An Object Oriented Simulation and Forecasting Tool with the SAS® System

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- simulation technology
- business management simulations
- specific demands in the project
- object oriented model
- implementation of object orientation in the application
- SAS® System as application development platform

The speed of reaction on emerging developments becomes more and more important for the success of enterprises.

If you agree with this statement you should also agree to the following:

Looking into the past is not sufficient to set the course for the future.

Simulation and forecasting are means to meet the challenges of today.

Simulation Technology

- well known examples
  - world models
    (Forester, Global 2000)
planning models  
(Ifo, Roland Berger)
company systems  
Thomas Witte: Simulationstheorie und ihre Anwendung auf betriebliche Systeme (1973!!)

- different types
  - Monte Carlo simulation
    - use random number generators and show distributions
      - production plants
      - queues
  - System Dynamics
    - do not use random numbers, results are reproduceable
      - world models
      - housing markets

Simulation for Business Management Needs
Demands

- easy access to different data sources
- integrated reporting system
  (management information)
- providing data for other information systems
- easy and flexible definition of models
- easy maintainance of models and further development
- automatic documentation

The current task was

Planning of Liquidity and Profitability
- simulation of the main accountancy
- input from existing forecasts and estimations
- modelling of processes with delays
- 2000 accounts and auxiliary variables
- support for the recognition of errors during the model definition
  - step by step approach for the creation of the models (object orientation)
  - complete documentation including cross reference lists
- easy further development and refinement

Main Structure

Object Orientation?
Due to a number of reasons the object oriented approach has to be modified:

- **development of a model by evolution**

  Starting with a simple model it must be possible to further develop it.
  - classes will be further developed (changed)
  - variables may change their class
  - this requires methods to balance a new class structure with an earlier developed model under the control of the developer

- **class model**
  - strict control of types
  - the class model defines the sequence of calculations
  - default calculations
  - limited inheritance
  - test program to control the consistency of a class model

- **documentation**
- **enhancements**

I am currently working on the implementation of dimensions. Then a model variable may be a vector which is summarized according to the definition of the dimension automatically after calculations have been performed.

**Integrated Application**

- integration of data access and preparation
- execution of the simulation and management of different scenarios with comments and documentation
- modularisation
  - dividing a model into submodels and managing the execution
- reports for executives
  - using a report generator [view an Example](#)
- what if analyses [DEMO](#)
- comparisons of plan and actual
- interactive information system
  - with drill down paths

**Implementation using the SAS System**

The most important reasons for implementing such a tool using the SAS System were the knowledge of the developer and the fact, that most of the data was already stored in a SAS database.

But there are also other reasons for using the SAS System:
• **application development environment**
  - short development time
  - flexible adjustment to new demands
  - support for prototyping concepts

• **investment security**
  - the programs are easy to understand and easy to maintain by the customer
  - they are portable to any platform supported by the SAS System

• **data access and preparation**

• **datastep compiler and SCL**

  (to compile the class and model definitions)

• **SAS/ETS®**

  (to incorporate elaborated forecasting methods)

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