.70%	-11.70%	-11.70%	-11.70%	-11.70%	0.00%	0.00%	0.00%	0.00%	0.00%

CPnM LoB … Motor vehicle liability insurance

	Baseline					Adverse					Inflation				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Insurance risk factors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lapse Ratio	2.00%	2.00%	2.00%	2.00%	2.00%	2.40%	2.40%	2.40%	2.40%	2.40%	2.70%	2.70%	2.70%	2.70%	2.70%
Lapse Ratio Base	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Lapse Ratio Shock	0.00%	0.00%	0.00%	0.00%	0.00%	20.00%	20.00%	20.00%	20.00%	20.00%	35.00%	35.00%	35.00%	35.00%	35.00%

Figure 4-3 illustrates the case where all types of risk factors are gathered in one form. In addition, economic factors and insurance factors (Lapse Ratio, Average Loss Growth) are collected. Economic risk factors are defined on the entity level and the insurance specific risk factors are defined for each line of business.

While it is useful to see all of the factors together, in most environments, different people are responsible for the definition of the two types of factors.

Note: The values represent the definition of scenarios taken from *Specifications for the 2011 EU-wide stress test in the insurance sector, 23 March 2011*.

Defining Risk Appetite

After defining scenarios, the next step is to define the Risk Appetite. There might be many methods that a user can use to define risk appetite. In addition, there can be different measures used on different levels.

For example, Risk Appetite can be defined by using one of the following methods:

- Manually entered by an adequate user. Figure 4-4 is an example of the form to manually define Risk Appetite.

  Note: The SAS Capital Planning and Management Insurance Framework supports the manual entry by an adequate user by default.

- Uploaded from external tools and then presented to the users as read-only. When this method is used, the definition of risk appetite measures needs to be reconciled with an external tool.

Figure 4-4 Definition of Risk Appetite Measures
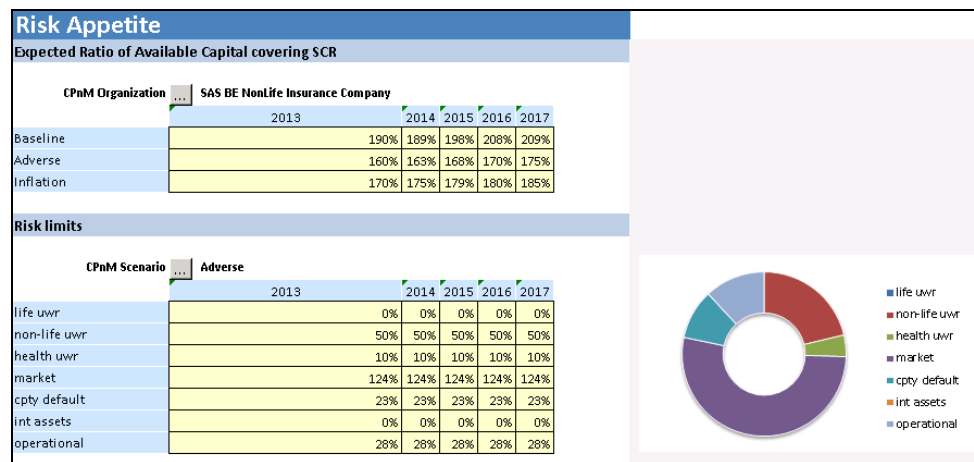
The SAS Capital Planning and Management Insurance Framework provides the following two risk appetite measures:

- Expected ratio of Available Capital covering solvency capital requirement (SCR)

- Risk limits (defined as percentage of overall SCR)

Both measures are defined on the level of entity and scenario.

Note: Users can define additional measures.

Adequate to them, we have also projected the version of those measures and at the end, compare the projected values against the expected ones.

Initial Projections

The Flow of Projections

The scope of the business model has been defined with the assumption that the income statement and the balance sheet need to be projected apart from capital requirements and own funds. This approach ensures the consistency (to the extent to which it is possible) with business planning. In addition, this approach enables the incorporation of the sensitivity management (sensitivity against or sensitivity to) decisions and risk factors.

With the factors above considered, and the assumption that there is a division of responsibility for certain business aspects within an insurance company, the process of projection is divided into the following steps:

1. Projections on the level of line of business (LoB), performed mainly by actuaries or product managers. This step looks different for different LoBs. In addition, unit-linked products might require input from asset managers.

   For non-life business, this projection follows two steps:
     a. Projection of premium
     b. Projection of claims and best estimate of liability

2. Projections of assets (on entity level), performed mainly by assets managers.

3. Projection of capital (on entity level), performed by risk managers.

Premium Projection – Non-Life LoBs

Premium projection as the first step of projections deals with elements of income statement concerning premiums and expenses, which are explained as functions of premium.

The SAS Capital Planning and Management Insurance Framework provides a set of predefined formulas that represent the logic of projection of income statement elements based on data about a portfolio from a previous period (for example, the number of policies and the average premium), risk factors, and management decisions factors.

Figure 4-5 Approach to Premium Projection
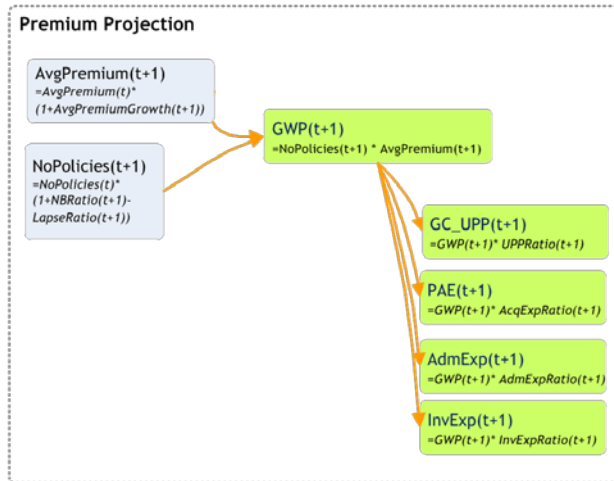
The best estimate of premium provisions is calculated based on the assumption that it is equal to unearned premium provisions.

The business user responsible for the projection for a given LoB is presented the following form-set, where:

- all risk factors = green cells
- parameters (driver rates) = violet cells
- management decision factors, which are empty at the beginning of process) = yellow cells

Figure 4-6 Premium Projection – Form-Set

Premium Projection

CPnM Organization ...	SAS BE NonLife Insurance Company
CPnM LoB ...	Motor vehicle liability insurance
CPnM Scenario ...	Adverse
CPnM Analysis ...	Projected Base

	2012	2013	2014	2015	2016	2017
Rates	0.00	0.00	0.00	0.00	0.00	0.00
Lapse Ratio	3.20%	2.00%	2.00%	2.00%	2.00%	2.00%
NB Ratio	4.20%	5.00%	5.00%	5.00%	5.00%	5.00%
Number of policies	4,046.00	4,168.00	4,294.00	4,423.00	4,556.00	4,693.00
Average Premium Growth	1.50%	2.00%	2.00%	2.40%	3.00%	3.10%
Average Premium	286.00	291.72	297.55	304.70	313.84	323.57
Acquisition Expense Ratio	7.40%	7.40%	7.40%	7.40%	7.40%	7.40%
Administration Expenses Ratio	11.60%	12.00%	12.00%	11.90%	11.90%	11.90%
Gross to Net ratio for Premiums	71.00%	71.00%	71.00%	71.00%	71.00%	71.00%
UPR to GWP Ratio	32.48%	32.48%	32.48%	32.48%	32.48%	32.48%
Unearned Premium Provision Ratio	5.20%	5.20%	5.20%	5.20%	5.20%	5.20%
Tax Rate	8.20%	8.20%	8.20%	8.20%	8.20%	8.20%
Best Estimate of Liabilities (gross)	(3,269,352.00)	(1,762,528.88)	(1,892,099.11)	(2,025,162.08)	(2,164,087.56)	(2,307,784.61)
BE of Premium Provisions	(375,943.00)	(394,920.73)	(414,996.50)	(437,722.93)	(464,411.85)	(493,206.51)
BE of Claims Provisions	(1,258,733.00)	(1,367,608.14)	(1,477,102.61)	(1,587,439.16)	(1,699,675.71)	(1,814,578.11)
Income Statement	22,430.46	112,134.26	113,654.32	120,304.05	129,486.21	138,912.53
Income	959,186.00	1,013,378.78	1,059,545.63	1,111,808.01	1,173,182.68	1,239,399.75
Gross Earned Premium	1,219,962.00	1,279,115.19	1,344,138.92	1,417,747.90	1,504,191.09	1,597,454.57
Gross Written Premium	1,157,460.00	1,215,888.96	1,277,698.59	1,347,669.11	1,429,839.44	1,518,492.94
Gross change in provision for unearned premiums	62,502.00	63,226.23	66,440.33	70,078.79	74,351.65	78,961.63
Ceded Earned Premium	(365,983.00)	(370,943.40)	(389,800.29)	(411,146.89)	(436,215.42)	(463,261.83)
Premium Written Ceded to reinsurers	(347,232.00)	(352,607.80)	(370,532.59)	(390,824.04)	(414,653.44)	(440,362.95)
Net change in provision for unearned premiums	(18,751.00)	(18,335.61)	(19,267.69)	(20,322.85)	(21,561.98)	(22,898.87)
Expenses	(907,474.54)	(891,228.17)	(935,739.18)	(980,757.84)	(1,032,130.16)	(1,088,078.91)
Policy acquisition and other underwriting expenses	(85,652.00)	(89,975.78)	(94,549.70)	(99,727.51)	(105,808.12)	(112,368.48)
Interest expense	(962.00)	(962.00)	(962.00)	(962.00)	(962.00)	(962.00)
Administration Expenses	(134,260.00)	(145,906.68)	(153,323.83)	(160,372.62)	(170,150.89)	(180,700.66)
Investment Expenses	(6,286.00)	(6,298.30)	(6,618.48)	(6,980.93)	(7,406.57)	(7,865.79)
Other Expenses	(471.00)	(471.00)	(471.00)	(471.00)	(471.00)	(471.00)
Income Tax expense	(29,281.00)	(10,016.35)	(10,152.13)	(10,746.11)	(11,566.31)	(12,408.31)

Each time that a user changes the values of management factors, all of the dependent measures are recalculated and presented. The user should use this form-set to fill data for all LoBs that are defined in a slicer.

Claims and Best Estimate Liabilities Projection – Non-Life LoBs

After projecting the amounts of premium and premium-driven measures, users can project claims and reserves.

Figure 4-7 illustrates the approach to the projection of claims and best estimate liability (BEL) of claims provisions used for non-life LoBs. This approach is influenced by the article *Measuring Uncertainty of Solvency Coverage Ratio in ORSA for Non-Life Insurance* by F. Planchet, Q. Guibert, and M. Juillard. The approach assumes that the main driver of change in technical provisions is claims provisions, and for them the percentage of claims being realized from existing business (EB) and from new business (NB).

The SAS Capital Planning and Management Insurance Framework functions under the assumption that reinsurance recoverables are calculated based on gross-to-net ratios. There is a separate ratio for claims and another one for premiums.

Figure 4-7 Approach to Claims and Best Estimate Projection
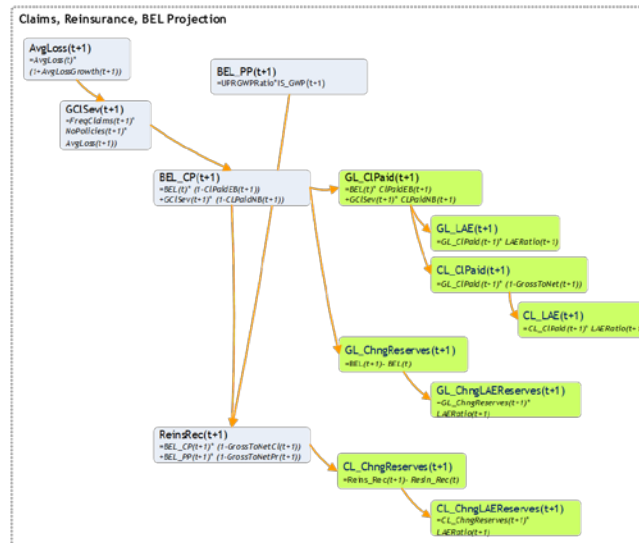
The insurance framework uses the "number of policies" (projected in the previous step) measure, the value of technical provision from the previous period, and the average loss in the previous period in their projection approach. In addition, the insurance framework enables a user to provide management decision factors (similar to business planning factors) such as:

- Loss Adjustment Expense Ratio
- Gross to net ratio (to define the amount of risk, which is kept by the insurer; separate for claims and premium provisions)

Projections are performed by using following form:

Figure 4-8 Claims Projection – Form-Set

Claims, Reinsurance, BEL Projection

		2012	2013	2014	2015	2016	2017
CPnM Organization	...	SAS BE NonLife Insurance Company					
CPnM LoB	...	Motor vehicle liability insurance					
CPnM Scenario	...	Adverse					
CPnM Analysis	...	Projected Base					
Rates		0.00	0.00	0.00	0.00	0.00	0.00
Average Loss Growth		1.10%	1.00%	1.90%	1.80%	2.00%	2.10%
Loss Adjustment Expenses Ratio		23.00%	23.00%	23.00%	23.00%	23.00%	23.00%
Frequency of Claims		20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
Number of policies		4,046.00	4,168.00	4,294.00	4,423.00	4,556.00	4,693.00
Average Loss		(890.00)	(898.90)	(915.98)	(932.47)	(951.12)	(971.09)
Gross Claims Severity		0.00	(749,323.04)	(786,642.85)	(824,860.06)	(866,656.95)	(911,464.60)
Claims Paid from EB		10.40%	10.40%	10.40%	10.40%	10.40%	10.40%
Claims Paid from NB		68.00%	68.00%	68.00%	68.00%	68.00%	68.00%
Best Estimate of Liabilities (gross)		(3,269,352.00)	(1,762,528.88)	(1,892,099.11)	(2,025,162.08)	(2,164,087.56)	(2,307,784.61)
BE of Premium Provisions		(375,943.00)	(394,920.73)	(414,996.50)	(437,722.93)	(464,411.85)	(493,206.51)
BE of Claims Provisions		(1,258,733.00)	(1,367,608.14)	(1,477,102.61)	(1,587,439.16)	(1,699,675.71)	(1,814,578.11)
Gross to Net ratio for Claims		71.00%	71.00%	71.00%	71.00%	71.00%	71.00%
Gross to Net ratio for Premiums		71.00%	71.00%	71.00%	71.00%	71.00%	71.00%
Reinsurance Recoverable		474,056.00	511,133.37	548,708.74	587,297.00	627,585.39	669,257.54
SCR_def to Reins Rec Ratio		3.88%	3.88%	3.88%	3.88%	3.88%	3.88%
SCR_nl to BEL ratio		8.57%	8.57%	8.57%	8.57%	8.57%	8.57%
Income Statement		22,430.46	112,134.26	113,654.32	120,304.05	129,486.21	138,912.53
Income		959,186.00	1,013,378.78	1,059,545.63	1,111,808.01	1,173,182.68	1,239,399.75
Gross Written Premium		1,157,460.00	1,215,888.96	1,277,698.59	1,347,669.11	1,429,839.44	1,518,492.94
Premium Written Ceded to reinsurers		(347,232.00)	(352,607.80)	(370,532.59)	(390,824.04)	(414,653.44)	(440,362.95)
Expenses		(907,474.54)	(891,228.17)	(935,739.18)	(980,757.84)	(1,032,130.16)	(1,088,078.91)
Net Losses and loss adjustment expenses		(679,843.54)	(647,614.40)	(679,814.18)	(712,243.78)	(747,331.58)	(785,710.98)
Claims and movements in insurance liabilities		(961,215.54)	(921,667.34)	(967,570.71)	(1,014,577.88)	(1,065,988.05)	(1,121,101.46)
Gross Claims Paid		(678,545.97)	(640,447.90)	(677,148.39)	(714,523.51)	(754,420.40)	(796,562.20)
Gross Loss Adjustment Expenses		(154,295.57)	(147,303.02)	(155,744.13)	(164,340.41)	(173,516.69)	(183,209.31)
Change in Gross Claims Reserve		(103,833.00)	(108,875.14)	(109,494.47)	(110,336.55)	(112,236.55)	(114,902.40)
Change in gross LAE Reserves		(24,541.00)	(25,041.28)	(25,183.73)	(25,377.41)	(25,814.41)	(26,427.55)
Claims and mvmnts in ins liab ceded to reinsurers		281,372.00	274,052.94	287,756.53	302,334.10	318,656.47	335,390.48
Ceded Claims Paid		208,089.00	185,729.89	196,373.03	207,211.82	218,781.92	231,003.04
Ceded Loss Adjustment Expenses		29,133.00	42,717.87	45,165.80	47,658.72	50,319.84	53,130.70
Change in Ceded Reserve		36,027.00	37,077.37	37,575.37	38,588.26	40,288.39	41,672.15
Change in Ceded Loss Adjustment Expenses Reserve		8,123.00	8,527.80	8,642.33	8,875.30	9,266.33	9,584.59
Balance Sheet		1,301,082.40	1,125,301.63	1,157,678.55	1,211,309.34	1,296,251.42	1,415,950.97
Best Estimate		(1,634,676.00)	(1,787,570.16)	(1,917,282.84)	(2,050,539.49)	(2,189,901.97)	(2,334,212.17)
Loans & mortgages		375,349.00	375,349.00	375,349.00	375,349.00	375,349.00	375,349.00
Reinsurance recoverables from:		474,056.00	511,133.37	548,708.74	587,297.00	627,585.39	669,257.54
Non-life and health similar to non-life		474,056.00	511,133.37	548,708.74	587,297.00	627,585.39	669,257.54
Capital		0.00	0.00	0.00	0.00	0.00	0.00
RC (SCR)		214,890.00	244,350.92	262,089.36	280,744.37	300,872.24	322,391.66
RC (P&C UWR Risk)		125,381.00	138,587.60	149,065.83	159,809.34	171,031.86	182,630.49
RC (Cpty Default Risk)		21,240.00	6,606.12	6,894.72	7,200.71	7,526.71	7,874.38
RC (SCR - OpRisk)		11,106.00	53,627.10	57,518.49	61,516.18	65,697.06	70,026.36
Basic Own Funds		573,317.00	450,120.65	463,071.42	484,523.73	518,500.57	566,380.39
Measures		0.00	0.00	0.00	0.00	0.00	0.00

Projections for Unit-Linked LoBs

The initial approach for the projection of life liabilities is to use a combination of expert methods and proxy methods that are based on the Curve-Fitting (CF) method or the Least Squares Monte Carlo (LSMC) method.

This projection is based on the following assumptions:

- Number of policies depends on new business, surrenders (here called lapses), and death
- Policyholders may invest into bonds and equities
- "Assets held for index-linked and unit-linked" are modeled, depending on the following:
  - (+) Amount of premiums paid (no upfront charge depending on premium)
  - (-) Fees (1) proportional to value of assets; 2) fixed from every policy
  - (+) Return of funds (depending on allocation into specific type of assets and return on that type)

- •   (-) Release of funds upon death
- •   (-) Release of funds upon surrenders (depending on lapse/surrender ratio)
- •   (-) Release on benefits paid out
- •   Sensitivity against interest rate (the sample polynomial proxy, which is supposed to be the result when the LSMC or CF method is applied)
- •   Change in technical provisions is proportional to change in "Assets held for index-linked and unit-linked"

In the income statement, only fees and surrender charges are disclosed as income and administration. Acquisition expenses and death benefits (paid by insurance company) are disclosed as expenses.

Figure 4-9 Approach to Projections for Unit-Linked LoBs
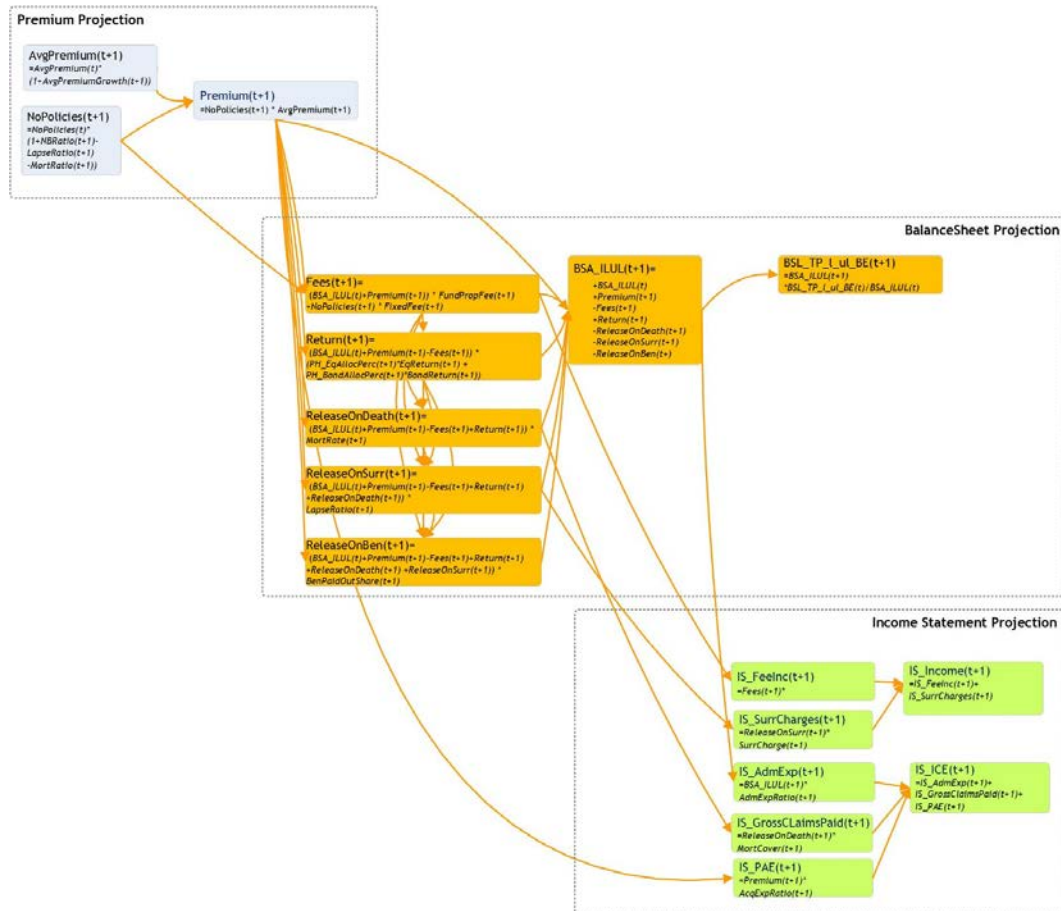
Figure 4-10 Projection for Unit-Linked Products – Form Set

Projection of Balance Sheet for Unit-linked products							
CPnMI Organization	SAS BE Life Insurance Company						
CPnMI Line of Business	Contracts without options and guarantees						
CPnMI Scenario	Supervisory Adverse						
CPnMI Analysis	Forecast - Version 1						
	Year 2011	Year 2012	Year 2013	Year 2014	Year 2015	Year 2016	Year 2017
Rates	0	0	0	0	0	0	0
Number of policies	10,000	10,490	11,005	11,545	12,111	12,705	13,328
NB Ratio	9%	9%	9%	9%	9%	9%	9%
Lapse Ratio	4%	4%	4%	4%	4%	4%	4%
MortalityRate	0%	0%	0%	0%	0%	0%	0%
Average Premium	1,000	1,010	1,020	1,030	1,041	1,051	1,062
Average Premium Growth	1%	1%	1%	1%	1%	1%	1%
Premium	10,000,000	10,594,900	11,226,201	11,894,825	12,602,755	13,353,083	14,147,941
Policyholder Equity Allocation	55%	55%	55%	55%	55%	55%	55%
Return on Equity	3%	3%	3%	3%	3%	3%	3%
Policyholder Bond Allocation	45%	45%	45%	45%	45%	45%	45%
Return on Bond	2%	2%	2%	2%	2%	2%	2%
Fund Value Proportional Fee	1%	1%	1%	1%	1%	1%	1%
Fixed Fee	30	30	30.00	30.00	30.00	30.00	30.00
Benefits Paid Out Share	3%	3%	3%	3%	3%	3%	3%
Interest Rate	0%	0%	4%	4%	4%	4%	4%
Interest Rate Base	0%	0%	2%	2%	2%	2%	2%
Interest Rate Shock	0%	0%	63%	63%	63%	63%	63%
Balance Sheet	195,810,398	203,277,882	207,885,509	215,434,352	223,733,911	232,811,195	242,695,255
Assets	103,603,385	107,554,435	111,203,287	115,241,356	119,681,003	124,536,675	129,823,912
Assets held for index-linked and unit-linked	103,603,385	107,554,435	111,203,287	115,241,356	119,681,003	124,536,675	129,823,912
Opening Balance	100,000,000	103,603,385	107,554,435	111,203,287	115,241,356	119,681,003	124,536,675
Premiums	10,000,000	10,594,900	11,226,201	11,894,825	12,602,755	13,353,083	14,147,941
Fees	(1,400,000)	(1,456,683)	(1,517,956)	(1,577,331)	(1,641,771)	(1,711,491)	(1,786,686)
Return on Funds	2,769,300	2,874,911	2,990,198	3,098,780	3,218,160	3,348,726	3,490,897
Release funds upon Death	(111,369)	(115,617)	(120,253)	(124,620)	(129,421)	(134,671)	(140,389)
Release funds upon Surrender	(4,450,317)	(4,620,036)	(4,805,305)	(4,979,798)	(5,171,643)	(5,381,466)	(5,609,938)
Release funds upon Benefits paid out	(3,204,228)	(3,326,426)	(3,459,820)	(3,585,454)	(3,723,583)	(3,874,656)	(4,039,155)
Interest Rate Sensitivity	0	0	(664,213)	(688,333)	(714,850)	(743,853)	(775,434)
Liabilities	92,207,013	95,723,447	96,682,222	100,192,996	104,052,908	108,274,520	112,871,343
TP I ul: BE	92,207,013	95,723,447	96,682,222	100,192,996	104,052,908	108,274,520	112,871,343
Base Value	92,207,013	95,723,447	98,970,925	102,564,807	106,516,093	110,837,641	115,543,281
Interest Rate Sensitivity	0	0	(2,288,703)	(2,371,811)	(2,463,185)	(2,563,120)	(2,671,938)
Measures	0	0	0	0	0	0	0
Present Value of Future Profits	11,396,372	11,830,988	14,521,064	15,048,360	15,628,095	16,262,155	16,952,569

Projection of Assets

Having a projected income statement (with all expenses, including claims and change in technical provisions) and LoB-specific elements of the balance sheet, one can begin the projection of assets.

The following three types of assets are projected in a more thorough way:

- equities
- properties
- bonds

The projection of assets is based on the following assumptions regarding sensitivity to economic risk factors:

	Equities	Properties	Bonds
Interest rate			Yes
Equity index	Yes	Yes	
Residential Property Index		Yes	
Commercial Property Index			Yes
Credit spread for High-Yield			Yes

The management decision factors used are:

- allocation into asset classes (equities, properties, bonds)
- allocation into types of properties (residential, commercial)
- allocation into types of bonds (corporate, government)
- allocation of corporate bonds into subtypes (investment grade, high-yield)

The above management factors are used for allocation of "New Production" (being equal to result of income statement) to different types and subtypes of assets.

The following figures identify the projection assumptions of each factor:

Figure 4-11 Projections of Equities Assumptions
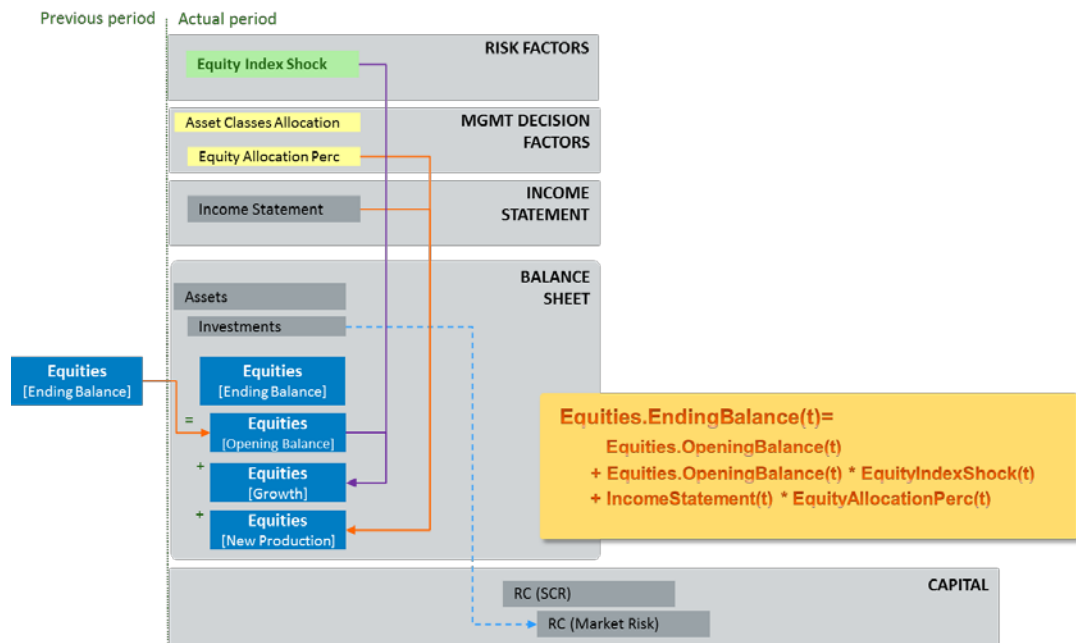
Figure 4-12 Projection of Properties Assumptions
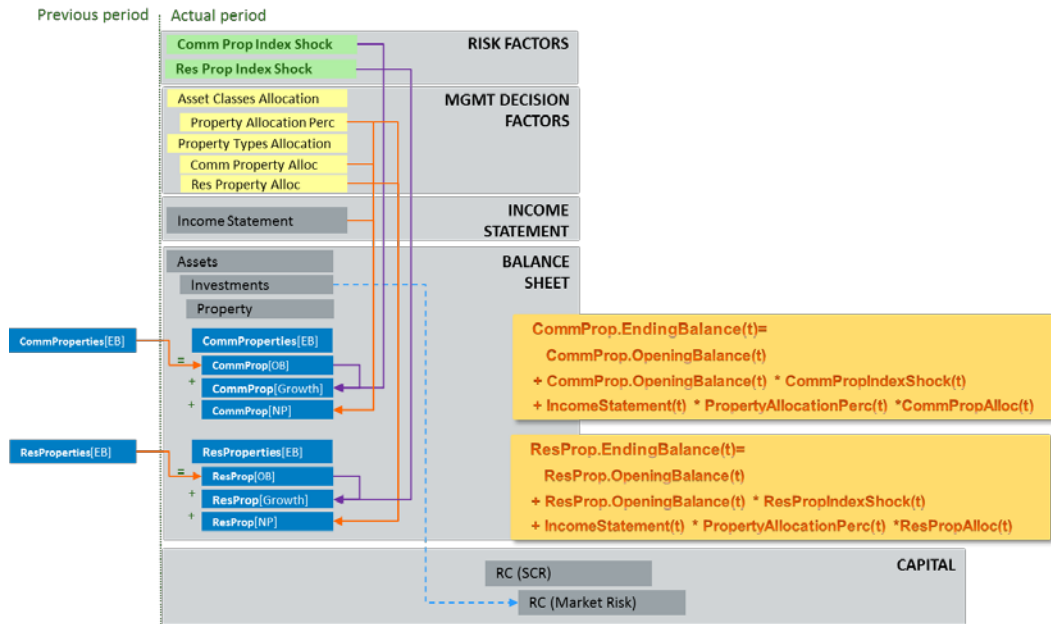
Figure 4-13 – Projection of Bonds Assumptions
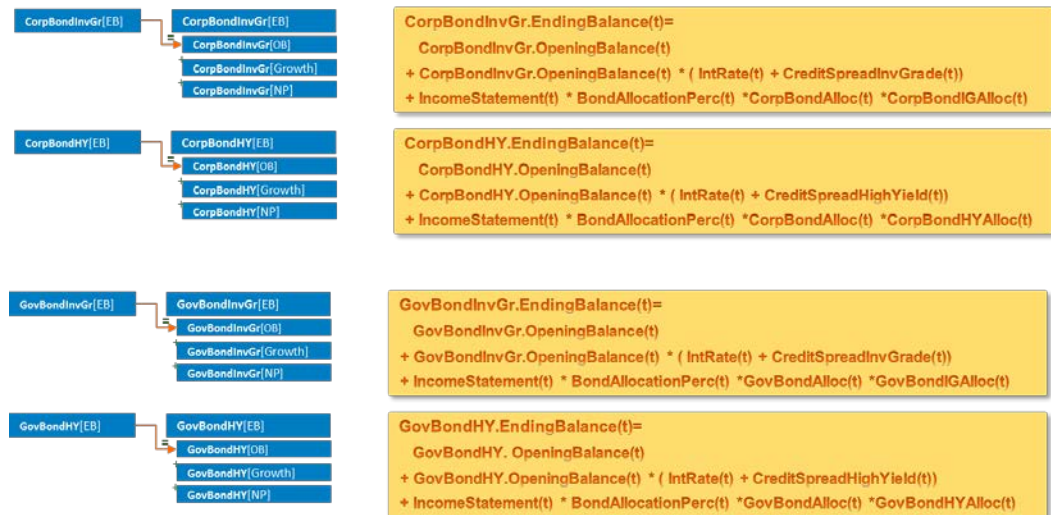
Initially, all of the projections are performed using the Assets Projections form-set.

The projected values of assets (an element of investments from the balance sheet) influence the value of SCR for market risk and SCR for counterparty default risk.

Projections for Other Balance Sheet Elements

With SAS Capital Planning and Management Insurance Framework, all other elements of the balance sheet must be input or assumed to stay constant within projected years.

Projections for Capital Requirements

The SAS Capital Planning and Management Insurance Framework uses the standard approach from Pillar I to calculate to the capital requirement projections.

A set of proxy methods are defined based on following assumptions:

SCR	Assumed to be
SCR for life underwriting risk	Proportional to BE of TP for life liabilities $SCR\_l(t) = SCR\_l(0) / BELnet\_l(0) * BELnet\_l(t)$
SCR for P&C underwriting risk	Proportional to BE of TP for non-life liabilities $SCR\_nl(t) = SCR\_nl(0) / BELnet\_nl(0) * BELnet\_nl(t)$
SCR for health underwriting risk	Proportional to BE of TP for health liabilities $SCR\_h(t) = SCR\_uwr\_h(0) / BELnet\_h(0) * BELnet\_h(t)$
SCR for market risk	Proportional to BS value of Investments and Loans $SCR\_mkt(t) = SCR\_mkt(0) / [Inv(0)+Loans(0)] * [Inv(t)+Loans(t)]$
SCR for counterparty default risk	Proportional to BS value of Reinsurance Recoverables and Loans $SCR\_def(t) = SCR\_def(0) / [ReRec(0)+Loans(0)] * [ReRec(t)+Loans(t)]$
SCR for intangible assets risk	Calculated using standard approach formula
Basic SCR	Calculated using standard approach formula
SCR for operational risk	Calculated using standard approach formula
Adjustment for loss absorbing effects	There is no real formula defined at this stage – it is assumed to be constant.
SCR on solo level	Calculated using standard approach formula
MCR	Calculated using standard approach formula
Own Funds	Projected in very simplistic way, as Basic Own Funds resulting from Solvency II Balance Sheet

SCR for Operational Risk

The standard formula that is used to calculate SCR operational risk is the following:

$$SCR\_op = \min \Big\{ 0.30 * BSCR \ ; \ \max \Big\{ \ 0.04 * (Earn_{life} - Earn_{life,ul}) + 0.03 * Earn_{nl} +$$
$$\max\{ 0.04 * ((Earn_{life} - 1.2*pEarn_{life}) - (Earn_{life,ul} - 1.2*pEarn_{life,ul})) \ ; 0\} +$$
$$\max\{ 0.03 * (Earn_{nl} - 1.2*pEarn_{nl}) \ ; 0\}$$
$$;$$
$$0.0045 * \max\{ TP_{life} - TP_{life,ul} \ ; \ 0\} + 0.03 * \max\{ TP_{nl} \ ; \ 0\}$$
$$\Big\}$$
$$+ 0.25 * Exp_{ul}$$

The SAS Capital Planning and Management Insurance Framework implements this calculation as follows:

- All parameters are defined as driver rates
- Data on gross earned premium and expenses are taken from projected income statements
- Data on gross BE of Technical Provisions are taken from a projected balance sheet

SCR on the Solo Level

The standard formula that is used to calculate SCR on solo level is the following:

$$SCR = BSCR + Adj + SCR_{Op}$$
$$BSCR = \sqrt{\sum_{ij} Corr_{ij} \times SCR_i \times SCR_j} + SCR_{intangible}$$

The SAS Capital Planning and Management Insurance Framework implements this calculation by using the following members of CPnM Account dimension:

C_RegC_SCR	RC (Solvency Capital ...	Expense	Credit	Period Close	
C_RegC_BSCR	RC (Basic Solvency Ca...	Expense	Credit	Period Close	
C_RegC_SCR_l	RC (Life Underwriting ...	Expense	Credit	Period Close	Modeling
C_RegC_SCR_nl	RC (P&C Underwriting ...	Expense	Credit	Period Close	Modeling
C_RegC_SCR_h	RC (Health Underwriti...	Expense	Credit	Period Close	Modeling
C_RegC_SCR_mkt	RC (Market Risk)	Expense	Credit	Period Close	Modeling
C_RegC_SCR_def	RC (Counterparty Def...	Expense	Credit	Period Close	Modeling
C_RegC_SCR_int	RC (Intangible Assets ...	Expense	Credit	Period Close	Modeling
C_RegC_SCR_div	RC (Diversification Eff...	Expense	Credit	Period Close	Modeling
C_RegC_Adj	RC (Adjustment for Lo...	Expense	Credit	Period Close	Modeling
C_RegC_SCR_op	RC (Operational Risk)	Expense	Credit	Period Close	Modeling

The correlation matrix is defined in the form of several driver rates with the prefix "RCM_". There is separate driver rate for each cell of correlation matrix.

The diversification effect is defined as one of the sons and is calculated based on the correlation matrix. The final SCR is calculated by using the default aggregation by summing values of children.

Although there is a CPnM Risk dimension, it is not used in this calculation to differentiate the SCR for the risks, primarily because it is easier to define them as separate accounts under one father (for calculation and visualization purposes).

Note: For qualitative assessment purposes, the insurance framework assigns the SCR value for CPnM Risk dimension.

Minimum Capital Requirement

The standard formulas to calculate the minimal capital requirement (MCR).

$$MCR = \max\{ MCR_{combined}; AMCR \} \quad \text{where AMCR is constant;}$$
$$MCR_{combined} = \min (\max (0.25*SCR; MCR_{linear}); 0.45*SCR)$$
$$MCR_{linear} = MCR_{(linear,nl)} + MCR_{(linear,l)}$$
$$MCR_{(linear,nl)} = SUM_{lob} (alpha_{lob} * TP_{lob} + beta * NWP_{lob})$$
$$MCR_{(linear, l)} = 0.037 * TP_{lob1} - 0.052 * TP_{lob2} + 0.007 * TP_{ob3} + 0.021 * TP_{ob4} + 0.0007 * CAR$$

Only the linear part of the formula is dependent on LoB.

The SAS Capital Planning and Management Insurance Framework implements this calculation by using the following two members of the CPnM Account dimension:

⊟ 📗 C_RegC_MCR	RC (Minimum Capital R...	Expense	Credit	Period Close	
📊 C_RegC_MCR_lin	Linear part of MCR	Expense	Credit	Period Close	Modeling
📊 C_RegC_MCR_fin	Final MCR	Expense	Credit	Period Close	Modeling

Where each of the members have formulas with a different scope:

- **C_Reg_MCR_lin**—represents the linear part of MCR

Figure 4-14 Formula for the Linear Part of MCR

Rank	Name	Expression
1	NL_Standard	-DRATE("MCR_alpha")...
2	Life_Standard	-DRATE("MCR_alpha") *(["...

Select members:

Dimension Type ▲	Member	Member Selection Rule	Apply
FINFUND	NA	Leaf descendants of member if a...	No
MISC	NA	Leaf descendants of member if a...	No
RISK	NA	Leaf descendants of member if a...	No
SOURCE	BaseForm	Leaf descendants of member if a...	
TRADER	EXT	Leaf descendants of member if a...	No
VALUEMETH	S2V	Leaf descendants of member if a...	No

Select properties:

Dimension Type ▲	Property	Operator	Value
ANALYSIS	CPnM_ForecastVersion	Equals value	true (True)
BUSINESS	CPnM_LobApproach	In the selected values	NL
TIME	CPnM_TimePerspective	In the selected values	Projected

Note: The linear member **is not summed** to its parent as indicated in the member properties. Therefore, ensure that this property is not changed. Changing the property results in invalid calculations.

☐ This member rolls up into its parent

- **C_Reg_MCR_fin**--represents the final value of MCR

Figure 4-15 Formula for the Final Value of MCR

Rank	Name	Expression
1	Standard	max(min(max(0.25*["...

Select members:

Dimension Type ▲	Member	Member Selection Rule
BUSINESS	NA	Leaf descendants of member if any...
FINFUND	NA	Leaf descendants of member if any...
MISC	NA	Leaf descendants of member if any...
RISK	NA	Leaf descendants of member if any...
SOURCE	BaseForm	Leaf descendants of member if any...
TRADER	EXT	Leaf descendants of member if any...
VALUEMETH	S2V	Leaf descendants of member if any...

Select properties:

Dimension Type ▲	Property	Operator	Value
ANALYSIS	CPnM_ForecastVersion	Equals value	true (True)
TIME	CPnM_TimePerspective	In the selected values	Projected

Note: All parameters that are used in formulas are defined as driver rates and have names AMCR, MCR_*, and so on.

Own Funds

The SAS Capital Planning and Management Insurance Framework uses a simplistic approach for the projection of own funds. Solvency II rules require to project basic own funds divided at minimum by tiers. Within the form-set that the insurance framework provides to the business user, initial (t=0) division into tiers is suggested. However, the user can change the proportions.

Figure 4-16 Form-Set Used for Capital Projections

Testing Alternative Management Decisions

All projections that are performed within the "Initial Projections" phase are labeled "PROJ_BASE."

PROJ_BASE is the first member of CPnM Analysis dimension, which is projected. This projection is achieved by scoping the form-set to this analysis. Adequate "Writeable Analysis members" are scoped to PROJ_VASE for the Initial Properties phase that the SAS Capital Planning and Management Insurance Framework provides.

When the "Initial Projections" step is complete, the user can analyze the results of the projections by analyzing how far is the projected "Ratio of Available Capital covering SCR" to the "Expected Ratio of Available Capital covering SCR" (risk appetite measure). If the position is not an expected one, then the adequate business user can test what alternative management decisions can be taken to meet the risk appetite.

Note: Before you test with an alternative management decisions, ensure that you make a copy of the projected data as illustrated in Figure 4-17.

Figure 4-17 Making a Copy of the Initial Projection to the Management Decision-Adjusted Projection
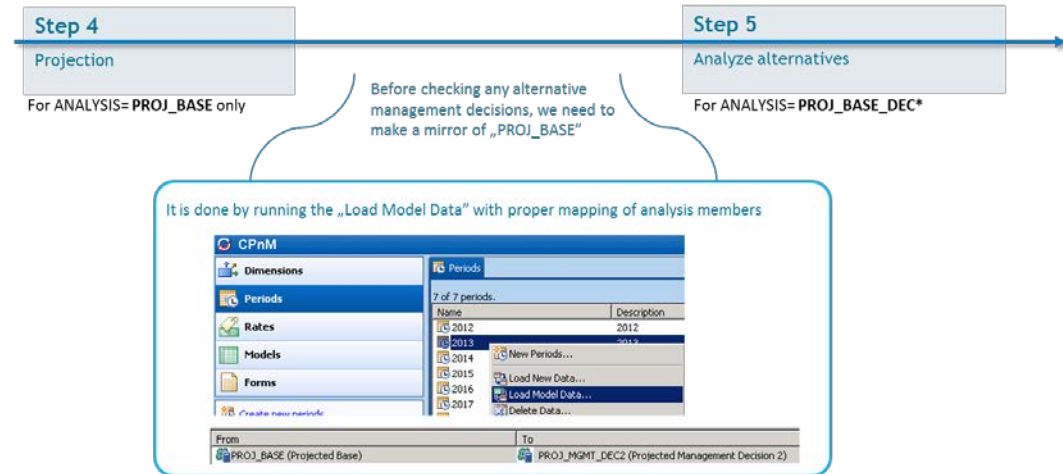
Because the SAS Capital Planning and Management Insurance Framework is using modeling formulas, which do not write the results to the database, data that is copied is uploaded to the system as well as the data that is manually changed within the forms.

Because all formulas are scoped for analysis members by using the custom property CPnM_ForecastVersion, only if a new analysis has that feature set to "True," are calculations performed the same way as in the initial analysis.

When performing a new analysis, ensure that within the definition of the model, there is a driver rate set defined for the new analysis.

Management Decisions on Level of LoB

You can perform the first step of testing alternative management decisions on the level of LoB. In the Test Alt Decisions – NL LoBs form-set (see Figure 4-18), the user is presented values of management factors in initial projections and the mirrored ones for tested projected analysis.

In Figure 4-18 and Figure 4-19, you can see that all of the numbers are recalculated, in addition to a graphical display of the same. If the risk appetite is not met, or the limits are very close, a user can change the values of factors, and the system recalculates all of the numbers. This feature enables a user to immediately determine whether his or her decision improves the position.

Figure 4-18 Testing Alternative Management Decisions for Non-Life Lines of Business

Test alternative management decisions: non-life lines of business

CPnM LoB ... Motor vehicle liability insurance
CPnM Scenario ... Baseline

	Projected Base					Projected Mgmt Decision				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Rates	0	0	0	0	0	0	0	0	0	0
NB Ratio	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Acquisition Expense Ratio	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Administration Expenses Ratio	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Loss Adjustment Expenses Ratio	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%
Gross to Net ratio for Claims	96%	96%	96%	96%	96%	86%	96%	96%	96%	96%
Gross to Net ratio for Premiums	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
Income Statement	177,459	184,073	194,809	209,983	226,474	237,498	184,073	194,809	209,983	226,474
Balance Sheet	(1,736,186)	(1,827,082)	(1,920,876)	(2,019,494)	(2,121,663)	(1,609,260)	(1,827,082)	(1,920,876)	(2,019,494)	(2,121,663)
Reinsurance recoverables from:	74,513	78,434	82,495	86,786	91,238	201,439	78,434	82,495	86,786	91,238
Technical provisions – non-life	(1,787,234)	(1,882,050)	(1,979,906)	(2,082,814)	(2,189,435)	(1,787,234)	(1,882,050)	(1,979,906)	(2,082,814)	(2,189,435)

	Projected Base					Projected Mgmt Decision				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
RC (MCR)	76,258	83,770	91,832	100,636	110,233	77,666	85,524	93,657	102,533	112,203
RC (SCR)	169,463	186,155	204,070	223,636	244,962	172,592	190,053	208,126	227,851	249,340
Basic Own Funds	346,107	421,131	512,208	622,431	755,537	533,073	483,518	576,954	689,554	825,060
Expected ratio of Available Capital covering SCR	180%	189%	198%	208%	209%	180%	189%	198%	208%	209%
Ratio of Available Capital covering SCR	204%	226%	251%	278%	308%	309%	254%	277%	303%	331%
Max Expected SCR	192,282	222,820	258,691	299,246	361,501	296,151	255,829	291,391	331,517	394,766

By changing the management factors, one can analyze how this influences final values

Figure 4-19 Testing Alternative Management Decisions for Unit-Linked Lines of Business

Test alternative management decisions: life lobs

CPnM LoB ... UL or IL other than var ann
CPnM Scenario ... Baseline

	Projected Base					Projected Mgmt Decision				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Rates	0	0	0	0	0	0	0	0	0	0
NB Ratio	9.00%	9.00%	9.00%	9.00%	9.00%	25.00%	9.00%	9.00%	9.00%	9.00%
Acquisition Expense Ratio	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Administration Expenses Ratio	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Investment Expense Ratio	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Fixed Fee	0	0	0	0	0	0.30	0.30	0.30	0.30	0.30
Fund Value Proportional Fee	1.00%	1.00%	1.00%	1.00%	1.00%	2.00%	1.00%	1.00%	1.00%	1.00%
Surrender Charge Rate	2.00%	2.00%	2.00%	2.00%	2.00%	10.00%	2.00%	2.00%	2.00%	2.00%
Income Statement	3,453	3,572	3,696	3,827	3,965	18,440	3,918	4,075	4,238	4,408
Balance Sheet	67,872	70,152	72,620	75,282	78,142	68,127	71,392	74,834	78,463	82,286
Assets held for IL and UL	1,109,821	1,147,105	1,187,464	1,230,989	1,277,760	1,113,992	1,167,379	1,223,671	1,283,001	1,345,515
Reinsurance recoverables from:	0	0	0	0	0	0	0	0	0	0
Technical provisions – life (excl IL and UL)	(1,041,950)	(1,076,953)	(1,114,844)	(1,155,707)	(1,199,618)	(1,045,865)	(1,095,988)	(1,148,837)	(1,204,539)	(1,263,230)

	Projected Base					Projected Mgmt Decision				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
RC (MCR)	39,127	39,822	40,628	41,546	42,574	40,905	41,821	42,858	44,014	45,289
RC (SCR)	156,509	159,286	162,514	166,185	170,296	163,622	167,285	171,433	176,058	181,157
Basic Own Funds	269,287	274,383	280,356	287,190	294,872	284,529	291,222	298,834	307,353	316,769
Ratio of Available Capital covering SCR	172.06%	172.26%	172.51%	172.81%	173.15%	173.89%	174.09%	174.32%	174.58%	174.86%
Expected ratio of Available Capital covering SCR	180.00%	189.00%	198.00%	208.00%	209.00%	180.00%	189.00%	198.00%	208.00%	209.00%
Max Expected SCR	149,604	145,176	141,594	138,072	141,087	158,072	154,086	150,926	147,766	151,564

By changing the management factors, one can analyze how this influences final values

Management Decisions for Assets

Once a management decision on the level of LoB has been made, the user can also test whether any change in the allocation of assets improves the position.

Figure 4-20 Testing Alternative Management Decisions for Assets

Test alternative management decisions

CPaM Organization … SAS BE NonLife Insurance Company
CPaM Scenario … Baseline

	Projected Base					Projected Mgmt Decision				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Asset Classes Allocation	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Bonds Allocation Percentage	82%	82%	82%	82%	82%	90%	82%	82%	82%	82%
Equity Allocation Percentage	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Property Allocation Percentage	8%	8%	8%	8%	8%	0%	8%	8%	8%	8%
Property Types Allocation	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Commercial Property Allocation	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
Residential Property Allocation	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Bonds Types Allocation	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Corporate Bond Allocation Perc	29%	29%	29%	29%	29%	29%	29%	29%	29%	29%
Government Bonds Alloc Percentage	71%	71%	71%	71%	71%	71%	71%	71%	71%	71%
Corporate Bonds Allocation	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Corp Bonds High Yield Alloc Perc	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%
Corp Bonds Inv Grade Alloc Perc	65%	65%	65%	65%	65%	65%	65%	65%	65%	65%
Government Bonds Allocation	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Gov Bonds High Yield Alloc Perc	18%	18%	18%	18%	18%	18%	18%	18%	18%	18%
Gov Bonds Inv Grade Alloc Perc	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%
RC (MCR)	76,258	83,770	91,832	100,636	110,233	77,666	85,524	93,657	102,533	112,203
RC (SCR)	169,463	186,155	204,070	223,636	244,962	172,532	190,053	208,126	227,851	249,340
Basic Own Funds	346,107	421,131	512,208	622,431	755,537	533,073	483,518	576,954	683,554	825,060
Expected ratio of Available Capital covering SCR	180%	183%	198%	203%	203%	180%	183%	198%	208%	203%
Ratio of Available Capital covering SCR	204%	226%	251%	278%	308%	303%	254%	277%	303%	331%
Max Expected SCR	192,282	222,820	258,631	299,246	361,501	296,151	255,829	291,391	331,517	334,766

By changing the management factors, one can analyze how this influences final values.

Projected Base — RC (MCR), RC (SCR), Max Expected SCR

Projected Mgmt Decision — RC (MCR), RC (SCR), Max Expected SCR

5

The Qualitative Assessment Process

Overview

Although the main objective of the SAS Capital Planning and Management Insurance Framework is to support capital projections, it can also support very basic qualitative assessment of elements of risks or control mechanisms by means of a questionnaire.

Within the predefined model, the insurance framework provides a predefined process named Qualitative Assessment for insurance that performs the following:

- Gathers information on assessment of maturity of risk management process by using a questionnaire that has six questions for each type of risk.

- Provides an expert estimation of the additional risks

Figure 5-1 Quality Assessment Process

Assessing Maturity of Risk Management Process

The first step of assessing maturity of managing each type of risk is performed by using the form-set (see Figure 5-2) that reflects the questionnaire with six questions, each

with five possible answers. Each of the five answers reflects a certain level. Each level has assigned grades, which are defined as driver rates. The sum of all grades obtained from all of the questions represents the overall maturity level.

This exercise is performed for each projected year.

Figure 5-2 Questionnaire Assessment

Estimating Other Types of Risks

The next step (see Figure 5-3) enables the user to provide an expert estimation of capital requirements for additional Own Risk and Solvency Assessment (ORSA) risks.

Figure 5-3 Expert Judgment of Risk Capital Requirements

Provide other Capital Requirements								
CPnM Organization ... SAS BE NonLife Insurance Company								
CPnM Scenario ... Baseline								
	2013		2014		2015		2016	
	Maturity Points	Capital Requirement	Maturity Points	Capital Requirement	Maturity Points	Capital Requirement	Maturity Points	Capital Requirement
Market risk	140	153,268	170	165,129	190	177,956	230	192,063
Counterparty default risk	100	20,698	140	21,293	190	21,888	210	22,491
Life underwriting risk	60	0	60	0	60	0	60	0
Health underwriting risk	60	0	60	0	60	0	60	0
Non-life underwriting risk	120	54,954	160	58,439	190	61,986	230	65,661
Operational risk	110	52,395	130	56,247	160	60,381	190	64,896
Reputational risk	60	8,356	80	8,774	90	9,212	110	9,673
Legal risk	60	6,273	80	6,587	100	6,916	130	7,262

C H A P T E R

6

Reports

Overview

The SAS Capital Planning and Management Insurance Framework provides a set of predefined reports. You can access these reports by using the SAS Visual Analytics Viewer, which is accessible from the SAS Financial Management web application.

For detailed information about the SAS Visual Analytics Viewer, see the *SAS Visual Analytics: User's Guide*.

To access the list of predefined reports that are provided by the SAS Capital Planning and Management Insurance Framework, complete the following steps:

1. From the SAS Financial Management web application, click **Open** under Common Actions.

Figure 6-1 SAS Financial Management Web Application – Access Predefined Reports

2. Navigate to the folder in which the predefined reports are stored by selecting **Products** > **SAS Capital Planning and Management** > **2.2 Insurance** > **Standard Reports**.

Figure 6-2 Path to Folder with Predefined Reports
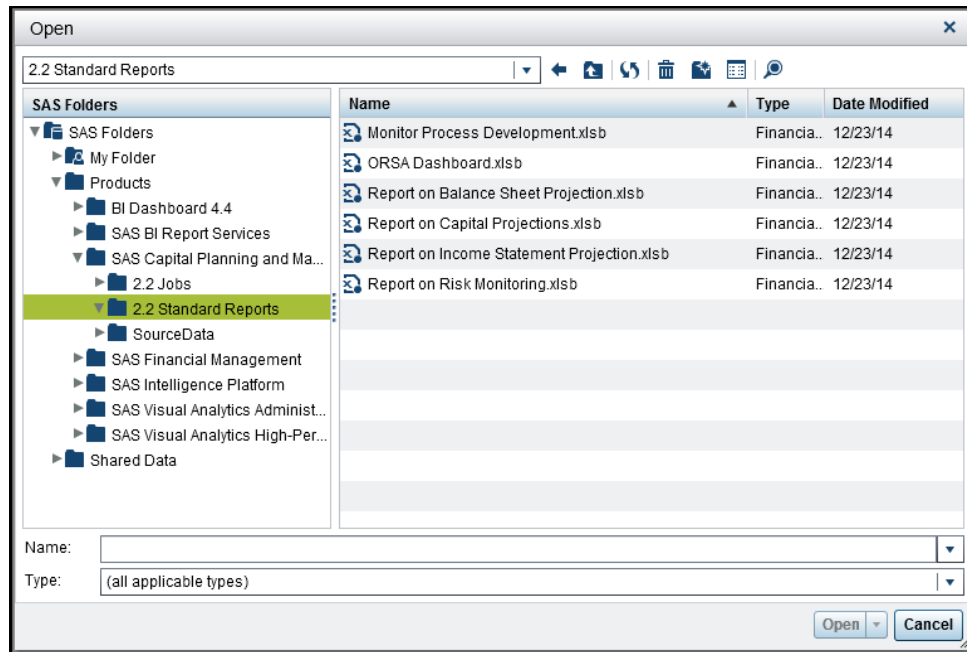
3. To open the report in the SAS Financial Management Add-In for Microsoft Excel, double-click the name of the report.

Reviewing the Report on Income Statement Projections

The "Report on Income Statement Projection" report presents all elements of income statement for a selected entity, line of business (LoB), scenario, and analysis. This report enables you to view all numbers. You can view additional measures by drilling down the hierarchy defined in the CPnM_Account dimension.

At the bottom of the report, there are graphical views of the comparison of the value of a selected measure for different scenarios, and the selected measure before and after management decision.

Figure 6-3 Report on Income Statement Projections
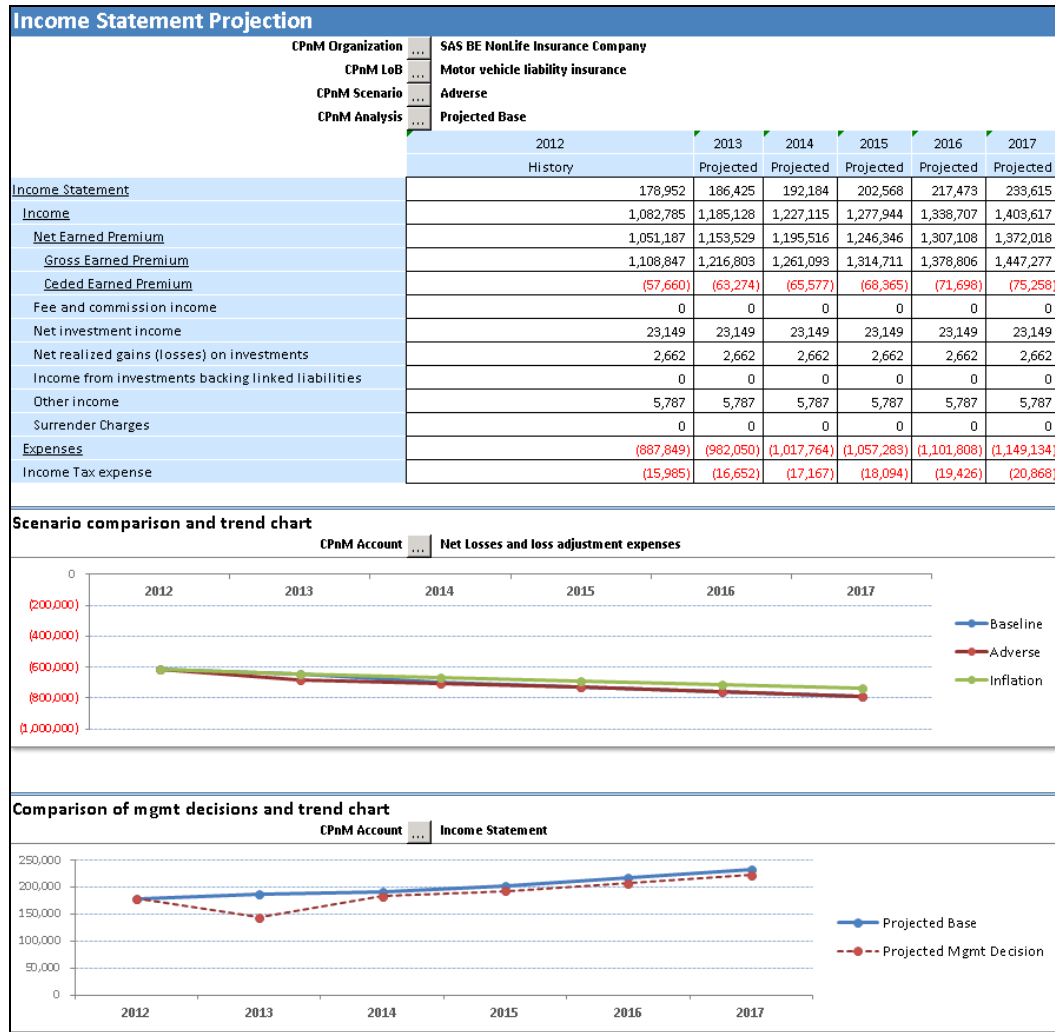
Reviewing the Report on Balance Sheet Projections

The "Report on Balance Sheet Projection" report presents all elements of a balance sheet for a selected entity, scenario, and analysis.

You can view all numbers and drill down on measures by following the hierarchy that is defined within CPnM_Account dimension.

At the bottom of the report, there are graphical views that show the comparison of a selected measure for different scenarios, and the selected measure with and without management decision.
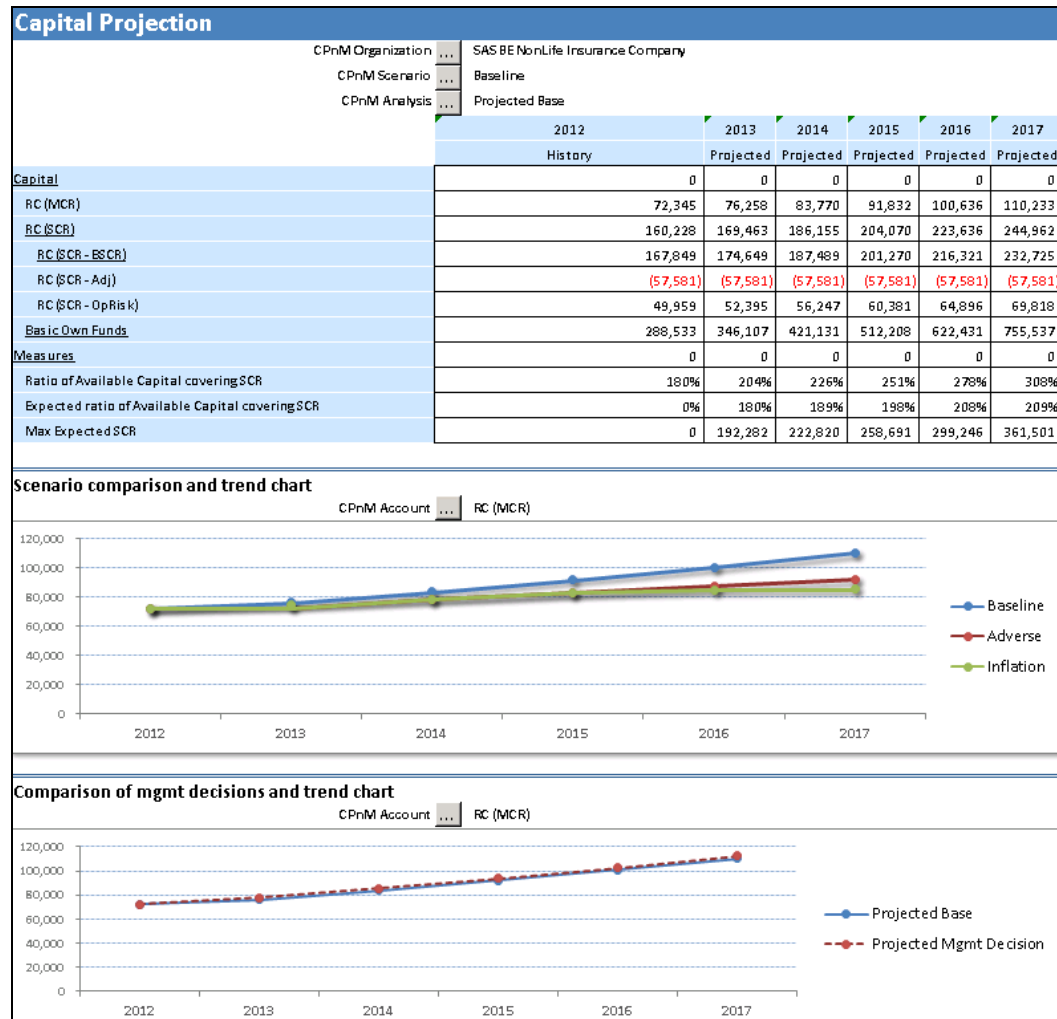
Figure 6-4 Report on Balance Sheet Projections
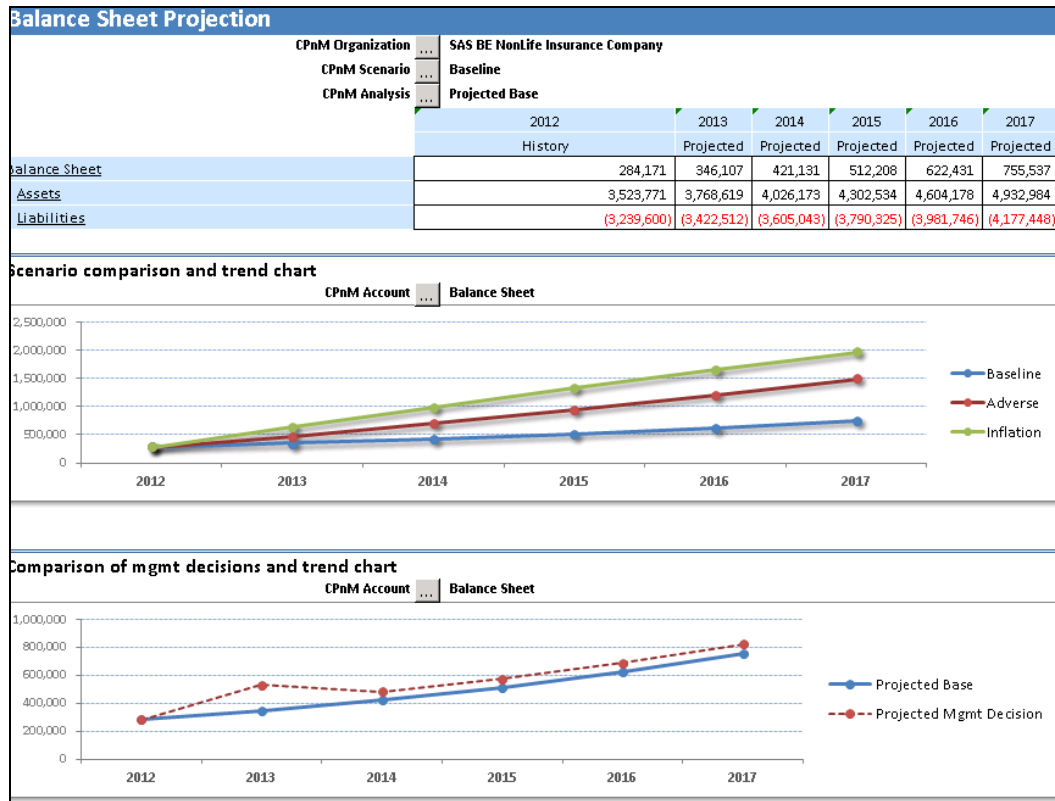
Reviewing the Report on Capital Projections

The "Report on Capital Projections" report presents all of the elements of capital requirements for a selected entity, scenario, and analysis. You can view all the numbers and drill down on measures by following the hierarchy that is defined in the CPnM_Account dimension.
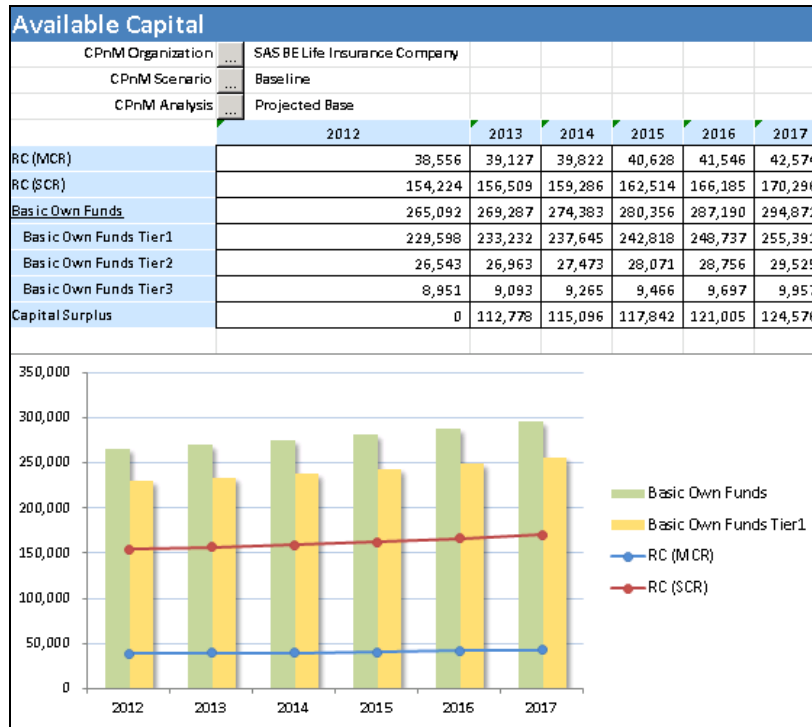
At the bottom of the report, there are graphical views that show the comparison of a selected measure for different scenarios, and then for the selected measure with and without management decision.

Figure 6-5 Report on Capital Projections, Part 1

Capital Projection						
CPnM Organization ...	SAS BE NonLife Insurance Company					
CPnM Scenario ...	Baseline					
CPnM Analysis ...	Projected Base					
	2012	**2013**	**2014**	**2015**	**2016**	**2017**
	History	Projected	Projected	Projected	Projected	Projected
Capital	0	0	0	0	0	0
RC (MCR)	72,345	76,258	83,770	91,832	100,636	110,233
RC (SCR)	160,228	169,463	186,155	204,070	223,636	244,962
RC (SCR - BSCR)	167,849	174,649	187,489	201,270	216,321	232,725
RC (SCR - Adj)	(57,581)	(57,581)	(57,581)	(57,581)	(57,581)	(57,581)
RC (SCR - OpRisk)	49,959	52,395	56,247	60,381	64,896	69,818
Basic Own Funds	288,533	346,107	421,131	512,208	622,431	755,537
Measures	0	0	0	0	0	0
Ratio of Available Capital covering SCR	180%	204%	226%	251%	278%	308%
Expected ratio of Available Capital covering SCR	0%	180%	189%	198%	208%	209%
Max Expected SCR	0	192,282	222,820	258,691	299,246	361,501

Scenario comparison and trend chart

CPnM Account ...   RC (MCR)

Comparison of mgmt decisions and trend chart

CPnM Account ...   RC (MCR)

The Report on Capital Projection report has two parts. The first part is capital projection. The second part of the report (second sheet) shows the comparison of capital requirements against Basic Own Funds (and BOF of Tier1) for a selected entity, scenario, and analysis.

Figure 6-6 Report on Capital Projections, Part 2

Available Capital							
CPnM Organization ...	SAS BE Life Insurance Company						
CPnM Scenario ...	Baseline						
CPnM Analysis ...	Projected Base						
		2012	2013	2014	2015	2016	2017
RC (MCR)		38,556	39,127	39,822	40,628	41,546	42,574
RC (SCR)		154,224	156,509	159,286	162,514	166,185	170,296
Basic Own Funds		265,092	269,287	274,383	280,356	287,190	294,872
Basic Own Funds Tier1		229,598	233,232	237,645	242,818	248,737	255,391
Basic Own Funds Tier2		26,543	26,963	27,473	28,071	28,756	29,525
Basic Own Funds Tier3		8,951	9,093	9,265	9,466	9,697	9,957
Capital Surplus		0	112,778	115,096	117,842	121,005	124,576

Reviewing the Report on Risk Monitoring

The "Report on Risk Monitoring" report presents the projected risk against expected risk appetite measures (solvency capital requirement [SCR] cover ratio and risk limits by risk).

Figure 6-7 Report on Risk Monitoring
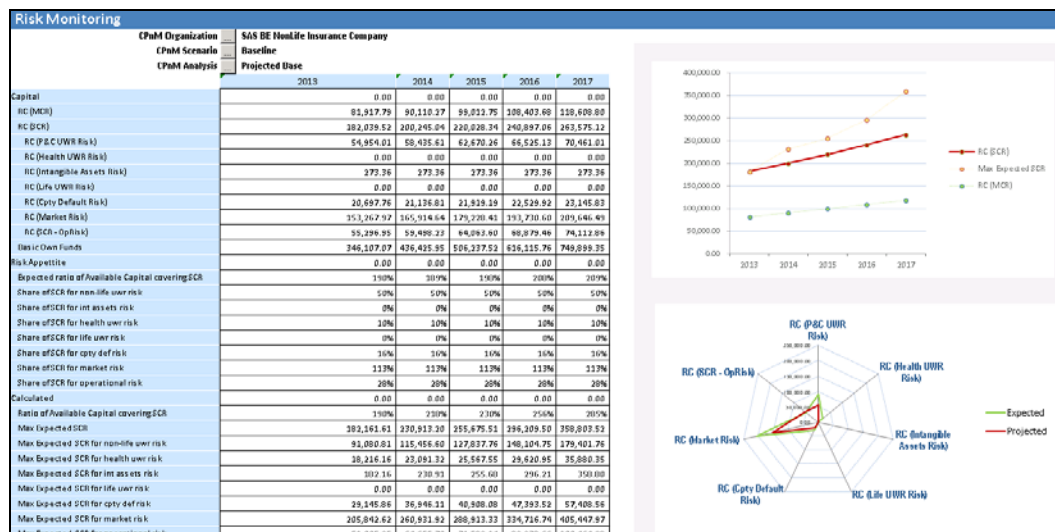
Using the Monitor Process Development Report

Qualitative assessment of maturity of risk management for each type of risk provides the data. This data can be further analyzed by using the "Monitor Process Development" report. (See Figure 6-8.) You can easily see which risk is being managed well and if a risk is not well managed at a specific time, whether it will be managed better in the future.

Figure 6-8 Monitor Process Development Report

Using the ORSA Dashboard Report

You can analyze all basic information about risk requirement and position from different angles with the "ORSA Dashboard" report.

Figure 6.9 ORSA Dashboard
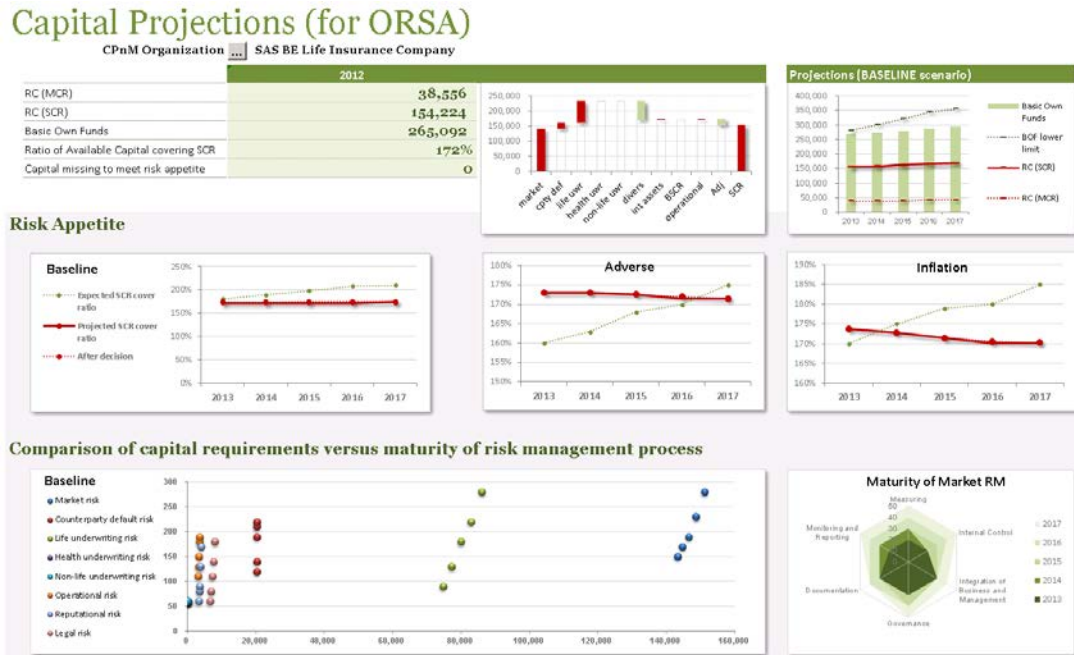
When using the ORSA Dashboard, note the following:

- In the top left corner of the report, you can see the basic information about *t*=0. In Figure 6.9, the year is 2012. The basic measure of capital requirement, as well as SCR cover ratio are shown, as well as the distribution of SCR by all elements (sub risks, diversification effect, and adjustment).

- In the top right corner of the report, the projection for the baseline scenario compares the capital requirements (minimum capital requirements [MCR], SCR) and Own Funds (OF) together with the lower limit of OF. You can see that in this example the limits are not reached.

- In the Risk Appetite frame, the behavior or projected (versus expected and expected after management decisions) value of basic risk appetite measure that is the SCR cover ratio is analyzed.

- In the bottom left corner, using the scatter plot, you can analyze the volume of capital requirements (axis X) for a given risk against the maturity of managing it (axis Y). This is an easy way to verify whether high risks are well managed.

- In the bottom right corner, the end the development of maturity of managing the highest risk (in this case – market risk) is shown in context of time.

Note: You can select the entity for which this dashboard presents information.

C H A P T E R

7

Predefined Jobs

Overview

To ease the step of configuration within implementation projects (or PoC), the SAS
Capital Planning and Management Insurance Framework comes with a set of
predefined SAS Data Integration Studio jobs, as shown in Figure 7-1:

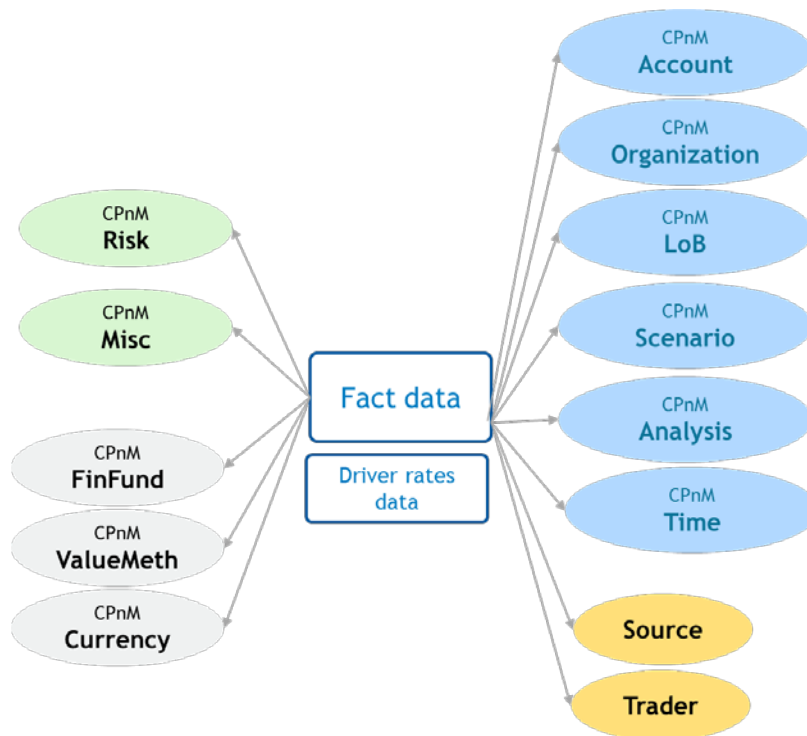Figure 7-1 Predefined SAS Data Integration Studio Jobs
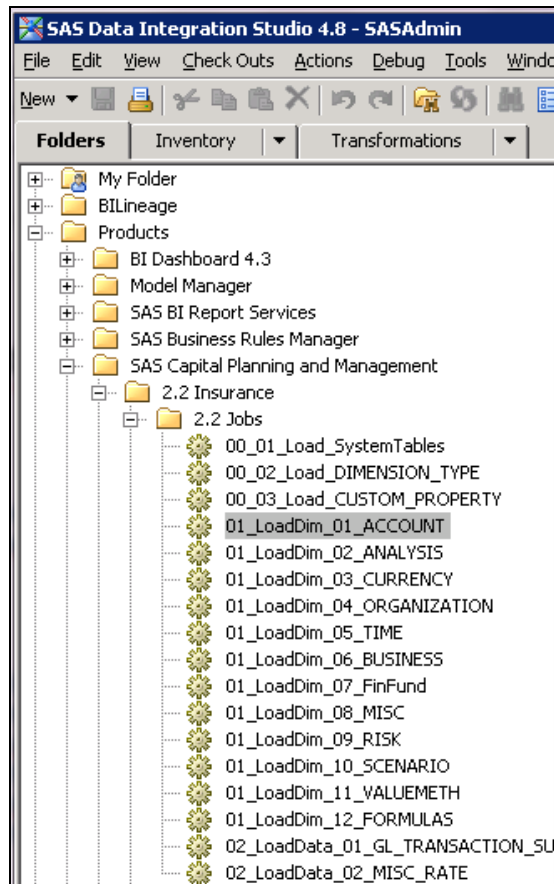
The list of predefined jobs includes the following:

- 00_01_Load_SystemTables—ensures proper content of all system tables within StageFM

- 00_02_Load_DIMENSION_TYPE—loads the definitions of all dimensions that a model uses; definitions of those dimensions are prepared in the dedicated Microsoft Excel file CPnMI_Dimensions sheet "DIMENSION_TYPE"

- 00_03_Load_CUSTOM_PROPERTY—loads the definitions of custom properties that are defined in the dedicated Microsoft Excel file CPnMI_Dimensions sheet "CUSTOM_PROPERTY"

- 01_LoadDim_*—loads the domain of dimensions; reads the data that is prepared in the dedicated Microsoft Excel file CPnMI_Dimensions from sheets with the name of a given dimension type

- 02_LoadData_01_GL_Transaction_sum – loads the data (mainly for $t=0$, but it can be any data) that is prepared in the dedicated MS Excel file CPnMI_InputData, sheet "Data"

- 02_LoadData_02_MISC_RATE – loads the driver rates that are prepared in the dedicated MS Excel file CPnMI_InputData, sheet "DriverRates"

Both the input data as well as driver rates should be prepared in specific format. They must be defined in the context of all of the dimensions that are used in the SAS Capital Planning and Management Insurance Framework model. For those dimensions, where the given $t=0$ value is not defined, you should provide the default value, which in most cases is "NA." Driver rates, which are defined as constant within a given dimension, should have a null value for that dimension.

Figure 7-2 Fact Data and Driver Rates Should be Defined in Context of These Dimensions

Uploading Dimension Definitions

Using the predefined SAS Data Integration Studio jobs and SAS Financial Management Studio features, the process of uploading the definitions of dimensions (hierarchies, members, and formulas) is as follows:

1. Business user prepares the definition of a dimension in an Microsoft Excel file, following the required logic:

Figure 7-3 Sample Definition of CPnM Account Dimension in Input Data File

PARENT_GL_ACCO...	GL_ACCOUNT_ID	GL_ACCOUNT_NM	GL_ACCOUNT_DESC	ROLL_UP_TO_PARE...
IS	IS	Income Statement	Income Statement	Y
IS	IS_Income	Income	Income	Y
IS_Income	IS_NEP	Net Earned Premium	Net Earned Premium	Y
IS_NEP	IS_GEP	Gross Earned Premium	Gross Earned Premium	Y
IS_GEP	IS_GWP	Gross Written Premium	Gross Written Premium	Y
IS_GEP	IS_GC_UPP	Gross change in provision for unearn	Gross change in provision for unearn	Y

2. Data is uploaded to the staging area (StageFM) by using the SAS Data Integration Studio jobs (for Accounts and Analysis, the user should also run 01_LoadDim_12_FORMULAS).

Figure 7-4 SAS Data Integration Studio Job to Upload Dimension CPnM Account
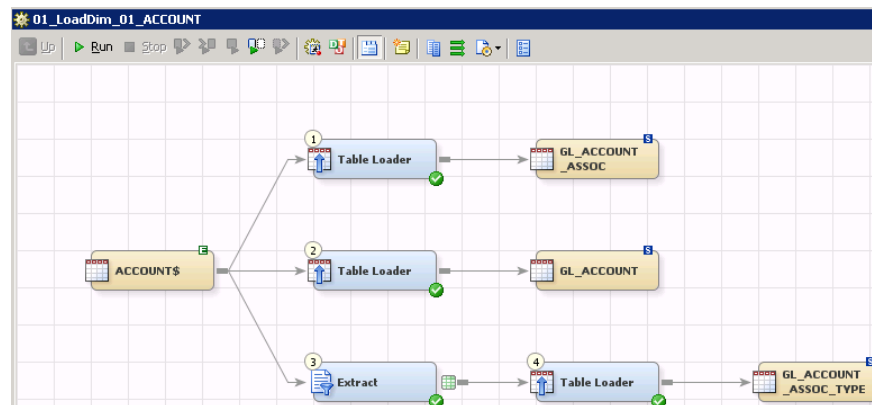
3. The business administrator loads the data from the staging area into the model by using SAS Financial Management Studio.

Figure 7-5 SAS Financial Management Studio used by Administrator for Uploading Dimension Definitions from StageFM to database.
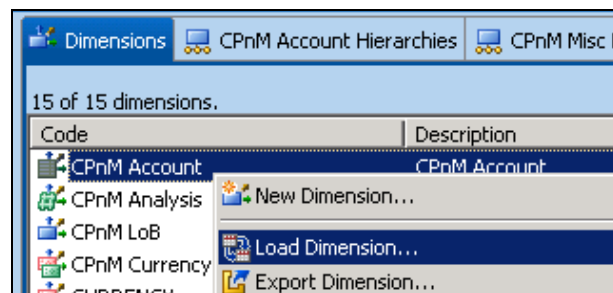
After completing those tasks, business users should be able to see updated content of dimensions in form-sets or reports (unless certain members of those dimensions are restricted within a given form-set or report).
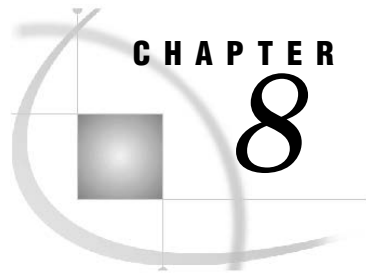
C H A P T E R

8

Formulas

Overview

One of the basic assumptions made by the SAS Capital Planning and Management Insurance Framework is that the calculations should be performed in real time. That is, when you change the value of a parameter and see the results of the recalculations following the change.

Performing calculations in real time is especially important for the "Testing Alternative Management Decision" phase.

Changing the value of a parameter invokes changes in the values of all measures that are dependent on it (and subsequent ones), regardless of whether the measures are present on given form-set or not.

It is for this reason that most of the formulas that are defined within the SAS Capital Planning and Insurance Framework are modeling formulas.

Scoping of Formulas

Modeling formulas are recalculated every time the value that influences the formula is changed. Therefore, it is very important that those calculations are performed quickly. To ensure that the speed of calculations is maximized, all modeling formulas need to be maximally scoped.

Figure 8-1 illustrates the typical scoping for formulas that the SAS Capital Planning and Management Insurance Framework uses.

Figure 8-1 Typical Scoping of Formulas in the SAS Capital Planning and Management Insurance Framework

General notes about the SAS Capital Planning and Management Insurance Framework scoping of formulas include the following:

- The first part of scoping uses members to scope.

- The members follow the assumptions that are explained in Chapter 2, "Dimensions." Dimensions are used within actual versions of the insurance framework, with the assumption on the Source dimension.

- The second part of scoping uses the custom properties, which provides more flexibility going forward:

| Custom Property	Description
CPnM_ForecastingVersion	Describes whether ANALYSIS is a forecast or a projection or whether they are actual or real values.
CPnM_LobApproach	Differentiates the approach to calculations. There are two domains: non-life (NL) and unit-linked (UL). The formula used in Figure 8-1 is for NL.
CPnM_TimePerspective	Differentiates historical periods from projected periods. Calculations are performed for projected periods.
CPnM_InitialPlanningPeriod	Indicates whether the given time period is the first one to be projected.

First Projected Period Formulas

There are many formulas that are based on values from previous periods. In general, this is not problematic, because a formula can refer to the Time dimension and take the value from previous member (["TIME"=CURRENT ("TIME")-1]). However, it is important to remember that the historical data (at $t=0$) is uploaded to ANALYSIS=Actual and SCENARIO=NA and that projections are done for other analyses and other scenarios.

If you write a simple formula (by referring to Time only), no values are obtained. That is why there are two versions for all recurrent formulas. The second version is identified by suffix **_FPP**.

Figure 8-2 illustrates the situation where, for the first projected period (FPP), additional cross-references are needed.

Figure 8-2 First Projected Period Formulas
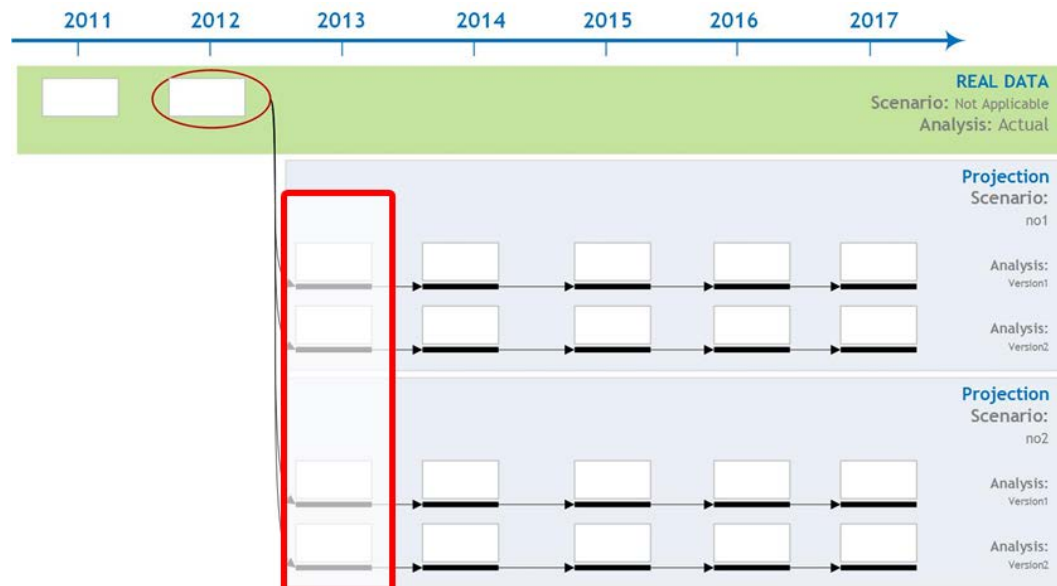
The _FPP formulas differ in the following ways:

- **Expression** – because the formula must reference analysis=ACT and scenario=NA

```
ceil(["ACCOUNT"="R_NoPolicies"]["TIME"=CURRENT("TIME")- 1]["ANALYSIS"="ACT"]["SCENARIO"="NA"]
*(1- ["ACCOUNT"="R_LapseRatio"]+["ACCOUNT"="R_NBRatio"]))
```

- **Scoping** – for *_FPP formula scoping on the following properties occurs:

Dimension Type	Property	Operator	Value
ANALYSIS	CPnM_ForecastVersion	Equals value	true (True)
BUSINESS	CPnM_LobApproach	In the selected values	NL
TIME	CPnM_InitialPlanningPeriod	Equals value	true (True)

Select properties:

While for all subsequent periods scoping on the following properties occurs:

Dimension Type ▲	Property	Operator	Value
ANALYSIS	CPnM_ForecastVersion	Equals value	true (True)
BUSINESS	CPnM_LobApproach	In the selected values	NL
TIME	CPnM_TimePerspective	In the selected values	Projected
TIME	CPnM_InitialPlanningPeriod	Does not equal value	true (True)

Select properties:

Formulas for Risk Factors

Within SAS Financial Management, by default, the value for the parent member is calculated as the sum of the values of the children.

However, in some cases the SAS Capital Planning and Management Insurance Framework needs to change the calculation. For example, when there is a risk factor, which is described by the base value and then the shock value, where the latter is expressed in basis points.

Figure 8-3 illustrations Lapse Ratio.

Figure 8-3 – Example of Risk Factor being the Subject of Shock

Lapse Ratio	3.20%	2.40%	2.40%	2.40%	2.40%	2.40%
Lapse Ratio Base	0	2.00%	2.00%	2.00%	2.00%	2.00%
Lapse Ratio Shock	0	20.00%	20.00%	20.00%	20.00%	20.00%

To obtain the effect as shown in Figure 8-3, apply the following workaround:

- Within the CPnM Analysis dimension, define a dedicated formula for each member.
- The predefined formula is scoped only for accounts that have the custom property CPnM_ShockRate set to true. (See Figure 8-4.)

Figure 8-4 Definition of Workaround Formula for Shocked Risk Factors

In addition, within the CPnM Account dimension, members that should be regarded as shocked risk factors are defined by being set to true. (See Figure 8-5.)
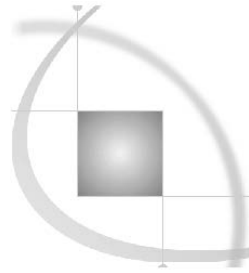
Figure 8-5 Using CPnM Shock Rate

This workaround enables the SAS Capital Planning and Management Insurance Framework to properly disclose the values of shocked rates. However, the insurance framework must provide full expression in all formulas that use a given risk factor.

References

European Insurance and Occupational Pensions Authority (EIOPA). 2011. *Specifications for the 2011 EU-wide stress test in the insurance sector*. Frankfurt, Germany.

Planchet F., Q. Guibert and M. Juillard. 2012. *Measuring Uncertainty of Solvency Coverage Ratio in ORSA for Non-Life Insurance*. Institute of Science and Financial Insurance. Lyon, France.