
Automation of an Internal Model based on MATLAB core calculations

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MathWorks Finance Conference 2024

somewhat different



01 What is an Internal Model?

02 Why do we use MATLAB and how?

03 Architecture of Automation

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05 Security and Audit Aspects

06 Q&A



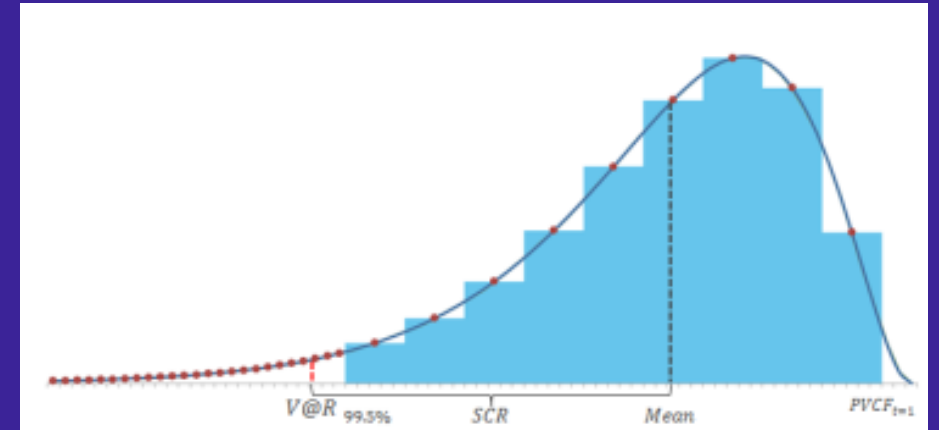
01

What is an Internal Model?

A brief introduction

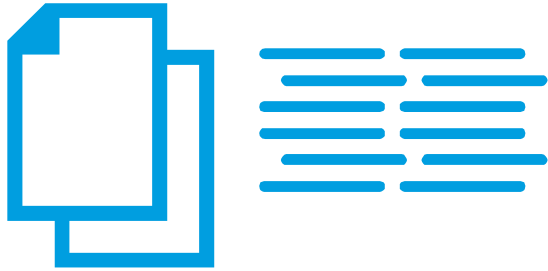
What is an Internal Model?

- In (re)insurance companies, *Internal Models* project the financial situation over a one-year time horizon
- **Ingredients:**
 - Risk Landscape – *What risks do we want to cover?*
 - Calibration of Risks – *Parameters to take into account*
 - Modelling of Risk Factors – *Monte Carlo Simulation*
 - Aggregation of Cash Flows – *Present Values at $t=1$*
 - Valuation – *Value at Risk, TV@R, SCR etc.*
- **Main purpose:**
 - (Solvency) Reporting
 - Analyses of special business cases
 - Estimation of Capital Requirements



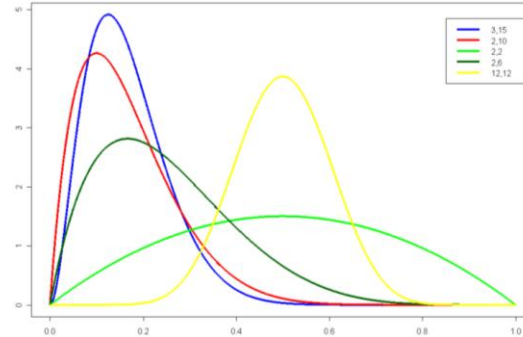
Workflow of an Internal Model

Heterogeneous Data



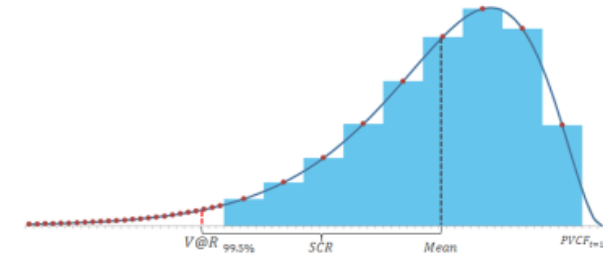
- Calibration Parameter
- (Projected) Cash Flows
- Volume Measures (Reserves etc.)
- t=0 Base Values (B/S)

Stochastic Modelling



- Several hundred Risk Factors
- Numerous Dependencies between Risk Factors
- Monte Carlo Simulation with 100k scenarios for t=1 values

Aggregation & Statistics



- Discounting of Stochastic Cash Flows → Present Values
- Aggregation to different levels of granularity (currencies, entities etc.)
- Calculation of several statistics
 - $SCR = V@R - Mean$
 - TV@R allocation
 - Dependencies

02

Why do we use MATLAB and how?

Some arguments and examples...

Why do we use MATLAB?

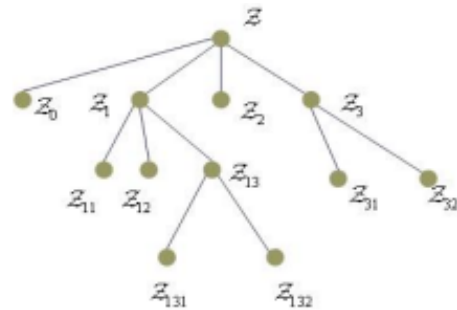
- **In 2008 starting to use MATLAB as a support tool (in addition to Excel / VBA / ReMetrica / Moody's ESG) – Arguments:**
 - Renowned software with worldwide customers in various industries
 - Easy-to-learn programming language with an excellent editor
 - Supported by seminars, webinars, MATLAB help and documentation
 - Fast and stable performance
 - Several built-in features and extensions available via toolboxes
- **Over the years, it grew more and more important...**
 - Some features to be implemented in our IM could not be done with other tools in place
 - New model parts have been built based on MATLAB
 - Generally accepted and appreciated to work with
- **In 2018, starting a five-year project...**
 - One of our goals: Complete switch to MATLAB in terms of our core calculations
 - Automate all relevant manual processes

General Data Processing

- > Scenario Aggregation
- > CF discounting
- > r/w data
- > Random Numbers & Distributions
- > Large matrices

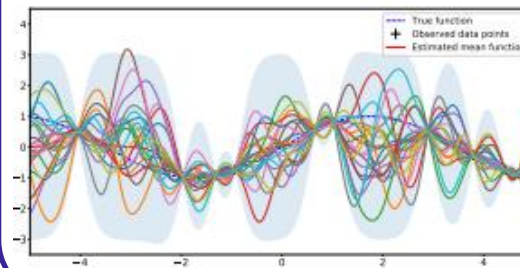
Dependency Tree

Simulation of copulas for >700 Property&Casualty risk factors



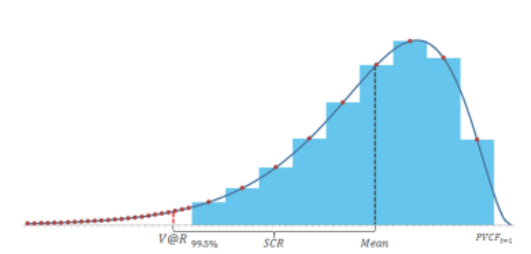
Gaussian Process Regression

Predicting 100k Life&Health cash flows based on ~300 supporting points



Statistics & Valuation

Generating several statistics and analyses for Solvency Reporting



How do we use MATLAB? – Version and Toolboxes in use

- **Version and licences:**
 - Currently using version R2023b, updating to R2024b soon
 - About 40 NNU licences and 2 CN for MATLAB, varies in terms of toolboxes between 1 and 40 licences
- **Toolboxes in use (alphabetical order):**
 - Curve Fitting Toolbox
 - Database Toolbox
 - Econometrics Toolbox
 - Financial Instruments Toolbox
 - Financial Toolbox
 - Global Optimization Toolbox
 - MATLAB Compiler
 - MATLAB Compiler SDK
 - Optimization Toolbox
 - Parallel Computing Toolbox
 - Risk Management Toolbox
 - Spreadsheet Link
 - Statistics and Machine Learning Toolbox

03

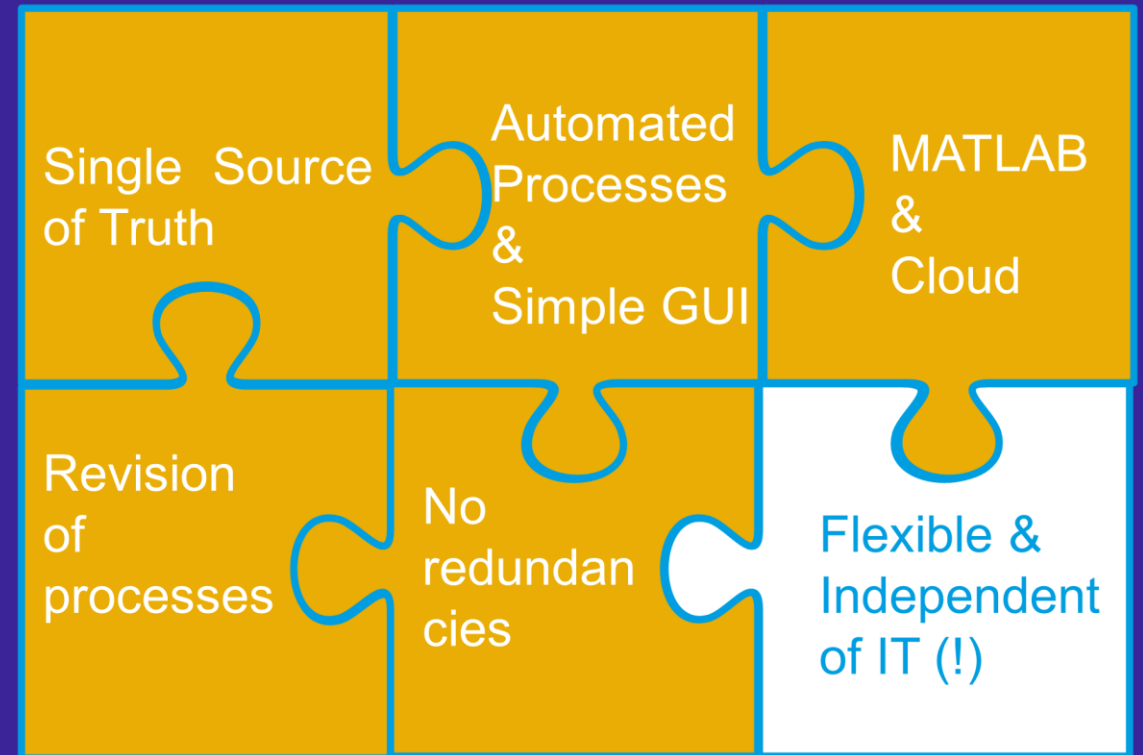
Architecture of Automation

Architecture of Automation – Targets

- **Taking into account:**

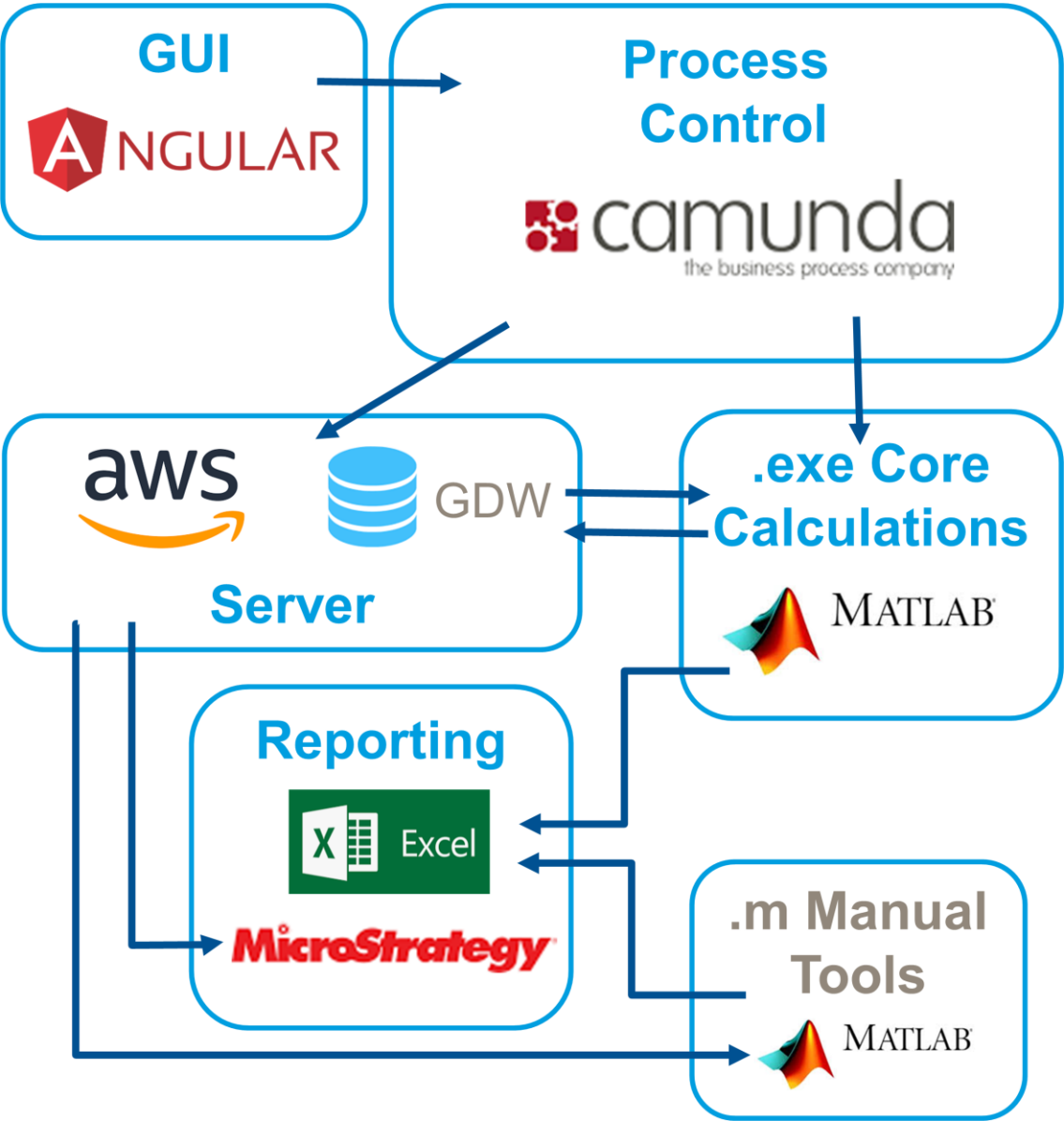
- Main targets on the right-hand side
- Project scope and time constraints
- Costs
- Regulatory requirements

Main **targets** of our **approach**:



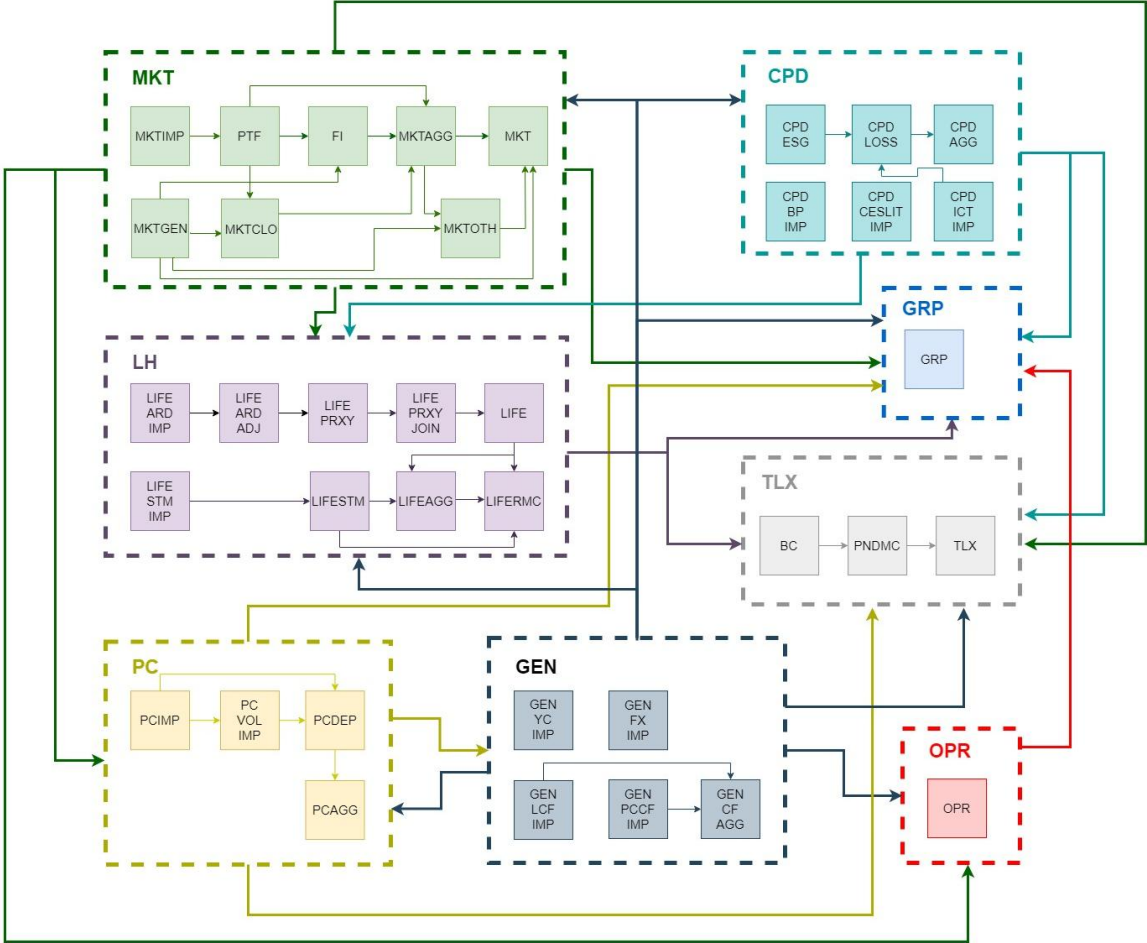
Architecture of Automation – Technical Setup

Basic technical setup

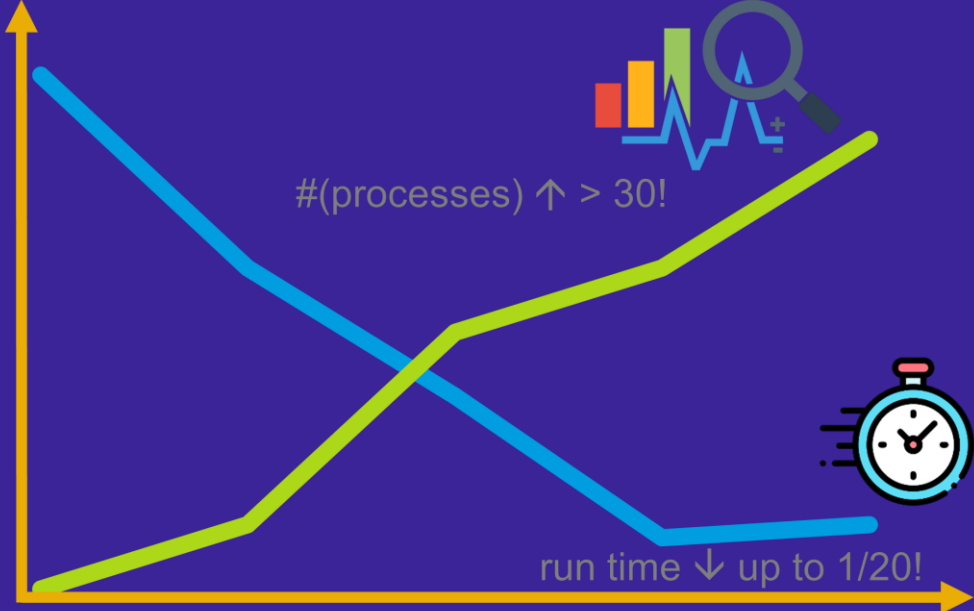


Architecture of Automation – Growing Complexity

Process Overview



Our main incentives of the project:

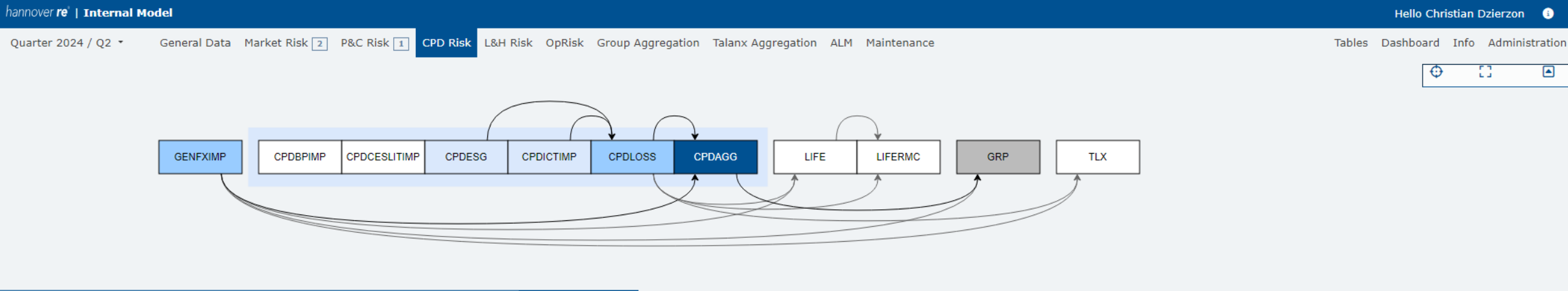


04

Example Workflow

Some basics about our Internal Model Application

Example Workflow – Module *Counterparty Default Risk (CPD)*



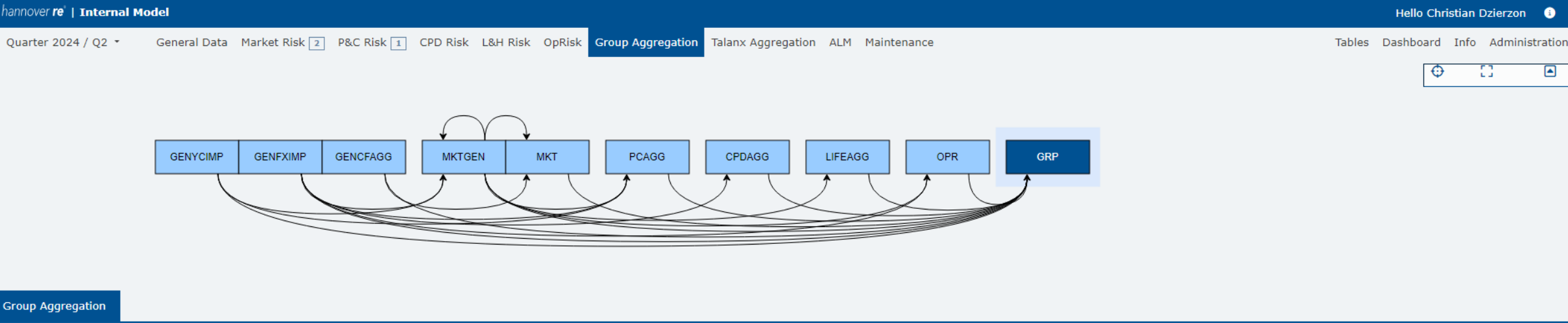
BP Import Cession Limits Import ESG Scenarios ICT Import Loss Scenarios **CPD Aggregation**

type here to filter by name

Completed calculation runs:

#	Name	Start time	End time	Duration	User name	Status	Flags	Action
17642	TEST 24Q2 HRI - without ICT	2024-08-27 13:04	2024-08-27 13:09	00:05:46	pze	Finished	Replicated #17367	<input type="button" value="Refresh"/> <input type="button" value="Copy"/> <input type="button" value="Refresh"/> <input type="button" value="Folder"/> <input type="button" value="Print"/> <input type="button" value="Filter"/> <input type="button" value="Close"/> <input type="button" value="Delete"/>
17367	24Q2 HRI Report - updated ICT scenarios	2024-07-30 14:55	2024-07-30 15:03	00:08:08	jed	Finished	Final Released Replicated #17356 ✓✓	<input type="button" value="Refresh"/> <input type="button" value="Copy"/> <input type="button" value="Refresh"/> <input type="button" value="Folder"/> <input type="button" value="Print"/> <input type="button" value="Filter"/> <input type="button" value="Close"/> <input type="button" value="Delete"/>
17175	24Q2 DFA Report all Entities	2024-07-17 09:48	2024-07-17 10:11	00:22:52	pze	Finished	Final Released Replicated #17174 ✓✓	<input type="button" value="Refresh"/> <input type="button" value="Copy"/> <input type="button" value="Refresh"/> <input type="button" value="Folder"/> <input type="button" value="Print"/> <input type="button" value="Filter"/> <input type="button" value="Close"/> <input type="button" value="Delete"/>
16763	24Q1 DFA Report all Entities v2 - used for Report	2024-06-25 15:00	2024-06-25 15:00	00:00:02	myu	Finished	Released Copied #15937	<input type="button" value="Refresh"/> <input type="button" value="Copy"/> <input type="button" value="Refresh"/> <input type="button" value="Folder"/> <input type="button" value="Print"/> <input type="button" value="Filter"/> <input type="button" value="Close"/> <input type="button" value="Delete"/>

Example Workflow – Module *Group Aggregation (GRP)*



Test

Completed calculation runs: (Showing 8 of 43)

#	Name	Start time	End time	Duration	User name	Status	Flags	Action
17770	TEST HRBah 24Q2 incl. VA v1 - additional large losses switched off	2024-09-17 10:41	2024-09-17 11:52	01:11:24	klq	Finished	Replicated #17766	<input type="button" value="↺"/> <input type="button" value="📄"/> <input type="button" value="♻️"/> <input type="button" value="📁"/> <input type="button" value="💬"/> <input type="button" value="📅"/> <input type="button" value="≠"/> <input type="button" value="📊"/> <input type="button" value="🗑️"/> <input type="button" value="📷"/> <input type="button" value="📅"/>
17673	Test HRI 24Q2 incl. VA v2 - Model Change relative instead of absolute pandemic stresses	2024-09-04 09:09	2024-09-04 09:21	00:12:36	xsh	Finished	Replicated #17569	<input type="button" value="↺"/> <input type="button" value="📄"/> <input type="button" value="♻️"/> <input type="button" value="📁"/> <input type="button" value="💬"/> <input type="button" value="📅"/> <input type="button" value="≠"/> <input type="button" value="📊"/> <input type="button" value="🗑️"/> <input type="button" value="📷"/> <input type="button" value="📅"/>
17365	HRG 24Q2 excl. VA v1 (Änderung der Zinskalibrierung / Testlauf)	2024-07-30 14:38	2024-07-30 14:49	00:11:17	r19	Finished	Replicated #17289	<input type="button" value="↺"/> <input type="button" value="📄"/> <input type="button" value="♻️"/> <input type="button" value="📁"/> <input type="button" value="💬"/> <input type="button" value="📅"/> <input type="button" value="≠"/> <input type="button" value="📊"/> <input type="button" value="🗑️"/> <input type="button" value="📷"/> <input type="button" value="📅"/>
17364	HRG 24Q2 incl. VA v1 (Änderung der Zinskalibrierung / Testlauf)	2024-07-30 14:32	2024-07-30 14:57	00:24:40	r19	Finished	Replicated #17285	<input type="button" value="↺"/> <input type="button" value="📄"/> <input type="button" value="♻️"/> <input type="button" value="📁"/> <input type="button" value="💬"/> <input type="button" value="📅"/> <input type="button" value="≠"/> <input type="button" value="📊"/> <input type="button" value="🗑️"/> <input type="button" value="📷"/> <input type="button" value="📅"/>

Example Workflow – Create Tasks

- Set name and description
- Calculation ID created automatically
- Select dependent runs that are available (released)

Create new calculation run 🔗 ×

Calculation process:
Group Aggregation (GRP) – 2024 / Q2

Calculation run name: (min 3 letters) 4/200

Calculation run description: (optional) 30/1000

Dependencies

Yield Curves Import (GENYCIMP):

Cashflow Aggregation (GENCFAGG):

General Scenarios (MKTGEN):

Market Risk (MKT):

Aggregation (PCAGG):

CPD Aggregation (CPDAGG):

Life Aggregation (LIFEAGG):

OpRisk (OPR):

Example Workflow – Setup Task

hannover re | Internal Model

Quarter 2024 / Q2 ▾ General Data Market Risk [2] P&C Risk [1] CPD Risk L&H Risk OpRisk Group Aggregation

Group Aggregation [1]

type here to filter by name [🔍]

Active calculation runs:

#	Name	Start time	User name
18269	Demo	2024-10-08 14:34	dzc

Completed calculation runs:

Set up calculation run

Process: Group Aggregation (GRP) - 2024 / Q2

User name: Christian Dzierzon (dzc)

Run: #18269 - Demo

Task created: 2024-10-08 14:34

show dependencies

Upload input files from public

P1: SAM

Input files: uploaded by Ninwe Kaplo (klq) on 2024-09-18 17:56 Upload from public

Matlab script: 2024-06-25 14:55 by Maya Thuernau: Merged PR 44338: SAM: Export of ChgNAV pr ▾ ▾

Parameter file: 2023-06-14 09:45 by dzc: corrected name of SAMSA setup for Reverse Stress Test a ▾ ▾

Matlab config: 2024-02-27 17:49 by dzc: added JSON control for Risk Separation in SAM (inherited ▾ ▾

SAM_Setup

Enter name of SAM Setup File as given in P1\Input.

UWR_Run_only

false ▾

Apply_Risk_Separation

true ▾

Reverse Stress Test run

HRG ▾

Select entity or switch off Reverse Stress Test.

P2: HRSE Calculation

Hello Christian Dzierzon [👤]

Dashboard Info Administration

files

Example Workflow – MS Excel still important for us...

Input Parameters

General Parameters			FX Rates Setup Table
Parameter	Variable		Original
Input File	P4\input\IBNR\IBNR_All.xlsx		31/12/2023
Sheets to read	L&H US; L&H Af; L&H Ir; L&H Ber; L&H UK; HO	input split by ';', leading whitespace will be stripped	
IBNR sign of sheets	[1, 1, 1, 1, 1, 1]	insert as vector, must have same number of items	
Output Folder	P4\Output\IBNR		
Output File Name	LIFE_IBNR		
Write .mat for RM	1	produces .mat output for capital allocation (risk margin process)	
Report Template	P4\input\STATS_LIFE_P4_IBNR_Template.xlsx		
Column names in IBNR input file			
Type	Name		
ME	ModellingEntity		
Model	CalculationModel		
LoB	ICM Modelling block		
Entity	ReportingUnit		
BusinessType	SII_Main_LoB		
Currency	Original Currency		
IBNR	EUR		
Line of Business suffix table for LoB names in output files			
Entity	suffixCFM	suffixSTM	
BAH BR	BAH BR_	_BAHBR	
BAHBR	BAH BR_	_BAHBR	
FRA BR	FRA BR_	_FRABR	
FRABR	FRA BR_	_FRABR	
HF US			
HK BR	HK BR_	_HKBR	
HKBR	HK BR_	_HKBR	
HILR BR			

Output Statistics

Chg. NAV pre-tax, incl. OpRisk and fix	Due to...							Interest (incl. VA)
	Chg. NAV	P&C	L&H	Market	CPD	OpRisk	FX	
Drift	2,124,906	1,319,191	663,083	667,585	-35,927	-84,066	35,445	2,808,386
Mean	0	0	0	0	0	0	0	0
StdDev	3,509,488	2,262,221	844,678	1,988,465	68,408	128,632	1,547,339	588,186
Percentiles								
Min	-37,280,415	-18,613,580	-7,913,159	-11,676,009	-1,635,479	-7,498,192	-5,939,295	-2,716,207
0.01	-21,867,727	-13,476,348	-5,775,486	-10,188,819	-936,426	-4,139,866	-5,478,694	-2,243,281
0.03	-18,424,829	-10,528,316	-4,720,357	-8,715,053	-769,727	-2,679,672	-5,029,545	-2,003,759
0.07	-15,099,192	-9,579,324	-4,151,481	-7,917,612	-652,347	-1,964,344	-4,620,113	-1,884,474
0.1	-14,119,414	-8,965,081	-3,851,394	-7,643,545	-594,312	-1,664,703	-4,458,592	-1,807,847
0.2	-12,294,916	-7,971,399	-3,197,098	-7,063,196	-497,744	-1,329,188	-4,149,660	-1,648,628
0.4	-10,629,557	-7,130,681	-2,715,437	-6,324,346	-432,040	-780,980	-3,852,044	-1,499,353
0.5	-10,159,957	-6,888,751	-2,575,610	-6,105,691	-408,163	-683,172	-3,740,501	-1,450,328
1	-8,799,335	-6,006,887	-2,186,448	-5,384,741	-305,170	-404,050	-3,387,659	-1,298,918
10	-4,403,982	-2,898,900	-1,061,514	-2,618,156	-67,094	-47,935	-1,913,254	-719,631
50	73,330	129,098	35,166	167,617	25,277	23,568	-84,920	-25,582
75	2,328,502	1,547,250	569,479	1,400,375	33,171	38,892	976,229	365,270
90	4,380,324	2,767,522	1,035,229	2,384,752	35,284	48,817	1,993,286	756,437
99	7,897,993	4,725,186	1,815,084	3,972,499	35,956	61,737	3,909,686	1,526,397
Max	14,795,360	8,477,819	3,123,313	7,217,728	67,858	74,295	8,691,621	3,675,358
TVaR								
0.01	-26,233,762	-15,059,099	-6,590,996	-10,868,644	-1,062,854	-5,189,198	-5,683,995	-2,421,913
0.05	-20,116,648	-11,696,817	-5,215,219	-9,195,160	-837,694	-3,248,068	-5,132,548	-2,117,586
0.1	-17,540,723	-10,565,600	-4,659,204	-8,547,803	-741,042	-2,578,692	-4,863,345	-1,994,796
0.25	-14,652,184	-9,154,917	-3,873,343	-7,732,375	-610,380	-1,873,394	-4,479,377	-1,809,790
0.75	-11,726,539	-7,677,379	-3,029,666	-6,677,296	-475,646	-1,103,607	-4,003,857	-1,576,598
1	-11,063,606	-7,306,012	-2,837,511	-6,386,291	-437,687	-938,256	-3,868,966	-1,514,700
2	-9,587,442	-6,414,630	-2,424,467	-5,674,362	-344,548	-612,329	-3,522,591	-1,365,550
3	-8,767,806	-5,882,089	-2,202,720	-5,237,782	-293,788	-461,941	-3,309,617	-1,276,086
4	-8,189,849	-5,504,425	-2,050,228	-4,917,727	-259,532	-375,915	-3,149,076	-1,210,637
5	-7,750,964	-5,213,422	-1,933,866	-4,664,430	-233,882	-319,820	-3,018,777	-1,157,854
TVaR-Allocation								
0.01	100.0%	36.3%	18.2%	31.2%	1.4%	13.1%	-0.1%	-5.2%
0.05	100.0%	38.7%	18.2%	31.9%	1.1%	10.2%	0.9%	-6.2%
0.1	100.0%	40.9%	16.4%	34.8%	1.3%	8.0%	1.2%	-7.2%
0.25	100.0%	42.1%	14.7%	38.0%	1.4%	5.7%	1.8%	-7.9%
0.75	100.0%	44.4%	12.8%	38.5%	1.4%	3.5%	4.1%	-8.3%
1	100.0%	44.9%	12.3%	38.6%	1.3%	3.1%	4.7%	-8.4%
2	100.0%	45.3%	11.6%	38.7%	1.3%	2.2%	6.3%	-8.5%
3	100.0%	45.9%	11.0%	38.3%	1.2%	1.8%	7.6%	-8.7%
4	100.0%	46.2%	10.8%	37.7%	1.1%	1.5%	8.4%	-8.6%
5	100.0%	46.4%	10.4%	37.5%	1.1%	1.4%	9.0%	-8.6%
Rank Correlation								
	Chg. NAV	P&C	L&H	Market	CPD	OpRisk	FX	Interest (incl. VA)
Chg. NAV	100%	64%	32%	54%	36%	15%	43%	-41%
P&C	64%	100%	2%	9%	20%	3%	0%	-40%
L&H	32%	2%	100%	6%	4%	5%	0%	8%
Market	54%	9%	6%	100%	42%	19%	-1%	-57%
CPD	36%	20%	4%	42%	100%	9%	0%	-24%
OpRisk	15%	3%	5%	19%	9%	100%	0%	-8%
FX	43%	0%	0%	-1%	0%	0%	100%	2%
Interest (incl. VA)	-41%	-40%	8%	-57%	-24%	-8%	2%	100%

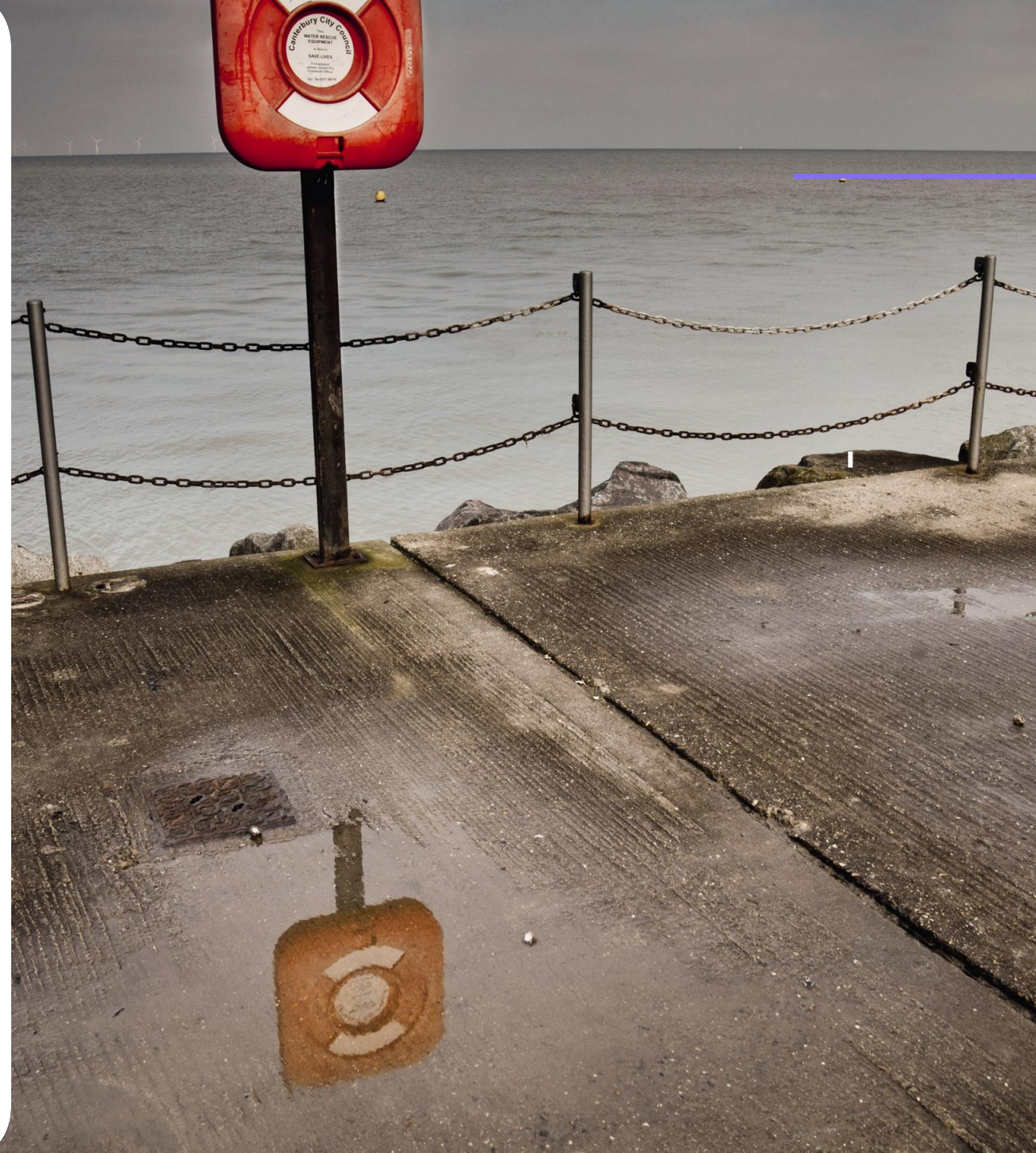
05

Security and Audit Aspects

Recommendations

Security and Audit Aspects

- **Several best practices around in terms of writing code:**
 - Style Guide
 - Code Review
 - Git source control
 - Pull Requests
 - Unit Testing
- **However, our Internal Model Application (IM App) executes compiled .exe files...**
 - Can't really manage different versions in git (binary files)
 - How to be sure what code is actually executed?
 - → Develop Compiler Tool !



Security and Audit Aspects – Our Compiler Tool

The screenshot shows a MATLAB App configuration dialog box titled "MATLAB App" overlaid on a MATLAB IDE window. The IDE window shows a file explorer on the left with a folder structure: I:_restricted Area\ DFA \ Programme \ Matlab \ 04_IM_Auto \ _Compiler. The Command Window on the right displays the following log output:

```
>> MAIN_COMPILE_CODE
2024-10-08 15:36:48 ::: MAIN_COMPILE_CODE ::: Info ::: Main procedure started...
2024-10-08 15:36:48 ::: MAIN_COMPILE_CODE ::: Info ::: User: dzc
2024-10-08 15:36:48 ::: F1_readDefValues ::: Info ::: Default path file defaultPaths.txt read.
2024-10-08 15:36:48 ::: F1_readDefValues ::: Info ::: Default output folder definitionlastOutput
2024-10-08 15:36:48 ::: F1_readDefValues ::: Info ::: Default main file definition lastMainFile.
2024-10-08 15:36:48 ::: F2_UI ::: Info ::: Opening User Interface...
```

The MATLAB App dialog box contains the following sections:

- Add MATLAB search folders for compilation:**
 - Folder 1: H:\TortoiseGit\IM_MATLAB_24Q3\src\COMMON (with subfolders checked)
 - Folder 2: H:\TortoiseGit\IM_MATLAB_24Q3\src\TOOLS (with subfolders checked)
 - Folder 3: (empty) (with subfolders checked)
- Options for compilation:**
 - Add folder contents: (empty) (Browse... button)
 - Remove existing search folders from MATLAB search path list
 - Create snapshot of m-files
 - Include Parallel Profile
- Fill compiler settings:**
 - Output Folder: I:_restricted Area\DFA\Programme\Matlab\04_IM_Auto\TLX\2024-Q3\TLX_EXE-Files (Browse... button)
 - Main Files to compile: H:\TortoiseGit\IM_MATLAB_24Q3\src\GRP\P1\GRP_P1_MAT_SCRIPT.m (Browse... button)

At the bottom of the dialog are two buttons: "Start Compilation" (green) and "Cancel" (white).

Security and Audit Aspects – Compiler Tool Output Folder

Name	Date modified	Type
_mFileLibrary_2024-02-27_10-40-27-841	27/02/2024 10:41	File folder
_mFileLibrary_2024-02-27_17-05-22-667	27/02/2024 17:05	File folder
_mFileLibrary_2024-02-29_13-42-55-524	29/02/2024 13:43	File folder
_mFileLibrary_2024-03-07_16-50-26-855	07/03/2024 16:50	File folder
_mFileLibrary_2024-03-08_08-39-28-097	08/03/2024 08:39	File folder
_mFileLibrary_2024-03-14_09-22-55-732	14/03/2024 09:23	File folder
_mFileLibrary_2024-03-14_14-45-22-819	14/03/2024 14:45	File folder
_mFileLibrary_2024-03-26_16-19-12-786	26/03/2024 16:20	File folder
_mFileLibrary_2024-06-03_10-56-43-625	03/06/2024 10:57	File folder
GRP_P1_MAT_SCRIPT	03/06/2024 10:58	File folder
_COMPILE_LOG_2024-02-27_10-40-27-84...	27/02/2024 10:41	TXT File
_COMPILE_LOG_2024-02-27_17-05-22-66...	27/02/2024 17:06	TXT File
_COMPILE_LOG_2024-02-29_13-42-55-52...	29/02/2024 13:44	TXT File
_COMPILE_LOG_2024-03-07_16-50-26-85...	07/03/2024 16:51	TXT File
_COMPILE_LOG_2024-03-08_08-39-28-09...	08/03/2024 08:40	TXT File
_COMPILE_LOG_2024-03-14_09-22-55-73...	14/03/2024 09:23	TXT File
_COMPILE_LOG_2024-03-14_14-45-22-81...	14/03/2024 14:46	TXT File
_COMPILE_LOG_2024-03-26_16-19-12-78...	26/03/2024 16:20	TXT File
_COMPILE_LOG_2024-06-03_10-56-43-62...	03/06/2024 10:58	TXT File

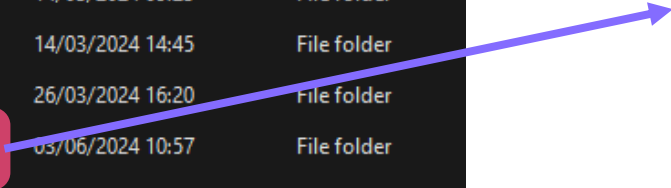
Name	Date modified	Type	Size
GRP_P1_MAT_SCRIPT.exe	03/06/2024 10:58	Application	1,912 KB
includedSupportPackages.txt	03/06/2024 10:58	TXT File	0 KB
mccExcludedFiles.log	03/06/2024 10:58	Textdokument	1 KB
readme.txt	03/06/2024 10:58	TXT File	2 KB
requiredMCRProducts.txt	03/06/2024 10:58	TXT File	1 KB
unresolvedSymbols.txt	03/06/2024 10:58	TXT File	1 KB

```

_COMPILE_LOG_2024-06-03_10-56-43-625.txt
1 2024-06-03 10:56:43 :: MAIN_COMPILE_CODE :: Info :: Main procedure started...
2 2024-06-03 10:56:43 :: MAIN_COMPILE_CODE :: Info :: User: myu
3 2024-06-03 10:56:44 :: F1_readDefValues :: Info :: Default path file defaultPaths.txt read.
4 2024-06-03 10:56:44 :: F1_readDefValues :: Info :: Default output folder definitionlastOutputFolder.txt read.
5 2024-06-03 10:56:44 :: F1_readDefValues :: Info :: Default main file definition lastMainFile.txt read.
6 2024-06-03 10:56:44 :: F2_UI :: Info :: Opening User Interface...
7 2024-06-03 10:57:07 :: F2_UI :: Info :: Received settings, UI closed.
8 2024-06-03 10:57:08 :: F3_setPaths :: Info :: Setting MATLAB search paths...
9 2024-06-03 10:57:09 :: F3_setPaths :: Info :: Added search path with subfolders: H:\TortoiseGit\IM_MATLAB_24Q1_SAM
10 2024-06-03 10:57:11 :: F3_setPaths :: Info :: Added search path with subfolders: H:\TortoiseGit\IM_MATLAB_24Q1_SAM
11 2024-06-03 10:57:11 :: F3_setPaths :: Info :: Added search path with subfolders: H:\TortoiseGit\IM_MATLAB_24Q1_SAM
12 2024-06-03 10:57:11 :: F3_setPaths :: Info :: Added search path: H:\TortoiseGit\IM_MATLAB_24Q1_SAM_bug_fix_initRes
13 2024-06-03 10:57:34 :: F3_setPaths :: Info :: Search paths set, no duplicate m-files found.
14 2024-06-03 10:57:34 :: F3_setPaths :: Info :: Creating snapshot...
15 2024-06-03 10:57:38 :: F3_setPaths :: Info :: Snapshot created: I:\_restricted Area\DFA\Programme\Matlab\04_IM_Aut
16 2024-06-03 10:57:38 :: F3_setPaths :: Info :: Successfully finished.
17 2024-06-03 10:57:38 :: F4_compile :: Info :: Starting compilation...
18 2024-06-03 10:58:05 :: F4_compile :: Info :: Compilation of H:\TortoiseGit\IM_MATLAB_24Q1_SAM_bug_fix_initResExclV
19 2024-06-03 10:58:05 :: F4_compile :: Info :: Output folder: <a href="matlab: winopen('I:\_restricted Area\DFA\Prog
20 2024-06-03 10:58:06 :: MAIN_COMPILE_CODE :: Info :: Successfully finished. Copying log file to output folder.
21
    
```

Security and Audit Aspects – Compiler Tool Snapshot

Name	Date modified	Type
_mFileLibrary_2024-02-27_10-40-27-841	27/02/2024 10:41	File folder
_mFileLibrary_2024-02-27_17-05-22-667	27/02/2024 17:05	File folder
_mFileLibrary_2024-02-29_13-42-55-524	29/02/2024 13:43	File folder
_mFileLibrary_2024-03-07_16-50-26-855	07/03/2024 16:50	File folder
_mFileLibrary_2024-03-08_08-39-28-097	08/03/2024 08:39	File folder
_mFileLibrary_2024-03-14_09-22-55-732	14/03/2024 09:23	File folder
_mFileLibrary_2024-03-14_14-45-22-819	14/03/2024 14:45	File folder
_mFileLibrary_2024-03-26_16-19-12-786	26/03/2024 16:20	File folder
_mFileLibrary_2024-06-03_10-56-43-625	03/06/2024 10:57	File folder
GRP_P1_MAT_SCRIPT	03/06/2024 10:58	File folder
_COMPILE_LOG_2024-02-27_10-40-27-84...	27/02/2024 10:41	TXT File
_COMPILE_LOG_2024-02-27_17-05-22-66...	27/02/2024 17:06	TXT File
_COMPILE_LOG_2024-02-29_13-42-55-52...	29/02/2024 13:44	TXT File
_COMPILE_LOG_2024-03-07_16-50-26-85...	07/03/2024 16:51	TXT File
_COMPILE_LOG_2024-03-08_08-39-28-09...	08/03/2024 08:40	TXT File
_COMPILE_LOG_2024-03-14_09-22-55-73...	14/03/2024 09:23	TXT File
_COMPILE_LOG_2024-03-14_14-45-22-81...	14/03/2024 14:46	TXT File
_COMPILE_LOG_2024-03-26_16-19-12-78...	26/03/2024 16:20	TXT File
_COMPILE_LOG_2024-06-03_10-56-43-62...	03/06/2024 10:58	TXT File



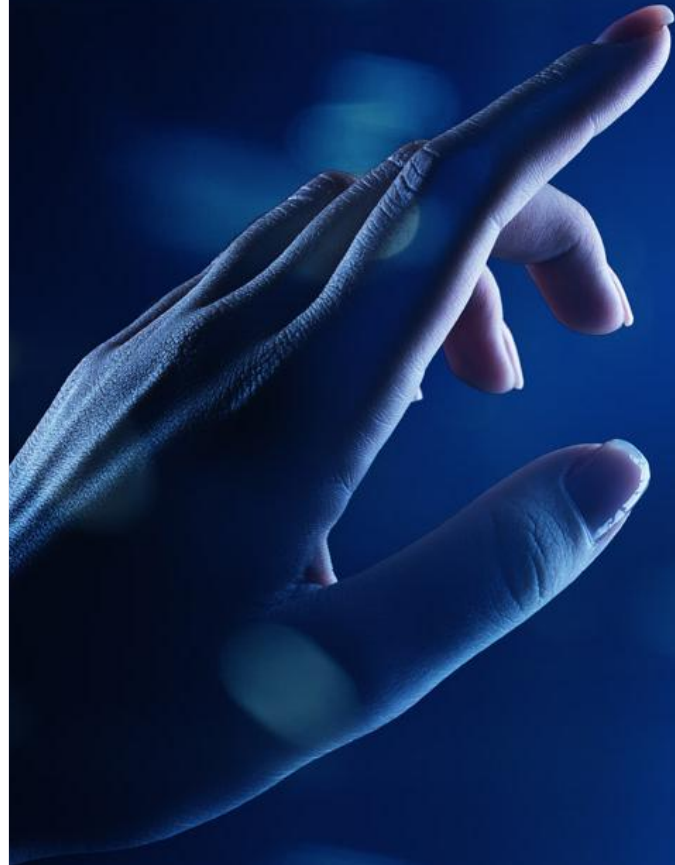
Name	Date modified	Type	St
+CF	03/06/2024 10:57	File folder	
+CFPC	03/06/2024 10:52	File folder	
+DBconn	03/06/2024 10:57	File folder	
+excel	03/06/2024 10:57	File folder	
+genData	03/06/2024 10:57	File folder	
+HybridCapital	03/06/2024 10:52	File folder	
+log	03/06/2024 10:57	File folder	
+MRKT	03/06/2024 10:57	File folder	
+PrepStatSheet	03/06/2024 10:52	File folder	
+SAM	03/06/2024 10:51	File folder	
+SAMSA	03/06/2024 10:51	File folder	
+scen	03/06/2024 10:57	File folder	
+stat	03/06/2024 10:57	File folder	
+utils	03/06/2024 10:57	File folder	
GRP_P1_MAT_SCRIPT.m	03/06/2024 10:43	MATLAB Code	

06

Q&A

Q&A

Thank you for your attention!
Happy to answer your
questions.



07

Backup

Additional Slides

Backup – Main Challenges

What my team had to learn...

