LLOYD'S

R VERSUS EXCEL/VBA

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- Typical challenges
  - On the input side
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- Improved systems setup
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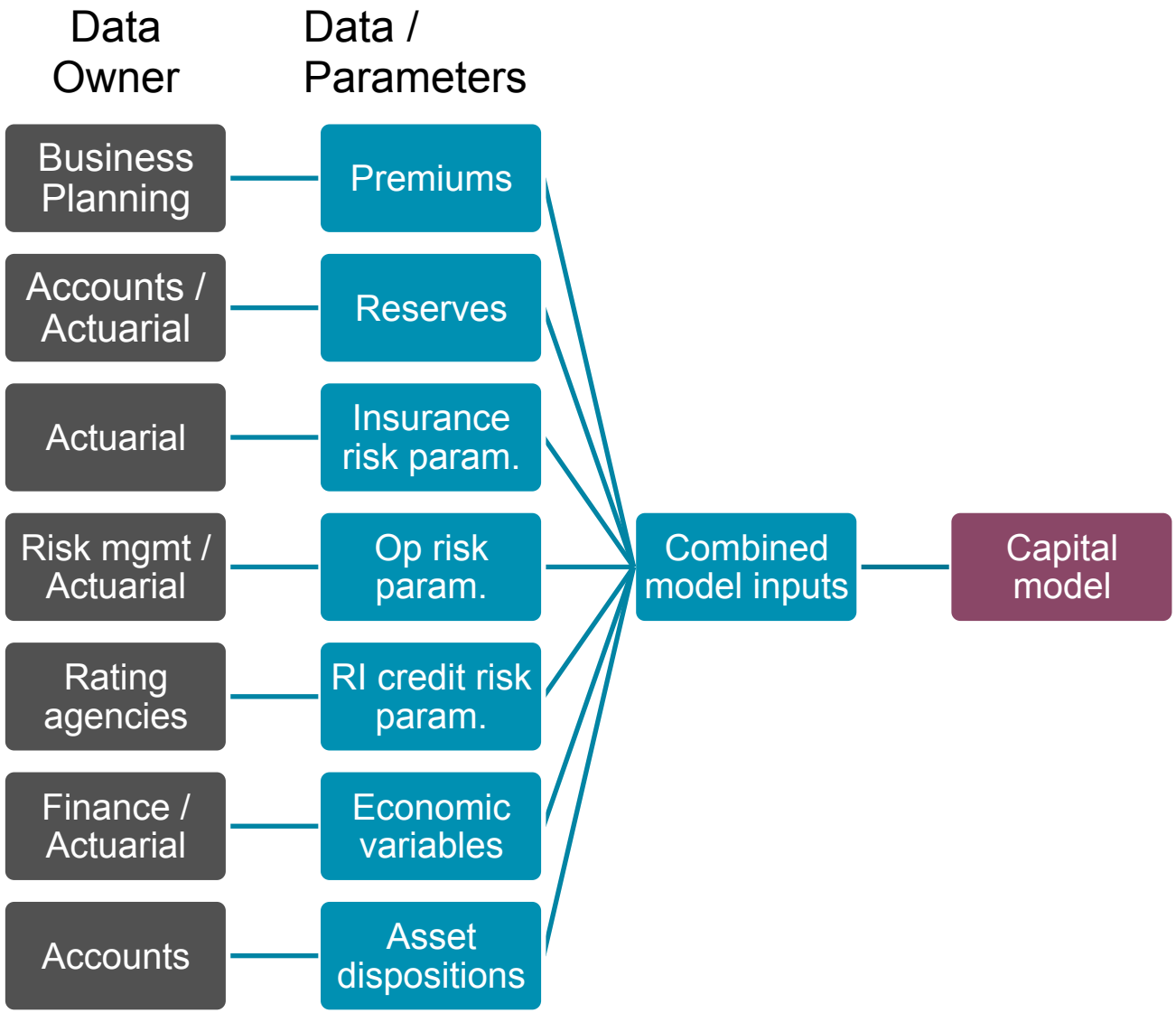
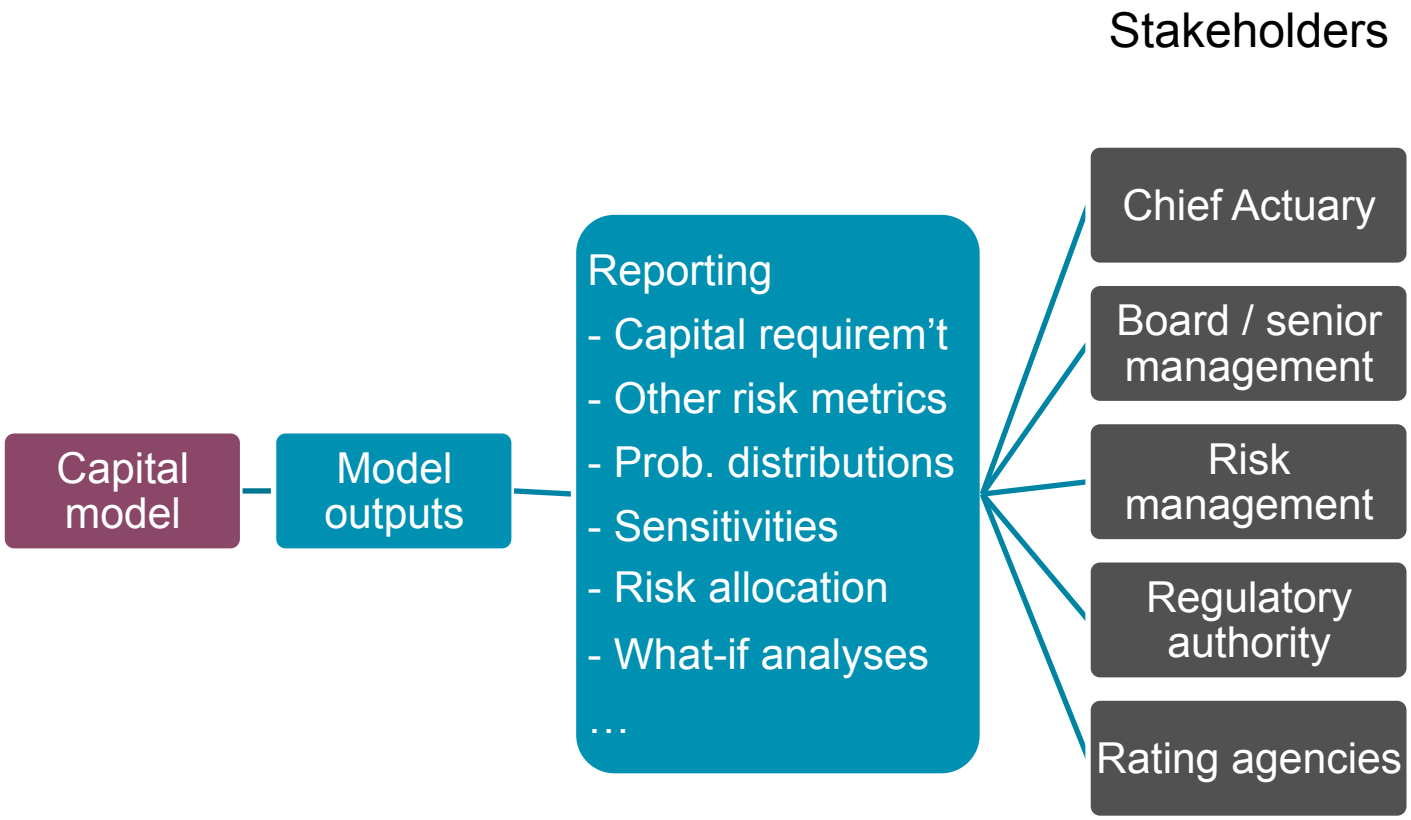
CAPITAL MODELLING WORKFLOW – INPUTS



CAPITAL MODELLING - INPUTS

- What are the main challenges on the input side?
  - Lots of different data sources and data source systems
  - Lots of data processing & data validation issues
  - Lots of different data versions
  - Team work

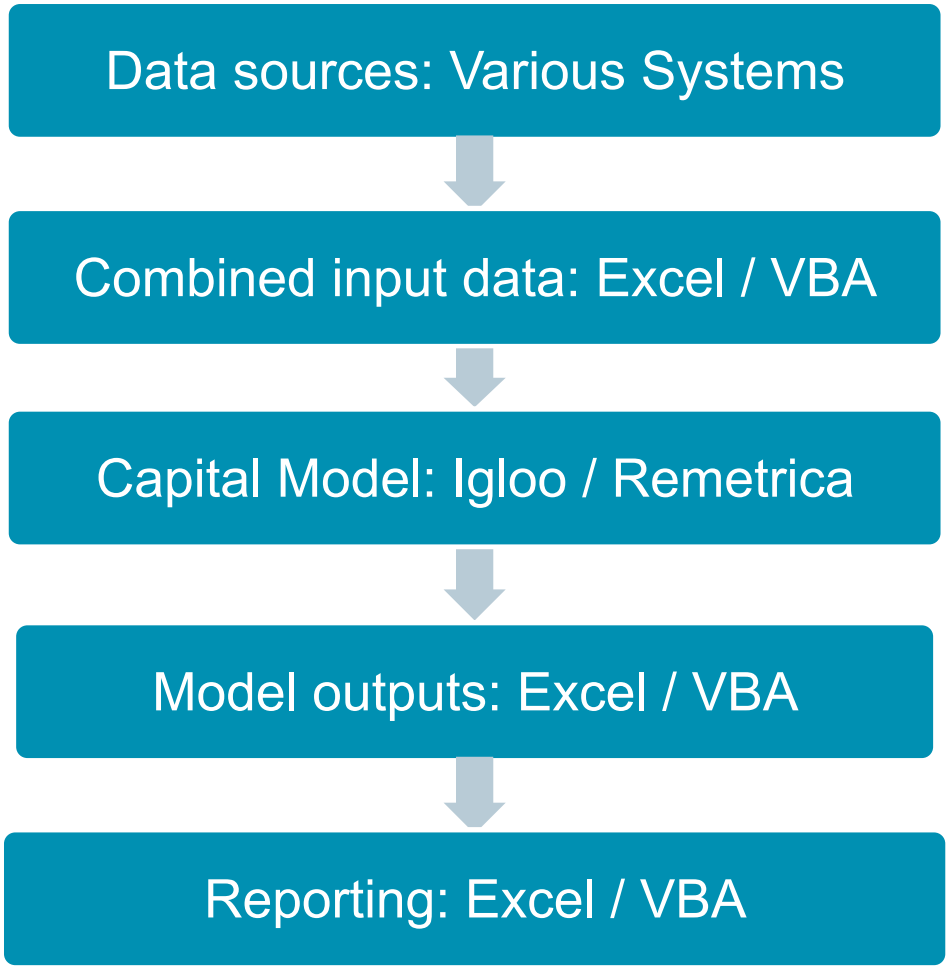
CAPITAL MODELLING WORKFLOW - OUTPUTS



CAPITAL MODELLING - OUTPUTS

- What are the main challenges on the output side?
  - Very high data volumes (Terabytes)
  - Lots of model runs with different versions of data and model configurations (> 1000 in one year)
  - Audit trail from input & model configuration to output
  - Lots of different analyses and reports
  - Team work

CAPITAL MODELLING TYPICAL SYSTEMS SETUP



ISSUES WITH EXCEL / VBA

- Disparate data sources ⇒ lots of linked files
  - Updating links in Excel is haphazard
- Updated at different times / lots of different versions
  - Links do not automatically point to new file versions
  - Version numbers in filenames break links
  - Tracking links becomes impossible
- Problems with referential integrity
  - Eg business planning segmentation of business is different from underwriting classes of business
  - Lots of lookup functions – very hard to check

MORE ISSUES WITH EXCEL/VBA

- Most common update is moving forward one year
  - Means changing layout of tables
  - Affects references to ranges
  - Potentially makes links obsolete
- No support for team work / multi user environment
  - Only one user can work on a file at any given time.
  - Standard solution is to split files ⇒ more links
  - Or make copies ⇒ problems with combining changes made by different users on different copies.

ISSUES WITH VBA

- VBA and data are typically bound together (although it is possible to have files which only contain VBA and operate on other files)
- VBA Code is duplicated many times over, because a copy is made every time the data is updated and a new version created
- VBA Code changes cannot easily be applied to past data sets
- Software development standards are hard to enforce
  - No formal version control
  - No concept of code releases
  - No concept of deployment
  - No way of going back to earlier releases
  - …

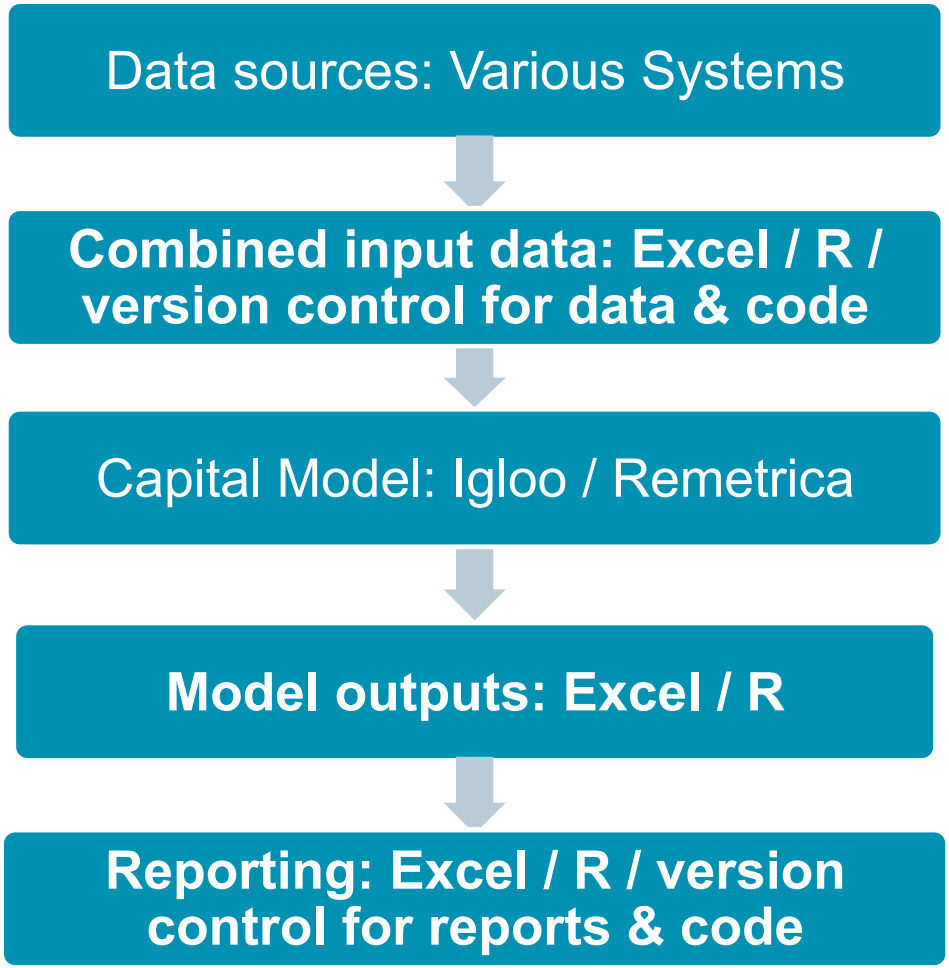
LIMITATIONS OF EXCEL REPORTING

- Can’t handle high data volumes
- Disconnect between input data and model outputs – lack of audit trail

DISADVANTAGES OF R

- Typical business users don’t use it
- Not suited to disseminating model results to stakeholders

CAPITAL MODELLING IMPROVED SYSTEMS SETUP

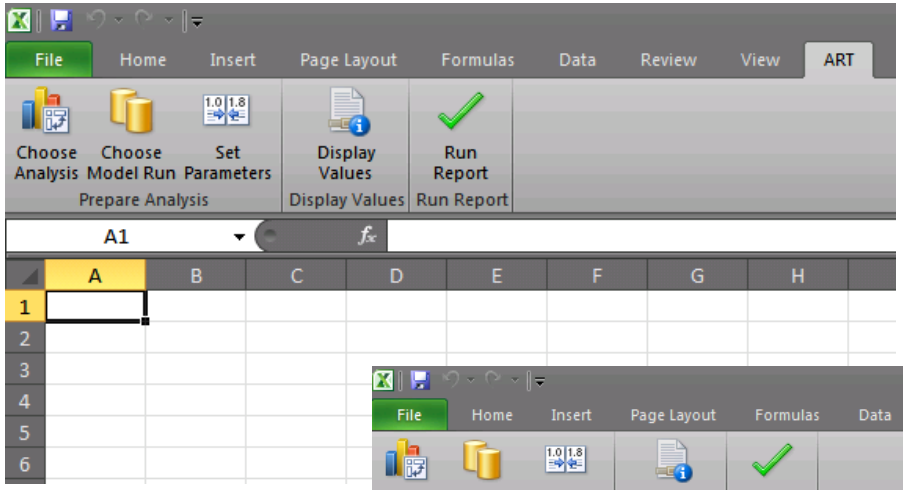


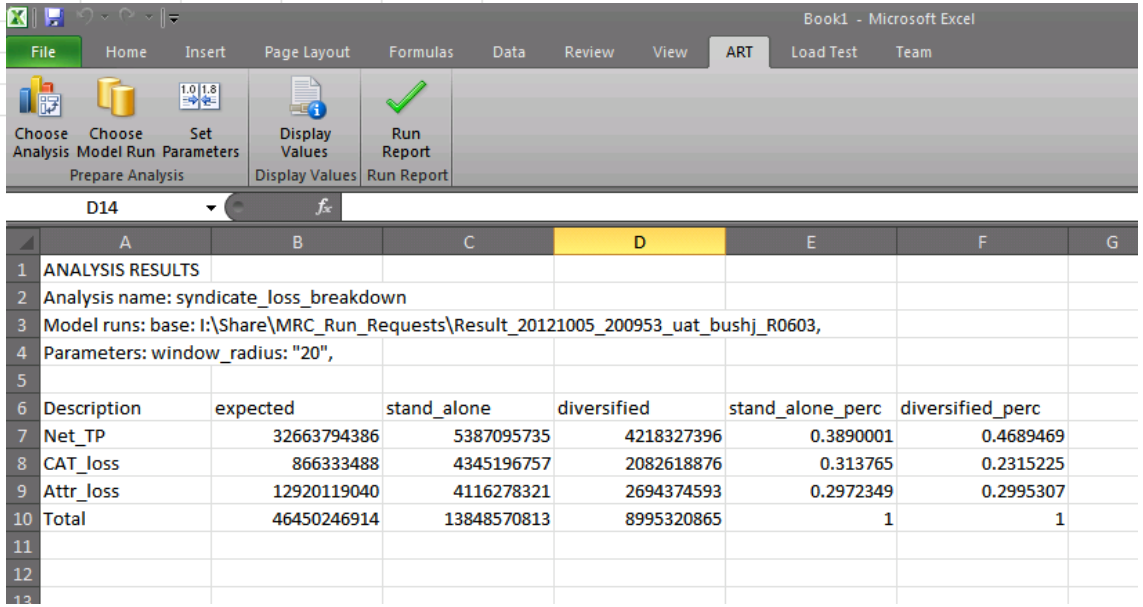
OBJECTIVES OF ANALYSIS & REPORTING TOOL

- Standardise reporting process for analysts
- Share analyses between analysts
- Make model results accessible to non-analysts
- Produce high quality reports
- Speed up report generation

REPORTING PROCESS WITH ART: EXCEL ADDIN

Analyses defined in R can be imported into Excel





	A	B	C	D	E	F	G
1	ANALYSIS RESULTS						
2	Analysis name: syndicate_loss_breakdown						
3	Model runs: base: I:\Share\MRC_Run_Requests\Result_20121005_200953_uat_bushj_R0603,						
4	Parameters: window_radius: "20",						
5							
6	Description	expected	stand_alone	diversified	stand_alone_perc	diversified_perc	
7	Net_TP	32663794386	5387095735	4218327396	0.3890001	0.4689469	
8	CAT_loss	866333488	4345196757	2082618876	0.313765	0.2315225	
9	Attr_loss	12920119040	4116278321	2694374593	0.2972349	0.2995307	
10	Total	46450246914	13848570813	8995320865	1	1	
11							
12							

REPORTING PROCESS WITH ART: REPORT ELEMENTS

Report elements combine an analysis with a method of presentation

Specify the analysis

```
syndicate_loss_breakdown <- create_analysis(
  description = "This analysis element calculates the individual portfolio asset risks.")

model_data(syndicate_loss_breakdown) <- list(
  calibrated_claims_yoa         = c(run_label = "base", output_name = "CalibratedClaims_TS1_LFNET_YoA_Sim"),
  calibrated_claims_rt.ne.0_yoa = c(run_label = "base", output_name = "CalibratedClaims_TS1_LFNET_RT.NE.0_YoA_Sim"),
  calibrated_claims_rt0_yoa     = c(run_label = "base", output_name = "CalibratedClaims_TS1_LFNET_RT0_YoA_Sim"),
  calibrated_claims             = c(run_label = "base", output_name = "CalibratedClaims_TS1_LFNET_Sim"))

content(syndicate_loss_breakdown) <- function(
  calibrated_claims,
  calibrated_claims_yoa,
  calibrated_claims_rt0_yoa,
  calibrated_claims_rt.ne.0_yoa,
  window_radius = 20)
```

Select or specify presentation format

	Expected	Stand Alone	Diversified
Net Technical Provisions	33,208	5,465	4,640
2012 Net Losses	13,233	5,624	5,010
Catastrophe	846	4,416	1,987
Attritional	12,386	4,175	3,023
Total	**46,442**	**14,057**	**9,651**

REPORTING PROCESS WITH ART: REPORTS

Define report by combining report elements

```
1-in-200 Syndicate Loss Breakdown
=================================

Notes
-----
 - The results in the table below are the 1-in-200 aggregate
   syndicate losses in excess of the mean.
 - Results are calibrated to Syndicates' 1:200 losses,
   excluding credit for future profits.

```{r syndicate_loss_breakdown, results='asis'}
report_element(
  analysis = "syndicate_loss_breakdown",
  presentation = "simple_table")
```

Syndicate Loss Distribution
===========================

```{r syndicate_loss_distribution, fig.width=3, fig.height=3}
report_element(
  analysis = "syndicate_loss_distribution",
  presentation = "cumulative_distribution_graph",
  percentile = 0.995)
```
```

Generate report based on model run(s)

1-IN-200 SYNDICATE LOSS BREAKDOWN

Notes

- The results in the table below are the 1-in-200 aggregate syndicate losses in excess of the mean.
- Results are calibrated to Syndicates' 1:200 losses, excluding credit for future profits.

	Expected	Stand Alone	Diversified
Net Technical Provisions	33,208	5,465	4,640
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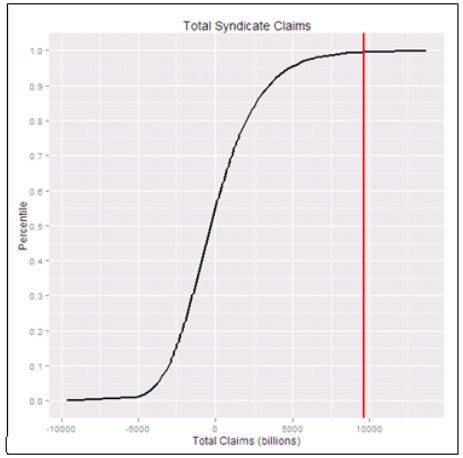
Syndicate Loss Distribution



ART BENEFITS

- Increased confidence in analysis results and reports
- Reproducible and consistent reports
- Improved access and visibility of CCK model data
- Increased focus on analysis
- Extensible by end users (actuaries) via a flexible framework