Automation in Finance and Actuarial:

Established Local IFRS17 Closing Process

Dr. Urs Burri

Leiter Aktuariat & Steuerung, Swiss Business Unit, Baloise

AFIR, 115. MITGLIEDERVERSAMMLUNG SAV

Bern, 06.09.2024

Agenda

1. Evolution of actuarial challenges
2. Solving an actuarial puzzle: Realizing the potential of automation
3. Ingredients for a performant solution (Actuarial Life Projection Solution ALPS)
4. Highlight 1: automation of IFRS17 closing process
5. Highlight 2: automated and fully integrated testing in code-development
6. Dialog

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Dynamic and fast evolving actuarial Environment

ROADMAP FOR ACTUARIES IN THE LAST 30 YEARS (SIMPLIFIED OVERVIEW)

Frameworks:

- Local GAAP
- Profit tests
- TEV (1995)
- IAS (1999)
- ALM
- IAS19
- IFRS4 (2006)
- MCEV (2006)
- SST internal models
- SST run-off models
- IFRS17/9
- ICS

Mathematics:

- Deterministic
- AoC & Sensitivities
- Stochastics
- Nested stochastics
- Market consistent valuation
- Leakage correction
- High granular stochastic AoCs

IT:

- PC
- Grid
- 8h --> 0.1 ms per run
- Several Servers for TEST, INT, ACC, PROD
- Clones
- Cloud

Actuarial way of working:

- Data collector
- Data cleansing,....

- Receiving reports
- Time for analysis
- first time right processes
- Automated controls

Actuarial profession:

- Actuaries of 1st kind, Life
- 2nd kind, Non-life
- 3rd kind ALM
- 4th kind ERM
- 5th kind Big Data, Analytics
- 6th kind process automation
- 7th kind AI/qx-Copilot

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Frameworks:	Mathematics:	IT:	Actuarial way of working:	Actuarial profession:
Local GAAP	Deterministic	PC	Data collector	Actuaries of 1st kind, Life
Profit tests				
TEV (1995)	AoC & Sensitivities	Grid	Data cleansing,....	2nd kind, Non-life
IAS (1999)				3rd kind ALM
ALM	Stochastics	8h --> 0.1 ms per run	Receiving reports	4th kind ERM
IAS19				
IFRS4 (2006)			Time for analysis	5th kind Big Data, Analytics
MCEV (2006)	Market consistent valuation	Several Servers for TEST, INT, ACC, PROD	first time right processes	6th kind process automation
SST internal models	Leakage correction			
SST run-off models			Automated controls	7th kind AI/qx-Copilot
IFRS17/9	High granular stochastic AoCs	Clones		
ICS				

AI/Gen-AI

Challenges for actuaries in recent 10 years

INCREASING DEMANDS FOR ACTUARIAL DAILY WORK

- **More accounting, valuation and solvency frameworks in parallel; higher specialization in general**
- **Higher demands in reporting frequency and granularity of results**
- **Complexity of products, assets and regulation is increasing and has to be implemented adequately**
- **Models are getting more and more «exact», using detailed input, and complexity is increasing**
- **Higher requirements (“Zero Tolerance”) in quality and with regard to the implementation of (time consuming) controls (ICS, ITGC)**
- **There is less time for the production of results, limited time for analysis and for producing relevant information**

Conclusion:

Actuaries need a well-organized (and flexible) operating business model with completely automated processes to get more time for analysis and the generation of relevant management information and business steering

Machines do things that would require intelligence if done by men

DEFINITION OF AI BY MARVIN MINSKI

- **One of the known definitions of AI was formulated by Marvin Lee Minsky as "*the science of making machines do things that would require intelligence if done by men*." The advantage of this definition is that it is broad enough to include different ideas, methods, and means.**

- **Der Wissenschaftler Marvin Minsky, der als einer der Gründungsväter der KI gilt, definierte den Begriff im Jahr 1966 wie folgt: *Künstliche Intelligenz liegt dann vor, wenn Maschinen Dinge tun, für deren Ausführung man beim Menschen Intelligenz unterstellt.***

Quelle: wikipedia

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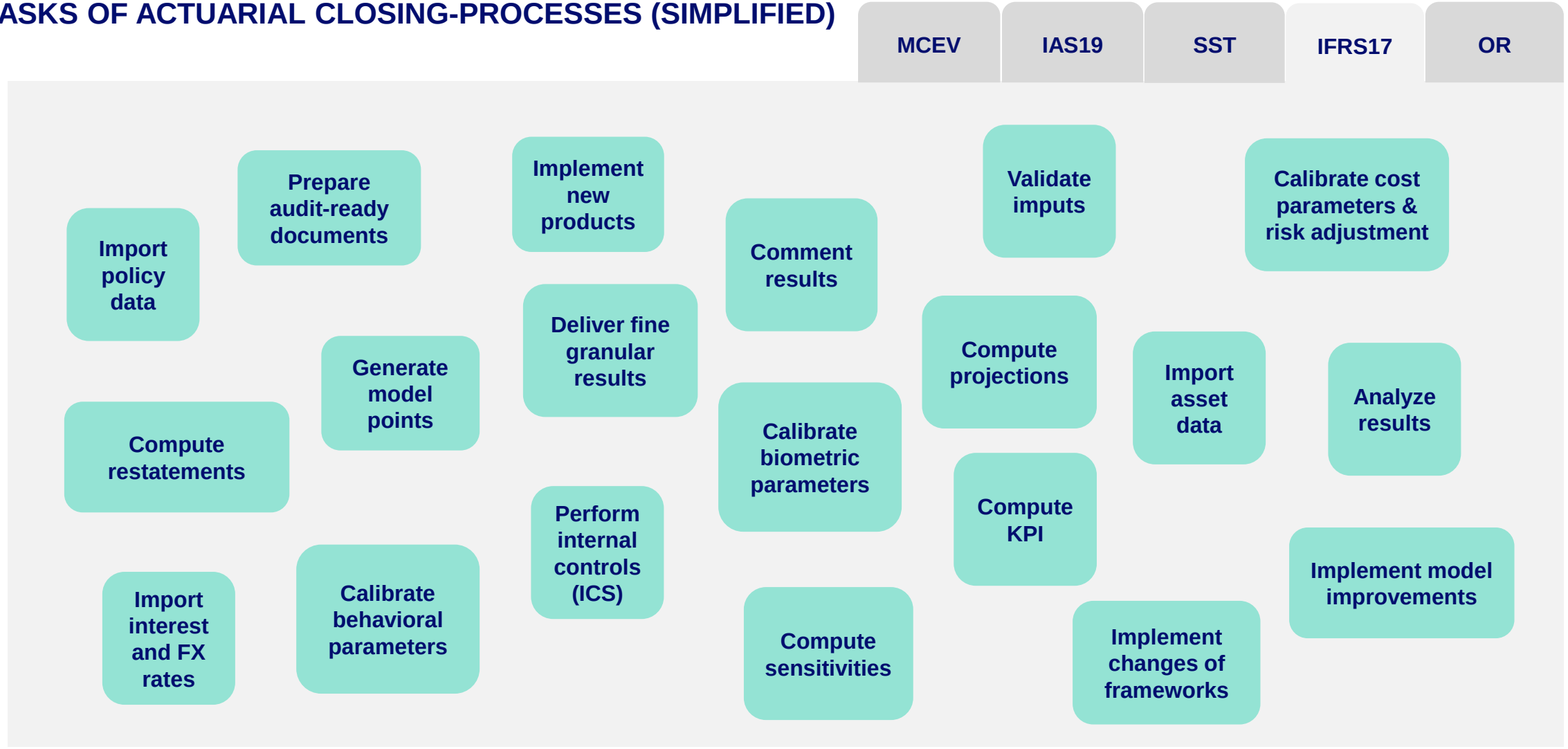
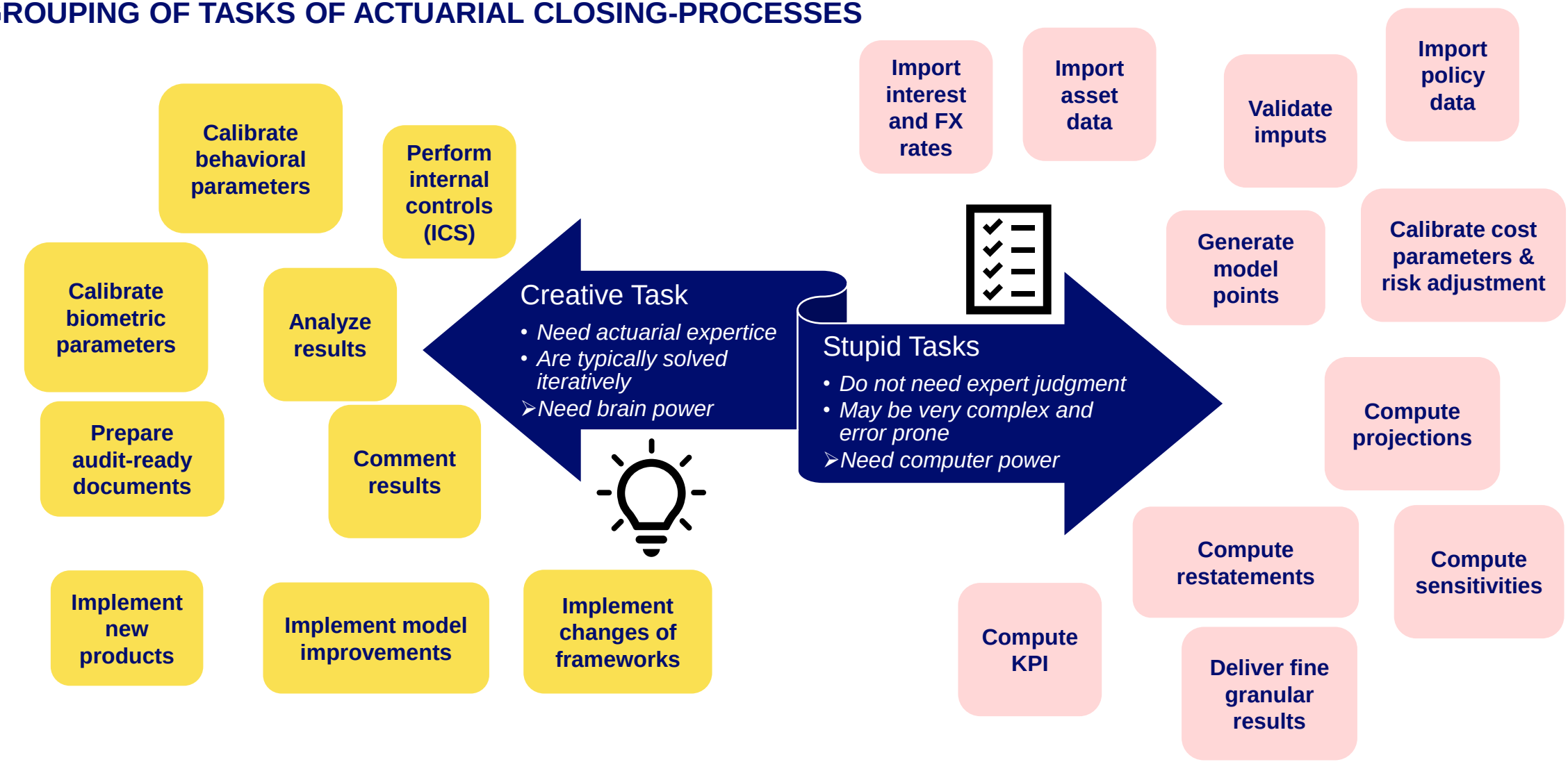
How to solve the actuarial closing-process puzzle?

TASKS OF ACTUARIAL CLOSING-PROCESSES (SIMPLIFIED)



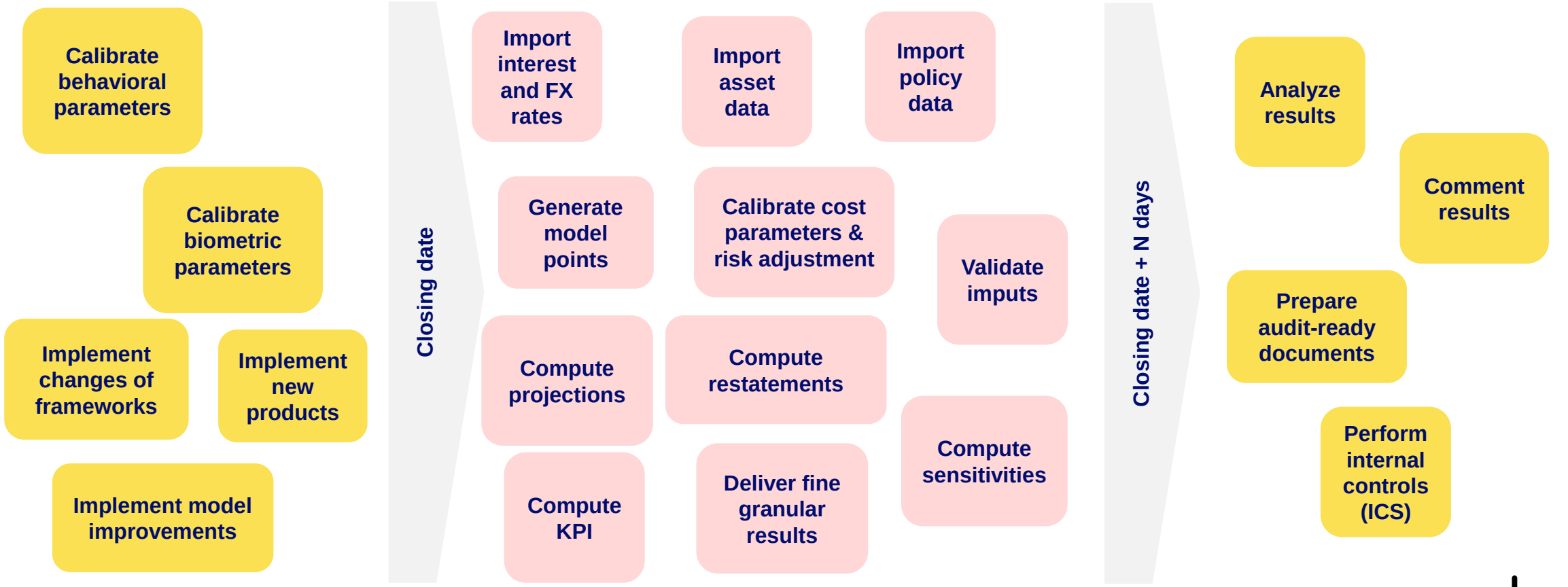
Separate creative from stupid and monotonous tasks

GROUPING OF TASKS OF ACTUARIAL CLOSING-PROCESSES



On the timeline: Sequence of import, computations and writing output

DEPENDENCIES OF TASKS OF ACTUARIAL CLOSING-PROCESSES



During the year: Creative task to derive input parameters and improve the model

***After closing date within N days*:** Perform plenty of stupid tasks

Finally, *creative tasks for analyzing and reporting the results*

On the timeline: Sequence of import, computations and writing output

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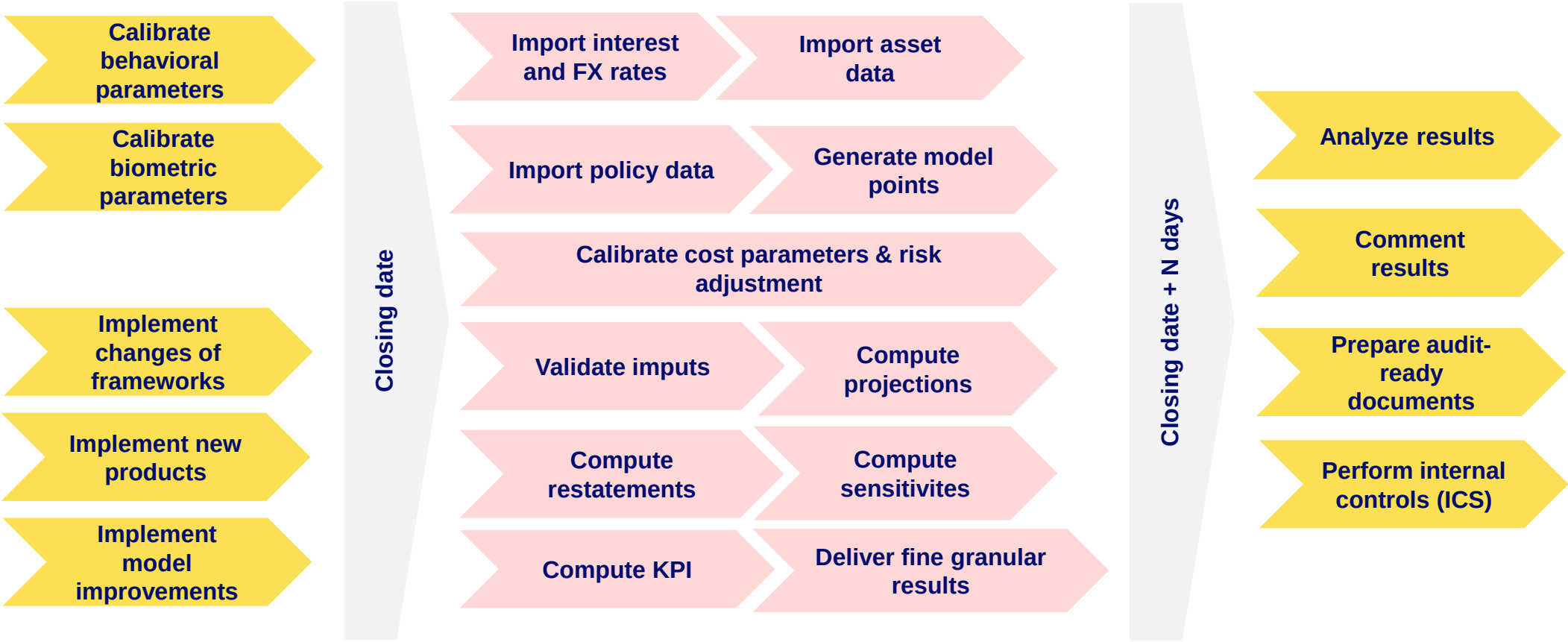

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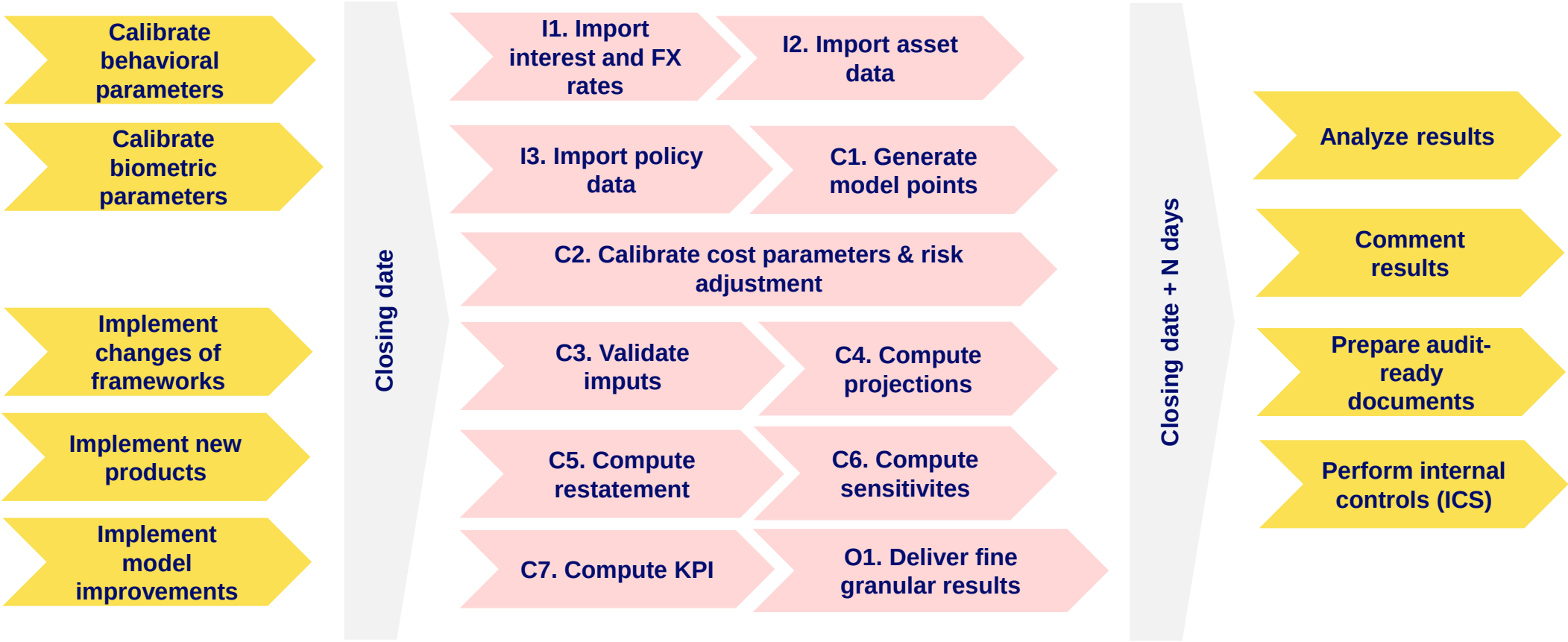


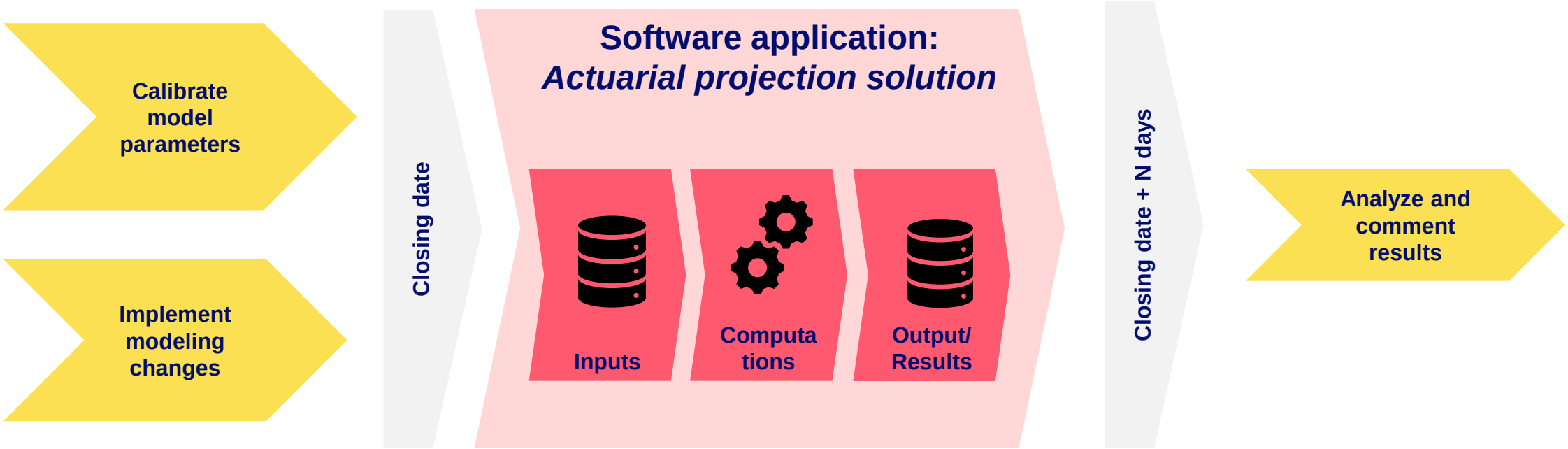
During the year: Creative task to derive input parameters and improve the model

***After closing date within N days*: I-mport data followed by performing C-omputations and writing O-utputs – a **simple linear process flow of many stupid tasks without loops**

Finally, *creative tasks for analyzing and reporting the results*

Optimization problem: Minimize N and process risks with means of automation

ACTUARIAL PROJECTION SOLUTION FOR AUTOMATION



Optimization problem: Minimize N and process risks with means of IT

ACTUARIAL PROJECTION SOLUTION FOR AUTOMATION

Calibrate model parameters

Implement modeling changes

Closing date

Software application:
Actuarial projection solution

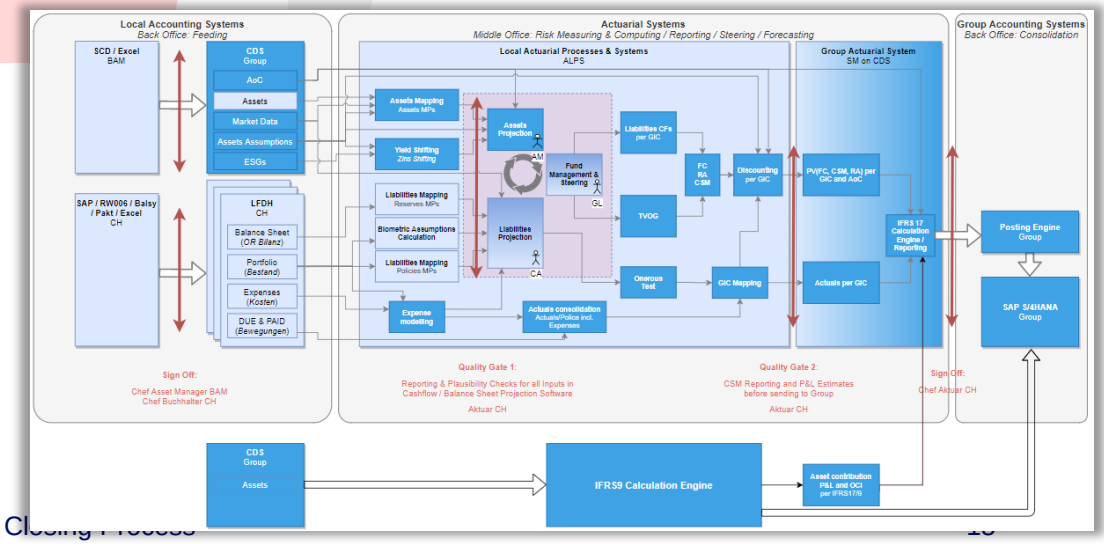
Inputs

Computations

Output/ Results

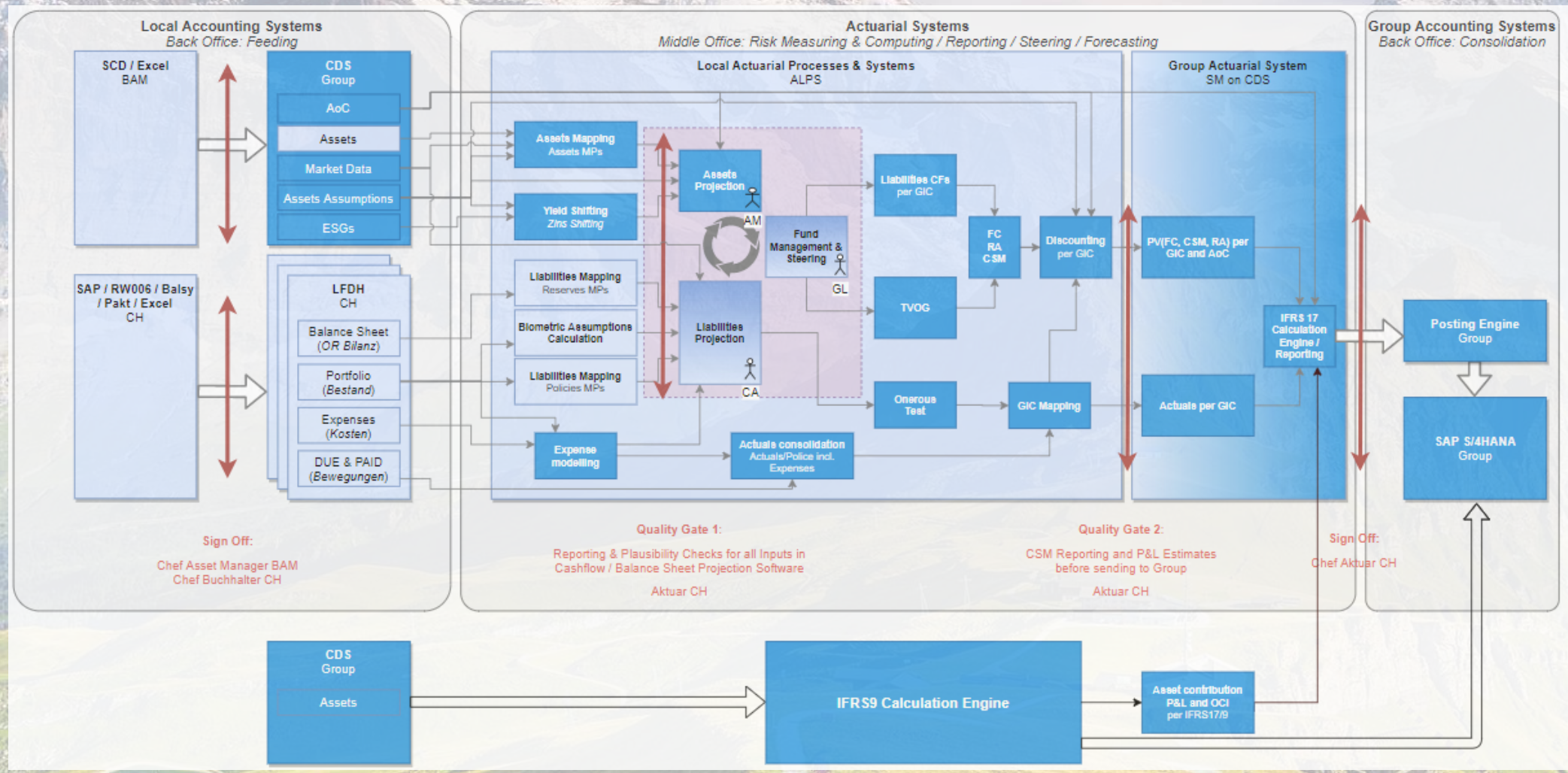
Closing date + N days

Analyze and comment results



Fully integrated Actuarial Projection Solutions (ALPS)

IFRS17 PROCESS ARCHITECTURE FOR BALOISE LEBEN AG



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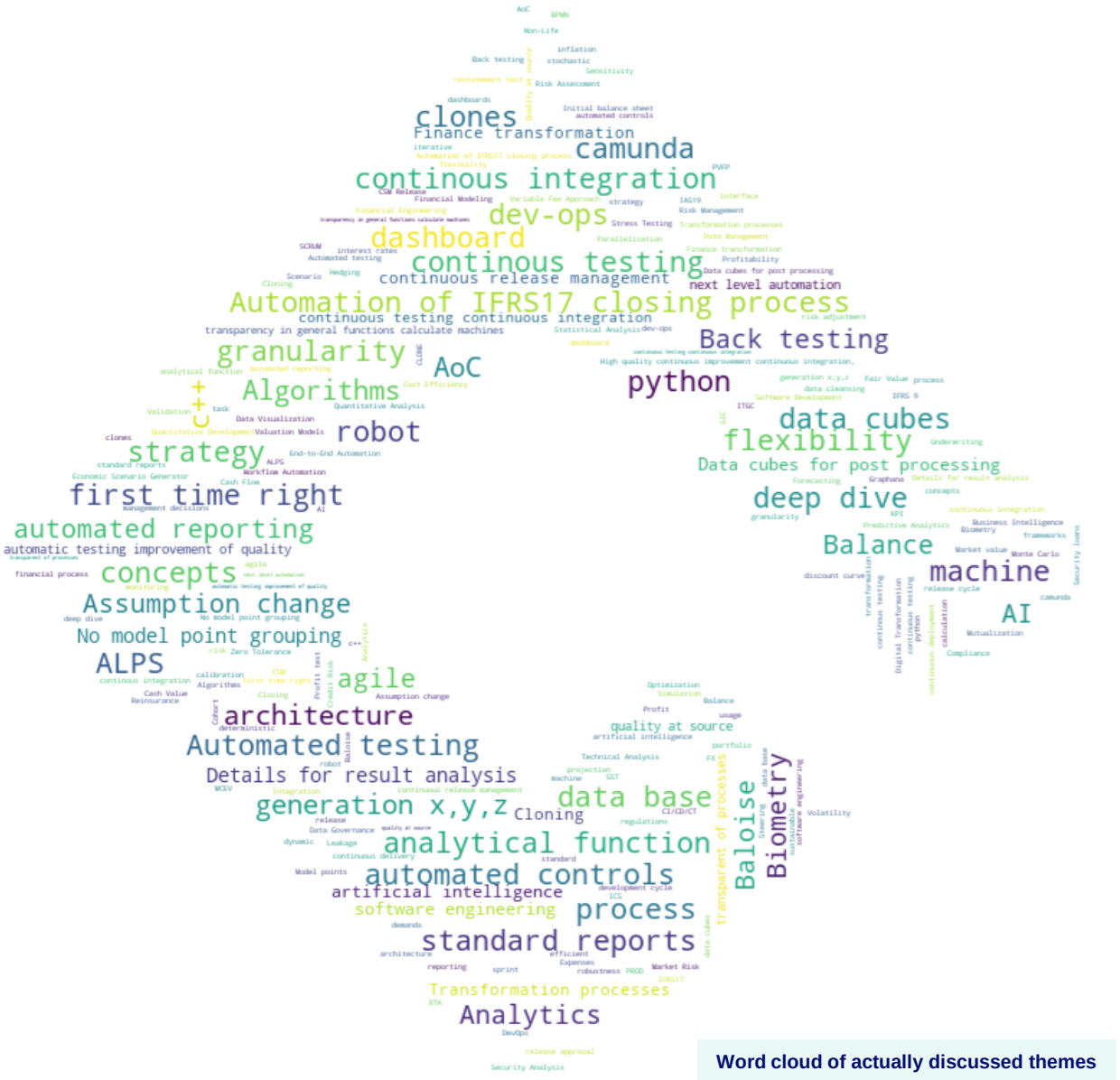
Ingredients for a performant solution (Actuarial Life Projection Solution ALPS)

Most important insights:

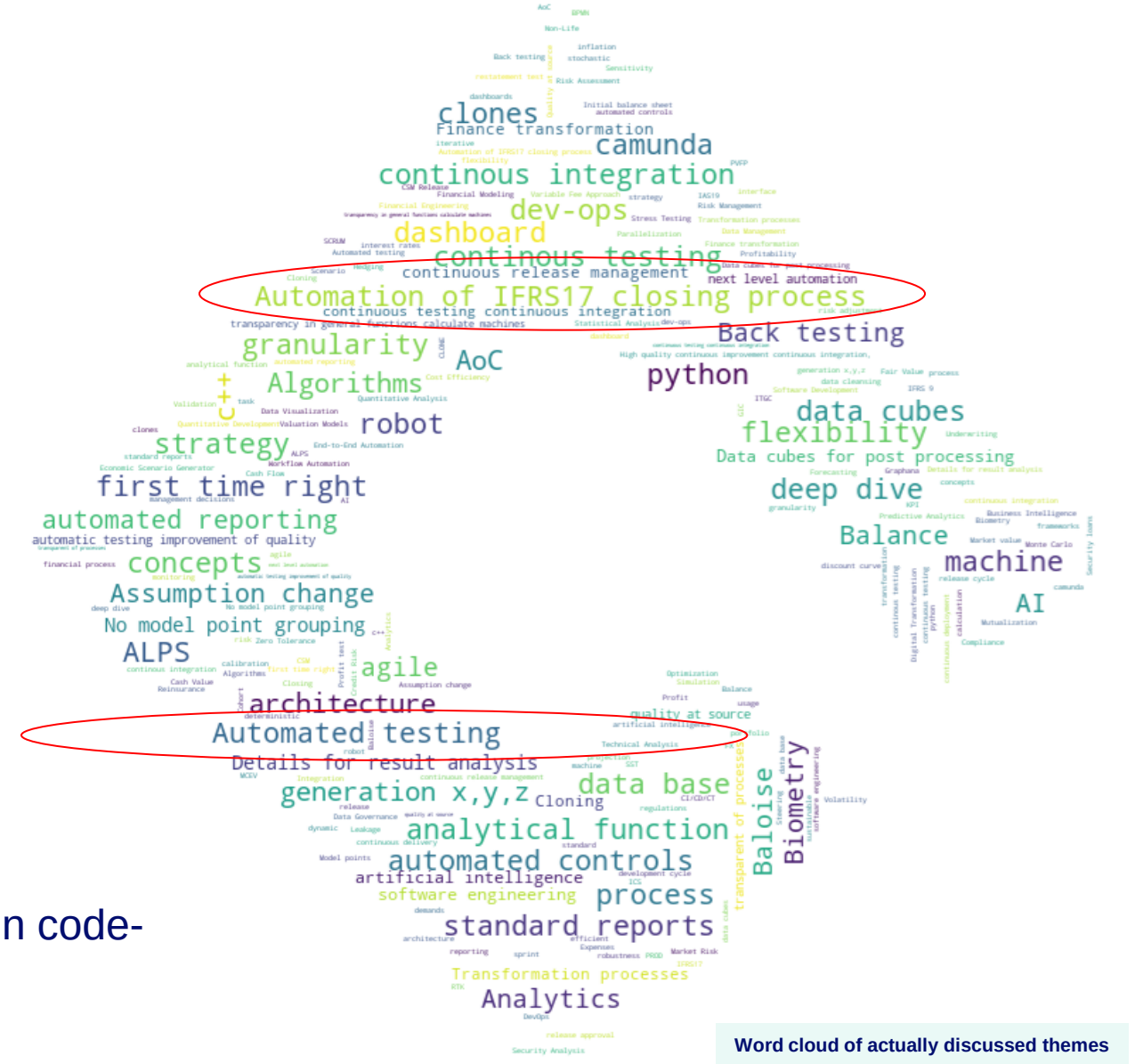
- Data belongs in databases
- business logic in computer code (ideally according the "*separation of concerns-principle*")
- Results in ready-made reports
- Additionally, a flexible toolset is needed for further analysis and deep dives to gain insights
- Handle ad hoc requests with clones
- Processes have to be orchestrated with dedicated BPMs
- Work on process skills

Source: 100 men year modelling experience @Baloise



Word cloud of actually discussed themes

Ingredients for a performant solution (Actuarial Life Projection Solution ALPS)



Word cloud of actually discussed themes

Highlights:

- automation of IFRS17 closing process
- automated and fully integrated testing in code-development

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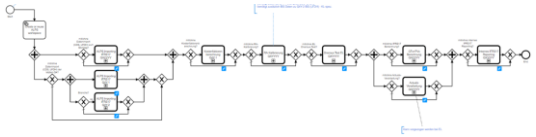
100% automated IFRS17-closing process

in 3 simple Steps: Push the button, Run & Control, Report and Analyze

Push the button

Run and control



Report and Analyze

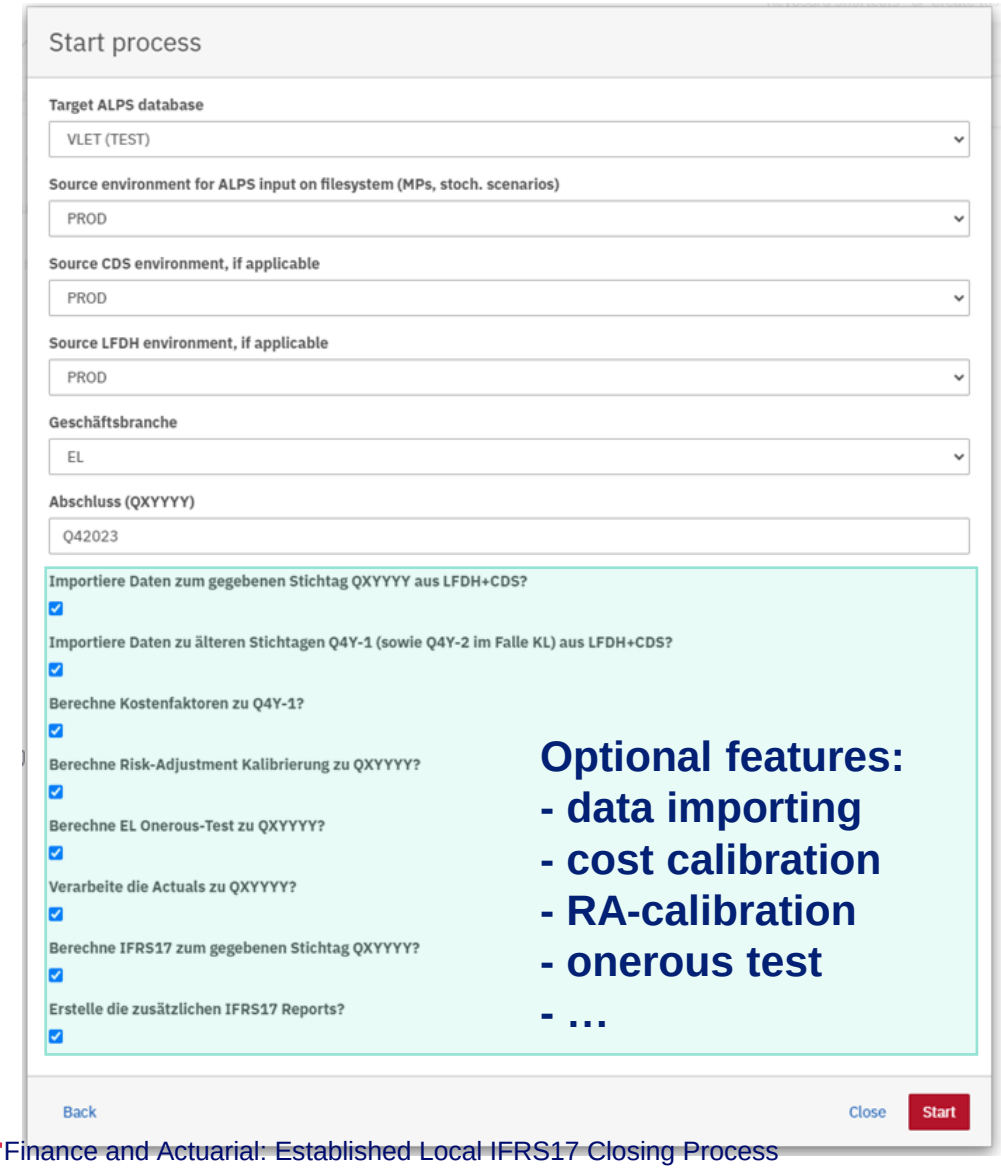
100% automated IFRS17-closing process

Push the button

Push the button

Run & Control

Report and Analyze



- «No-code» interface
- Minimal parameter set reduces error-proneness
- Reproducible calculations
- Full control of the process
- Rigorous quality control on format of input data (Quality-At-Source-Principle)

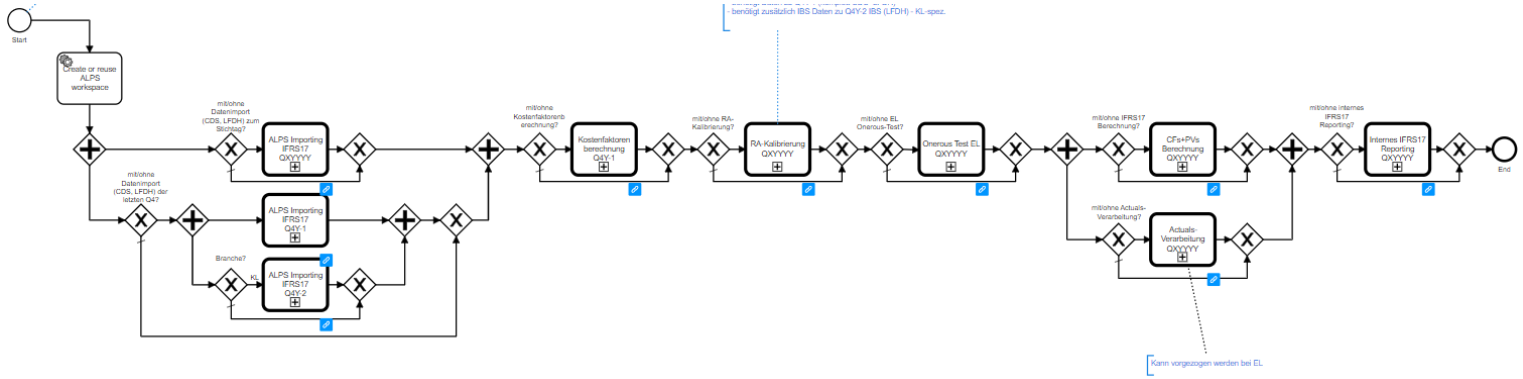
100% automated IFRS17-closing process

Run & Control

Push the button

Run & Control

Report and Analyze



- **Entire calculation is automated as an illustrative Business Process Management Notation (BPMN)**
- **No user intervention: results in automated ICS**
- **First-Time-Right-Principle**
- **Calculation time depends on selected options, 12hours max(*)**
- **Includes Report generation (standard reports, data cubes and dashboards)**

(*) Sophisticated dynamic valuation models in place (IL,GL), 50+ stochastic AoC-Steps with 1000 Economic Scenarios, >200 GICs, incl. risk adjustment calibration and all options enabled

100% automated IFRS17-closing process

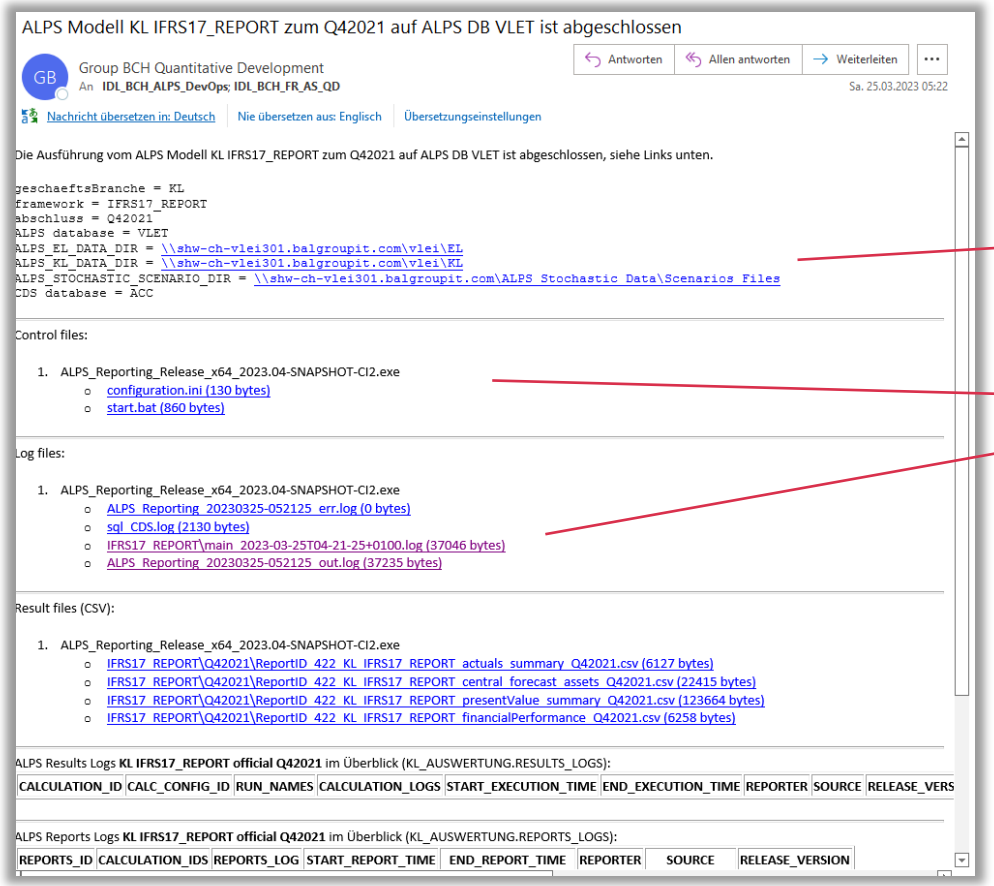
Report and Analyze

Push the button

Run & Control

Report and Analyze

- User is notified via a simple Email
- Generated reports accessible via a link



ALPS Modell KL IFRS17_REPORT zum Q42021 auf ALPS DB VLET ist abgeschlossen

Group BCH Quantitative Development
An IDL_BCH_ALPS_DevOps; IDL_BCH_FR_AS_QD

Antworten | Allen antworten | Weiterleiten | ...

Sa. 25.03.2023 05:22

Nachricht übersetzen in: Deutsch | Nie übersetzen aus: Englisch | Übersetzungseinstellungen

Die Ausführung vom ALPS Modell KL IFRS17_REPORT zum Q42021 auf ALPS DB VLET ist abgeschlossen, siehe Links unten.

```
geschaeftsBranche = KL
framework = IFRS17_REPORT
abschluss = Q42021
ALPS database = VLET
ALPS_EL_DATA_DIR = \\shw-ch-vlei301.balgroupit.com\vlei\EL
ALPS_KL_DATA_DIR = \\shw-ch-vlei301.balgroupit.com\vlei\KL
ALPS_STOCHASTIC_SCENARIO_DIR = \\shw-ch-vlei301.balgroupit.com\ALPS_Stochastic_Data\Scenarios_Files
CDS database = ACC
```

Control files:

1. ALPS_Reporting_Release_x64_2023.04-SNAPSHOT-CI2.exe
   - configuration.ini (130 bytes)
   - start.bat (860 bytes)

Log files:

1. ALPS_Reporting_Release_x64_2023.04-SNAPSHOT-CI2.exe
   - ALPS_Reporting_20230325-052125_err.log (0 bytes)
   - sql_CDS.log (2130 bytes)
   - IFRS17_REPORT\main_2023-03-25T04-21-25+0100.log (37046 bytes)
   - ALPS_Reporting_20230325-052125_out.log (37235 bytes)

Result files (CSV):

1. ALPS_Reporting_Release_x64_2023.04-SNAPSHOT-CI2.exe
   - IFRS17_REPORT\Q42021\ReportID_422_KL_IFRS17_REPORT_actuals_summary_Q42021.csv (6127 bytes)
   - IFRS17_REPORT\Q42021\ReportID_422_KL_IFRS17_REPORT_central_forecast_assets_Q42021.csv (22415 bytes)
   - IFRS17_REPORT\Q42021\ReportID_422_KL_IFRS17_REPORT_presentValue_summary_Q42021.csv (123664 bytes)
   - IFRS17_REPORT\Q42021\ReportID_422_KL_IFRS17_REPORT_financialPerformance_Q42021.csv (6258 bytes)

ALPS Results Logs **KL IFRS17_REPORT official Q42021** im Überblick (KL_AUSWERTUNG.RESULTS_LOGS):

CALCULATION_ID	CALC_CONFIG_ID	RUN_NAMES	CALCULATION_LOGS	START_EXECUTION_TIME	END_EXECUTION_TIME	REPORTER	SOURCE	RELEASE_VERS

ALPS Reports Logs **KL IFRS17_REPORT official Q42021** im Überblick (KL_AUSWERTUNG.REPORTS_LOGS):

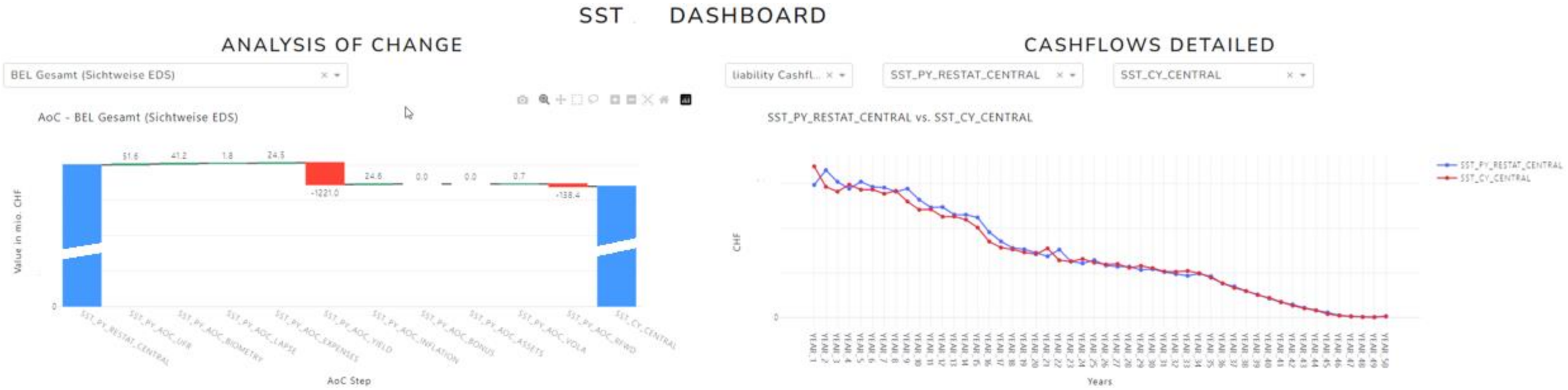
REPORTS_ID	CALCULATION_IDS	REPORTS_LOG	START_REPORT_TIME	END_REPORT_TIME	REPORTER	SOURCE	RELEASE_VERSION

Access to:

- Standard Reports, prepared for delivery
- Logs with complete metadata and the ALPS version used
- Data cubes, detailed outputs, such as CFs, for optional in-depth analysis on GIC level

100% automated IFRS17-closing process

Optional analysis, visualization in interactive dashboards



- **On top feature, beyond closing, ICS not required**
- **Interactive, configurable, selective and exportable**
- **Accessible from a web browser**
- **Reusable, persistent, multi-user and always online**

Easy access to gain valuable additional insights

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100% test coverage in development

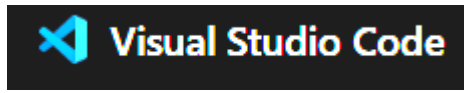
CI/CD/CT: Continuous Integration, Continuous Delivery, Continuous Testing

Continuous Integration

Continuous Delivery

Continuous Testing

- Every contribution of a developer is reviewed by a peer
- After review, every contribution is merged into the main development branch of ALPS
- After the merge, every new development version of ALPS is compiled and built to verify code integrity
- Developers (software engineers/actuaries) use a modern dev-ops tool kit:

- Agile Development in SCRUM Framework and 3-week sprints

100% test coverage in development

CI/CD/CT: Continuous Integration, Continuous Delivery, Continuous Testing

Continuous Integration

Continuous Delivery

Continuous Testing

- Every development version is deployed on dedicated TEST infrastructure and executed

100% test coverage in development

CI/CD/CT: Continuous Integration, Continuous Delivery, Continuous Testing

Continuous Integration

Continuous Delivery

Continuous Testing

- **Every TEST Version of ALPS is used to calculate the previous year closing**
- **The same data, the same assumptions, the same inputs are used as for the official closing**
- **Calculations in 10+ frameworks**
  [OR (local gaap), Nachweis ausreichende Rst., SST Central, SST Sensitivity, IFRS17 (PVFP, FCF, CU), IFRS17 P/L incl. CSM walk, cost calibration,..]

Automatically generated "restatement" report

- Transparent, automatic reporting of the sum of all modelling changes in a closing period

Official Closing from previous year in all frameworks (40+ columns)

#	Zeitraum der Berechnung	Version	Annotation	EB EB_EB_IAS19	EL EL_ADK	EL EL_EXPENSES	EL EL_IFRS17 Benefits Inv. Comp.	EL EL_IFRS17 FC	EL EL_IFRS17 PVFP
			Startwert				+[redacted]625'964.65~	+[redacted]457'651.07~	+[redacted]945'930.09~
1	03.07.2024 15:15 - 15:43	2024.07-CI8	03.07.2024 15:29 Modell verfeinern QD-3243: The fix of the model point generation KL resulted in some 10 policies changing the classification from Austockung to non-Aufstockung. This accounts for the changes in KL_SSTSM, KL_IFRS17, KL_OR positions f and KL_EXPENSES. The small effects seen in OR positions e stem from indirect effects via the Transfer Konto.						
2	10.07.2024 14:30 - 14:57	2024.07-CI11	10.07.2024 14:41 Anpassungen an Änderungen der Daten-Inputs QD-3069: Aufgrund des Klonings von VLEP zu VLEA wurden Veränderungen in Sollverstärkung sichtbar (ca.500 CHF). Dies triggert das Delta von 13 CHF in IFRS17. Die Veränderung der Sollverstärkung resultiert aufgrund einer Präzisionserhöhung der Zinskurve(Anstatt 3 Nachkomma stellen wurden 5 verwendet) 10.07.2024 14:55					-13.558~ (-1.971E-7~%)	+13.438~ (+6.970E-7~%)

Version Number of current ALPS TEST

Reason for deviation as stated by developer

Deviations

Professional software development principles

ALPS
ActuariaL ProjectionS

Industry standards and software development guidelines result in high-quality, maintainable and scalable ALPS:

- **Versioning:** Clear and consistent versioning of productive ALPS Releases: Q42023, Q12024, Q22024,…
- **Release Management:** well-planed release schedule & formal release-approval process
  - Software changes AND the restatement report must be approved by chief actuary
  - Approved ALPS releases are mandatory for official closings
- **Tracking Changes:** all changes made to the software are documented
- **Formal Change Request Process:** for proposing, reviewing, planning, implementing and approving the change
- **Traceability:** Maintaining a direct link between an individual change and its impact as stated in restatement reports.
- **Collaboration:** Ensuring that all stakeholders are informed and involved in the change management process (transparent roadmap planning, dev-ops-cycles).
- **Segregation of duties:** developers have no access to productive systems or databases

Automation is a game changer

SUMMARY

- **The potential of automation is huge**
- **The automation of financial processes in the actuarial environment enables the efficient handling of increasing challenges**
- **The quality of processes (and governance) increases**
- **The level of understanding the results is increasing**
- **The quality of insights for business steering increases**
- **Automation is an important strategic element to be well prepared for the future**
- **The Actuaries can unfold their potential more effectively in an enjoyable state of the art working environment**

Thank you!

urs.burri@baloise.ch