

Welcome to Milliman's Virtual Lunchtime Briefing

- The briefing will begin in a few minutes.

1st July 2020



Virtual Meeting Best Practices

- Mute: Keep yourself on mute at all times.
- Video: Keep your video turned off. Only presenters will be on video.
- Q&A: Use the chat function within the meeting for questions.

Agenda

Time	Topic	Presenter
12:00pm – 12:02pm	Welcome	Rob Frize
12:02pm – 12.25pm	Recovery Planning	Eamonn Phelan
12.25pm – 12.50pm	Modernising Actuarial Systems	Joseph Sloan
12.50pm – 1.15pm latest	Q&A session	Rob Frize

Recovery Planning for Insurers

Eamonn Phelan

1 JULY 2020



Agenda



New requirements



Contents of a recovery plan



Recovery planning practical challenges and solutions



The Isle of Man Corporate Governance Code

Changes on the way

Financial Management (S.11)

An insurer must evaluate at appropriate intervals in advance its risks, options and where appropriate, intentions under possible scenarios where the insurer would need to recover from severely adverse circumstances (including its hypothetical insolvency).

Risk Management (S.36)

The board of an insurer must review at appropriate intervals, and at least annually, the insurer's risks, options and, where appropriate, intentions in possible recovery scenarios.

Risk Management (S.36) continued

The board of an insurer must take any action necessary to ensure that the insurer has a properly considered approach in respect of possible recovery scenarios.



Recovery Plans

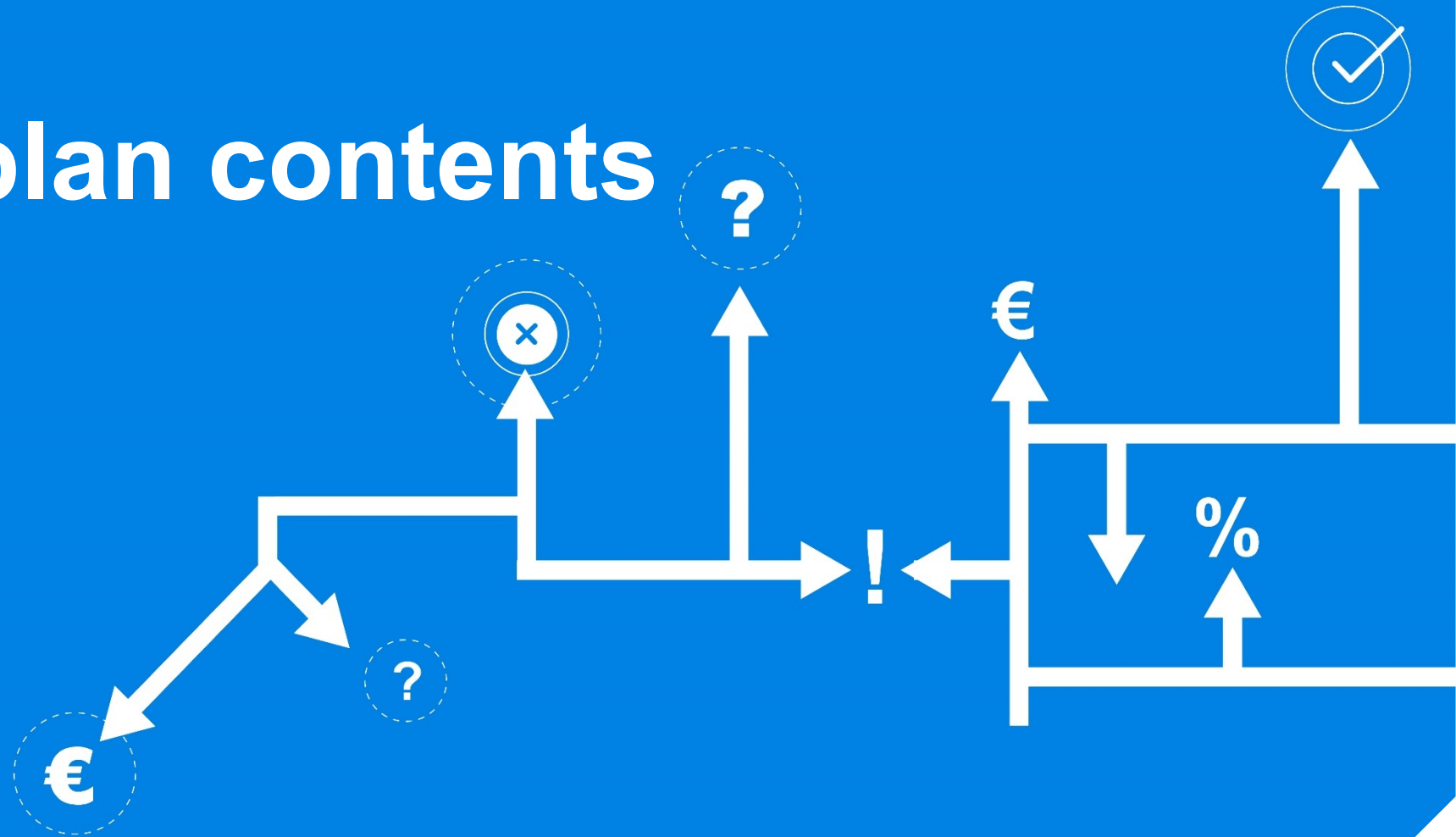
In Other Words...

Insurers must evaluate their recovery risks, options and intentions

It is a board responsibility to review this at least annually

It must be a properly considered approach

Recovery plan contents



Contents of a recovery plan

IAIS Application Paper

- Three key elements:
 - Credible options to cope with a range of severe stress scenarios, including both idiosyncratic and market-wide stress
 - Scenarios that address capital shortfall and liquidity pressures
 - Processes to ensure timely implementation of effective recovery options in a range of severe stress situations
- Contents of a recovery plan:
 - Executive summary – Helpful to use tables and flow charts to summarise
 - Description of the insurer or group – including operational structure and functions/services that are significant for the continuation of the business
 - Trigger framework
 - Governance
 - Recovery options – *“The core of the recovery plan is the menu of options”*
 - The range of recovery options would usually include actions to raise capital or other funding, increase liquidity, reduce costs, and enhance risk mitigation
 - Communication strategy
 - Stress scenarios

Contents of a recovery plan

EIOPA Opinion

- *“In a pre-emptive recovery plan, an insurer sets out the possible measures it could or would adopt to restore its solvency position following a (significant) deterioration”* – EIOPA Opinion on recovery and resolution framework, July 2017
- EIOPA considers that pre-emptive recovery plans should, at least, contain:
 - ❖ A **strategic analysis with a description of the entities** covered by the plan
 - Detailed description of the insurer’s legal structure, business model and core business lines. If relevant, a description of the essential functions whose disruption could harm the financial stability and/or relevant economy should be included.
 - ❖ Identify a **set of possible recovery options** to be used across a **range of stress scenarios**
 - Consider severe stress scenarios to the extent that these are not already covered in the ORSA
 - Combine adverse systemic and idiosyncratic conditions and identify the available recovery options and their feasibility in the stressed scenario
 - Include an assessment of the necessary steps and time needed to implement the recovery measures if needed, including the risks associated with the implementation of the measures
 - Determine whether any preparatory actions might be needed to ensure that the recovery measures can be implemented in an effective and timely manner
 - Include a communication plan covering the communication strategy of insurers with the authorities, public, financial markets, staff and other stakeholders

Contents of a recovery plan

CBI Consultation Paper 131 – June 2020

“Pre-emptive recovery planning will inform strategic decision-making processes during a crisis - developing a strategy during an extreme stress can limit the scope of the planning, the detail of the review, and the efficacy of decision making.”

Draft Regulations

- Review at least annually and on any material organisational or financial change
- Board assessed and approved
- Confirmation of internal reviews
- Monitoring of recovery indicators
- Confirmation that the trigger framework can operate reliably under financial stress
- Detailed requirements on plan contents:
 - ✓ Plan governance
 - ✓ Strategic analysis
 - ✓ Recovery indicators
 - ✓ Recovery options
 - ✓ Scenario analysis
 - ✓ Communication plan

Draft Guidelines

- Sets out links with recovery planning, with the insurer’s SoG, ERM framework and ORSA
- Allows for proportionality – nature and scale of insurer but also its systemic importance
- Insurers shouldn’t rely on a group recovery plan
- Breakdown of strategic analysis into core business lines, key services, and critical functions
- Indicator framework – capital, liquidity, profitability, reserving, market-based, macroeconomic
- Impact and feasibility assessments for recovery options

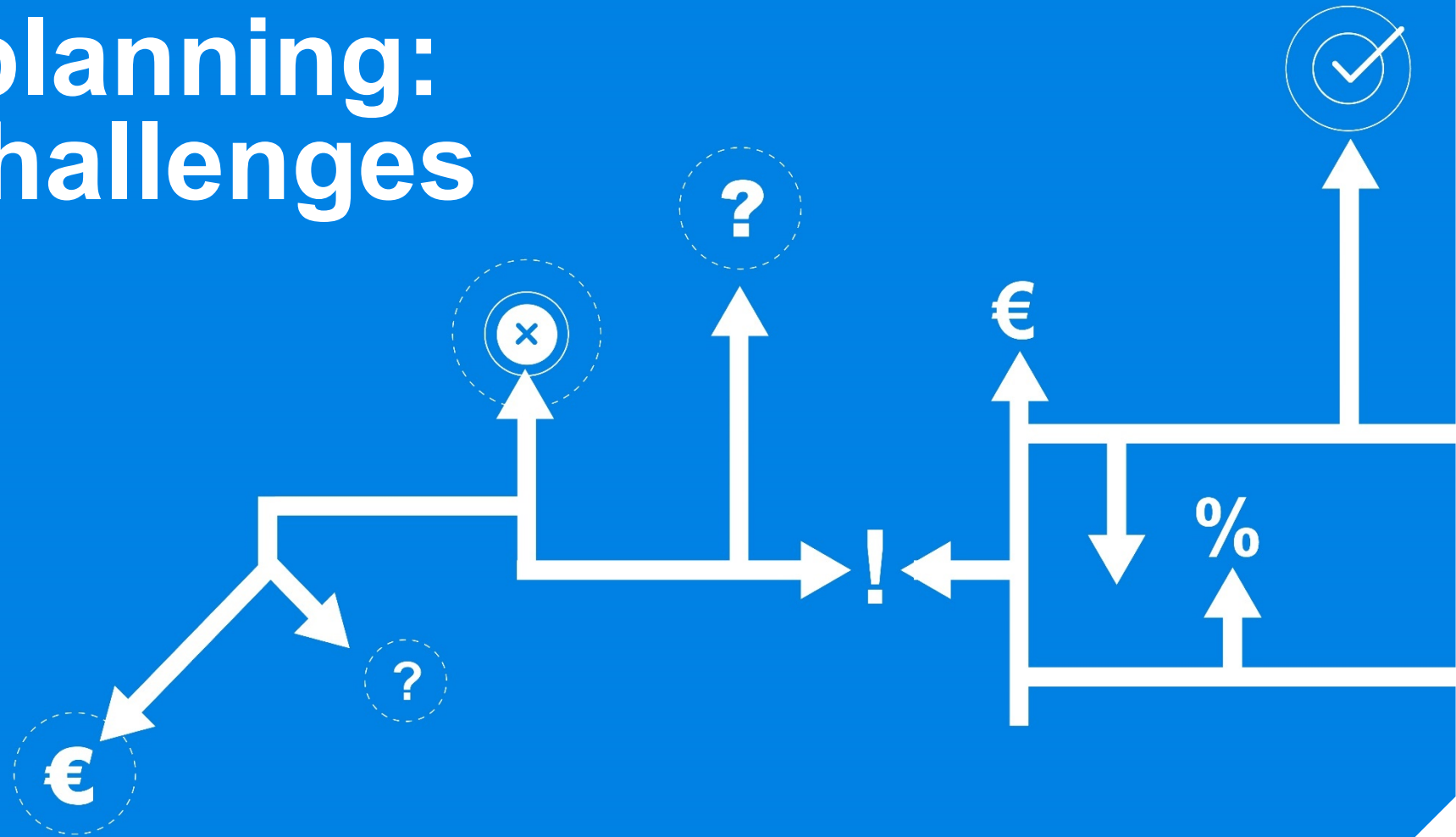
Credibility and Feasibility of Recovery Options

The insurer must assess the feasibility of the recovery options.

The key factors that might influence an option's feasibility are:

- a) **past experience** in implementing similar measures;
- b) estimated **timeframes** for executing recovery options; and
- c) **potential risks and impediments** to timely and effective implementation of recovery measures, as well as possible mitigating actions and concrete preparatory measures that can be undertaken to eliminate identified risks and impediments

Recovery planning: Practical challenges



Recovery Planning: Practical Challenges at a glance

- Obtaining buy-in from all stakeholders
- Defining the scope of the recovery plan
- Spending too much time on the scenarios which could get you into difficulty (the relatively easy part) and not enough on the solutions or 'recovery options' (the relatively hard part)
- Generating a shortlist of possible recovery options / not having sufficient expertise in relation to recovery options
- Assessing the feasibility of options in times of stress
- Quantifying the potential impact of recovery options
- Defining the point at which action would be taken

Challenge 1: Obtaining buy-in from all stakeholders

Common challenges:

- Are there reasonable scenarios that would lead to severe adverse financial distress?
- Does recovery planning add any value?

Solutions:

- Premise of recovery planning is that a breach has occurred – removes any potential for optimism bias or failure to identify an unexpected scenario. The scenarios are more helpful in terms of exploring credibility / feasibility of recovery options in specific scenarios
- Point to past failures of insurers
- Point to examples of how recovery planning can add value
- Explanation of clear regulatory expectations in this area

Challenge 2: Defining scope of the recovery plan

Solution: Focus on recovery; focus on solvency but don't ignore liquidity; include operational continuity

Recovery vs Resolution

- Regulator authors any resolution plan, and the insurer authors the recovery plan.
- Some insurers have been requested to produce elements of resolution plans in the past (e.g. Prudential public part available online).
- CBI has requested some insurers to address aspects of resolution depending on situation.

Solvency vs Liquidity Issues

- Primary focus is on breaches of capital requirements.
- However, guidance also recommends adverse scenarios should include those in relation to liquidity pressures.
- Liquidity not always a key risk for certain insurers.
- Proportionate approach but consideration needs to be given to liquidity where it is relevant.

Operational vs Financial Continuity

- Scenarios focus on financial difficulty.
- However, must ensure both financial and operational continuity throughout recovery.
- IAIS guidance: include an overview of the insurer including operational business structure, functions and/or services that are significant for the continuation of business
- CBI requesting information regarding both financial and operational continuity as part of recovery planning.

Challenge 3: Spending too much time on the scenarios and not enough on the solutions (recovery options)

Solution: “Begin with the End in Mind” – *Stephen Covey*

What would my options be if we were to get into financial difficulty?



How would these options work in particular scenarios?



What governance/operational processes would be needed to execute the plan?

Challenge 4: Generating a shortlist of recovery options

Solution: Know your full menu of possible recovery options, conduct research, seek expertise

Examples of possible recovery options:

Group finance &
Off Balance
Sheet Capital

Cost reductions
& Staff Pension
Schemes

Reinsurance,
Longevity
Transfer & Cat
Bonds / Swaps

Restructuring,
M&A

Repricing &
Reviewing
charges/benefits

Closure to New
Business,
Solvent Run-Off

ALM, Hedging &
Asset Allocation

Subordinated
Debt & Hybrid
Capital

(P)IM, USPs &
Unit under-
funding

Equity Capital

Suspension of
Dividends

Liquidity Options

Challenge 5: Assessing feasibility of options under stress

Recovery options which seem reasonable during normal conditions may not be feasible during times of stress:

- Availability of desired option
- Counterparty strength during times of macro-induced stress
- Lack of liquidity in the market
- Parent also under stress
- ...

Challenge 6: Quantifying the potential impact of recovery options

Solution: Decide on proportionate approach, document data / assumptions used, seek expertise

High Level approach

- Use a combination of assumptions, expert judgement and approximate calculations to estimate the impact of the recovery option.

Point in time approach

- Take a point in time balance sheet/capital position (e.g. YE19)
- Stress this position such that solvency coverage is less than 100% (YE19*)
- Recalculate the position following implementation of the recovery option (YE19**).
- The difference between YE19* and YE19** is the impact of the recovery option.

Scenario projections approach

- Model severe adverse multi-year scenarios showing e.g. breach of SCR (or breach of lower capital thresholds) if not already in ORSA.
- Then model the scenario following implementation of the recovery option(s) to determine the impact.

Challenge 7: Defining point at which action would be taken



Trigger Framework

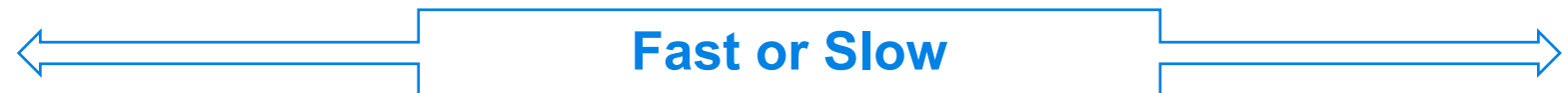
- Capital
- Liquidity
- Asset quality
- Profitability
- Market
- Macro-economic
- Operational

Systemic Scenarios

- Fall in financial markets
- Persistent low interest rates
- Catastrophic event
- Longevity shock

Idiosyncratic Scenarios

- Adverse move in assets
- Mass lapse
- Counterparty failure
- Rogue trader severe loss
- Major cyber attack



Solution: Leave scope for judgement as there is a balance between prompt action ensuring continuous compliance and potentially temporary / short-term fluctuations



For more information:

<https://ie.milliman.com/en-gb/risk/recovery-and-resolution>

Eamonn Phelan

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Actuarial Modelling:

Python case study

Joseph Sloan

1 JULY 2020

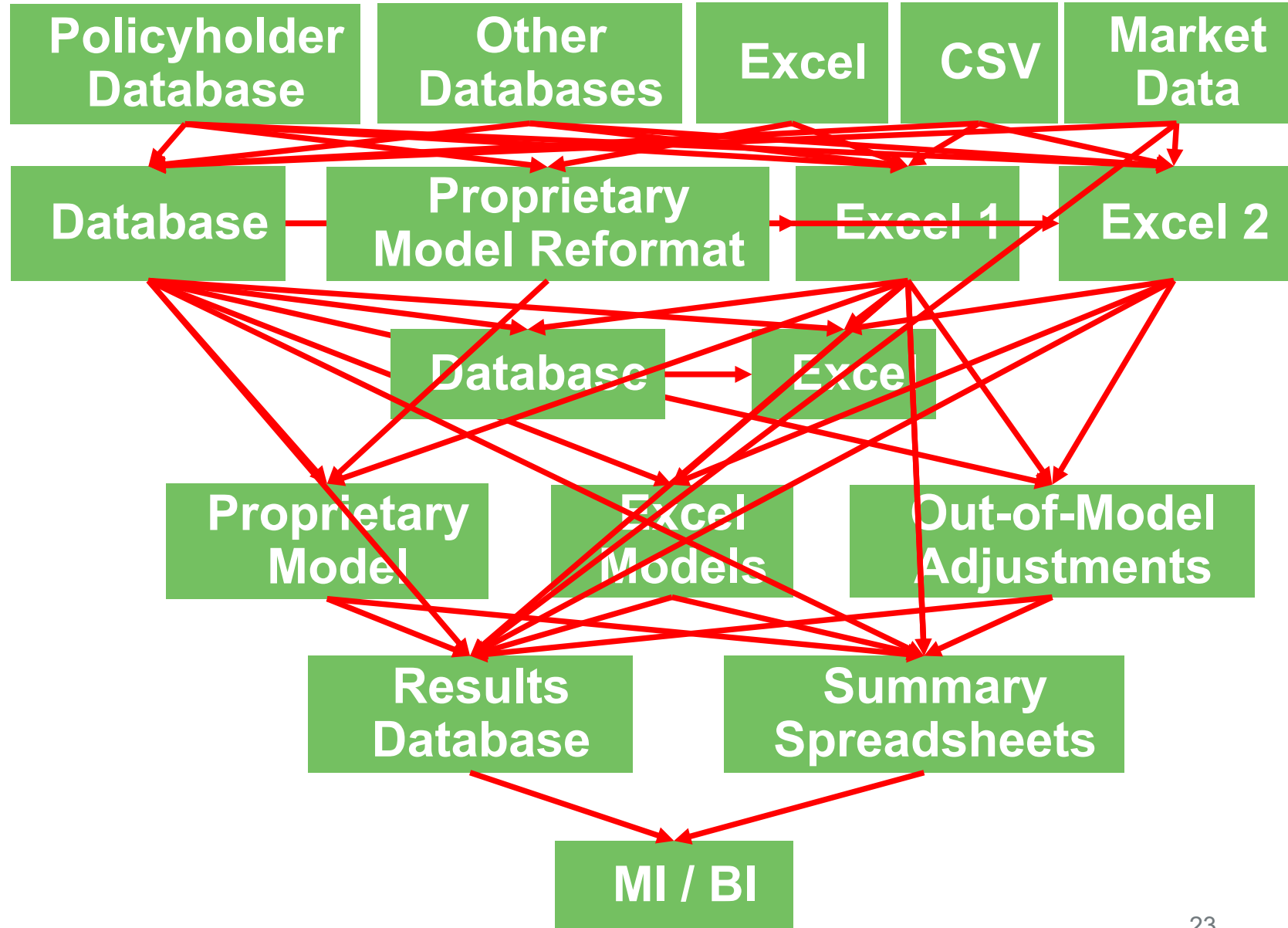
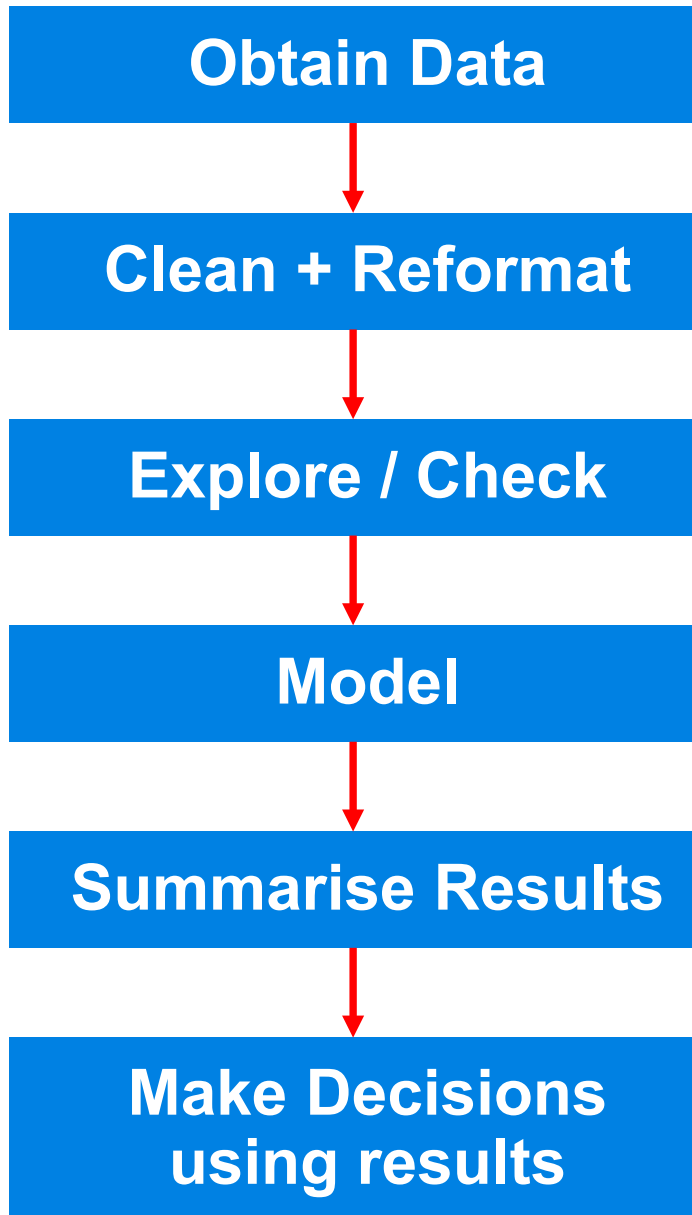


Actuarial Models

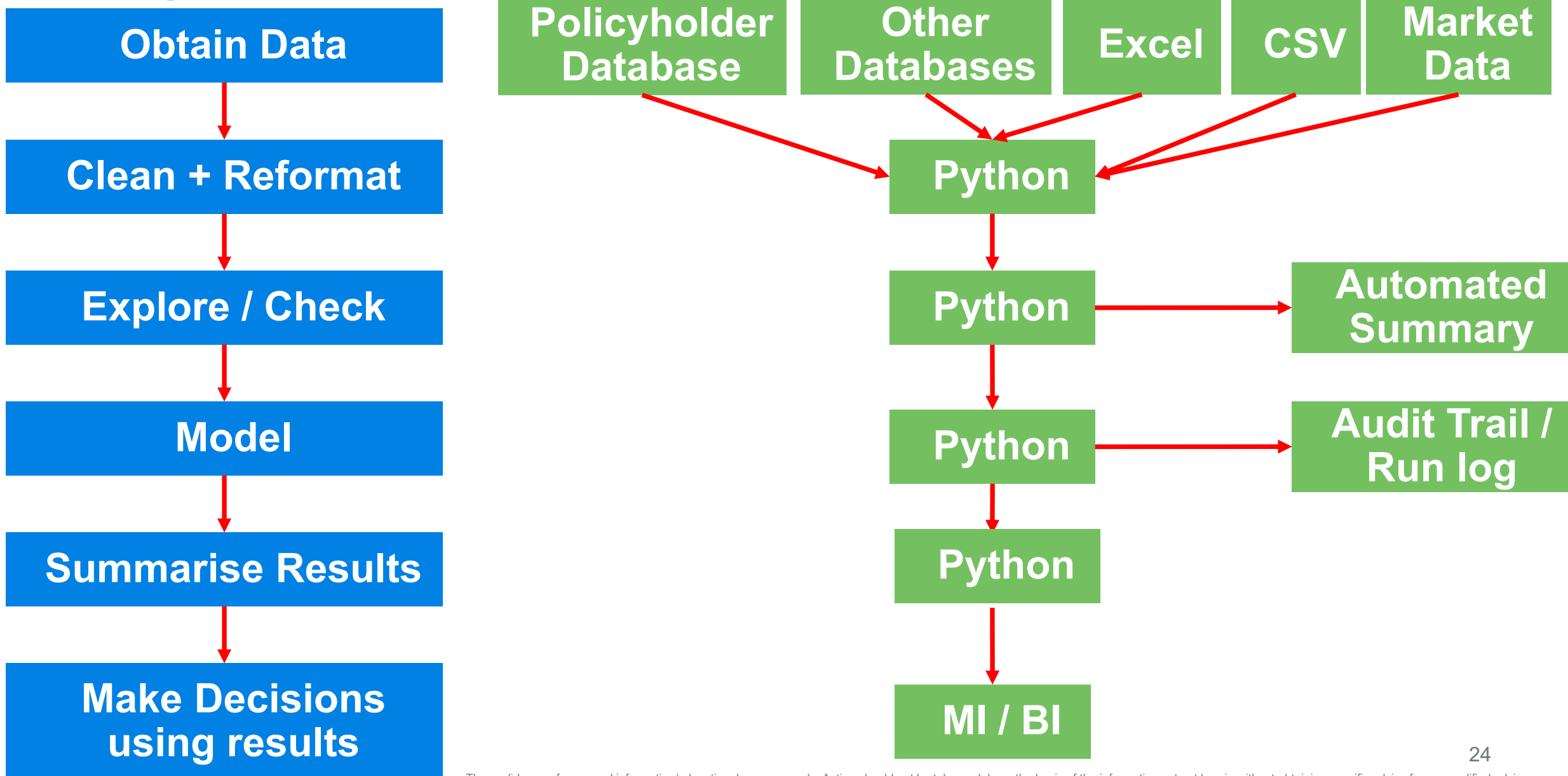


- **Benefits of enhancing Actuarial models:**
 - Reduce costs through automation and harmonisation
 - Risk mitigation
 - Allow for high value resources to do high value work
 - Ability to meet demands from regulators
 - Access to information faster
 - Improved accuracy

Traditional Actuarial Process



Example of a Modernised Actuarial Process



What is Python?

General
purpose
programming
language

High level &
concise

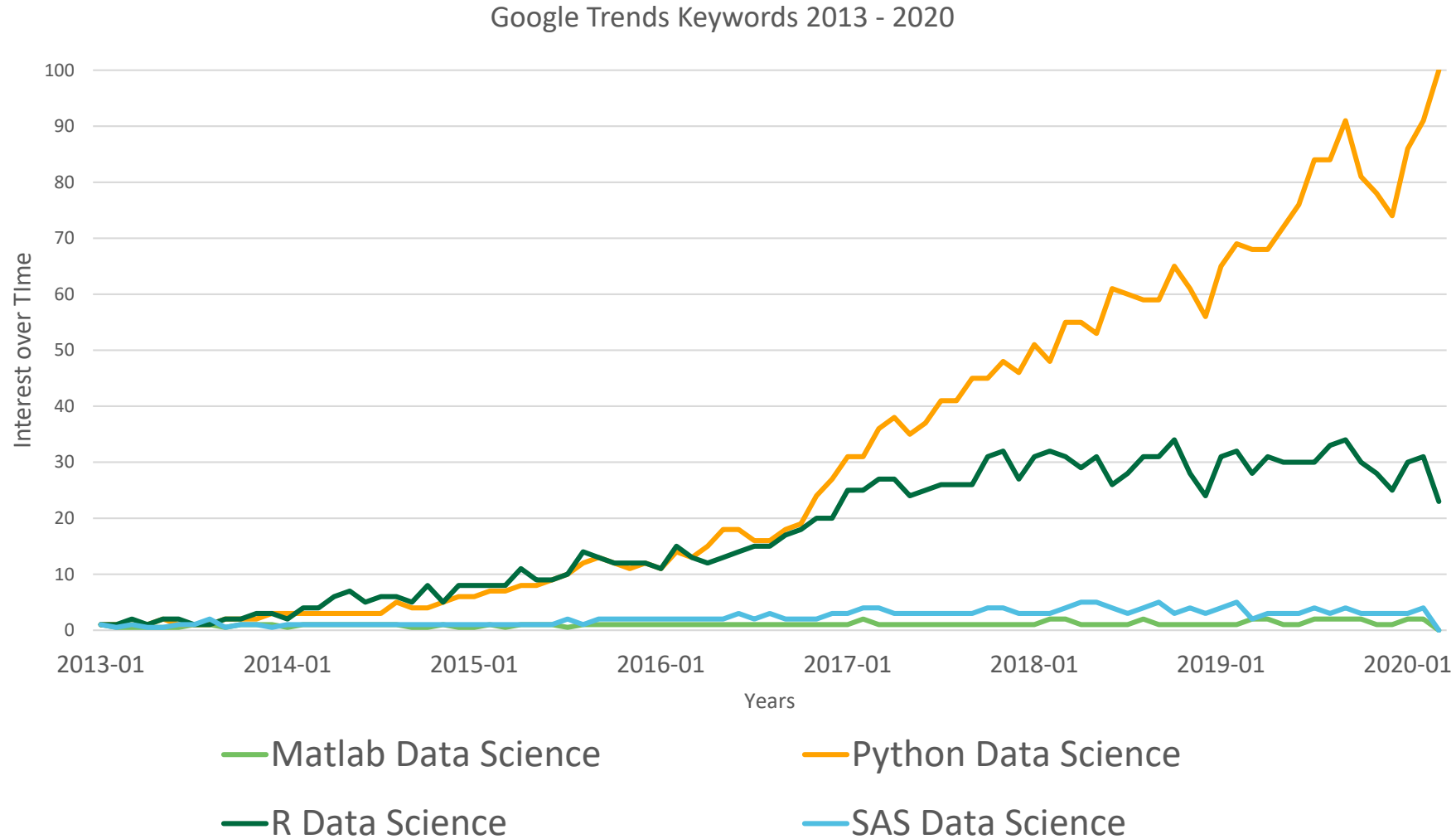
Batteries
Included

Relatively easy
to learn

Highly
Extensible

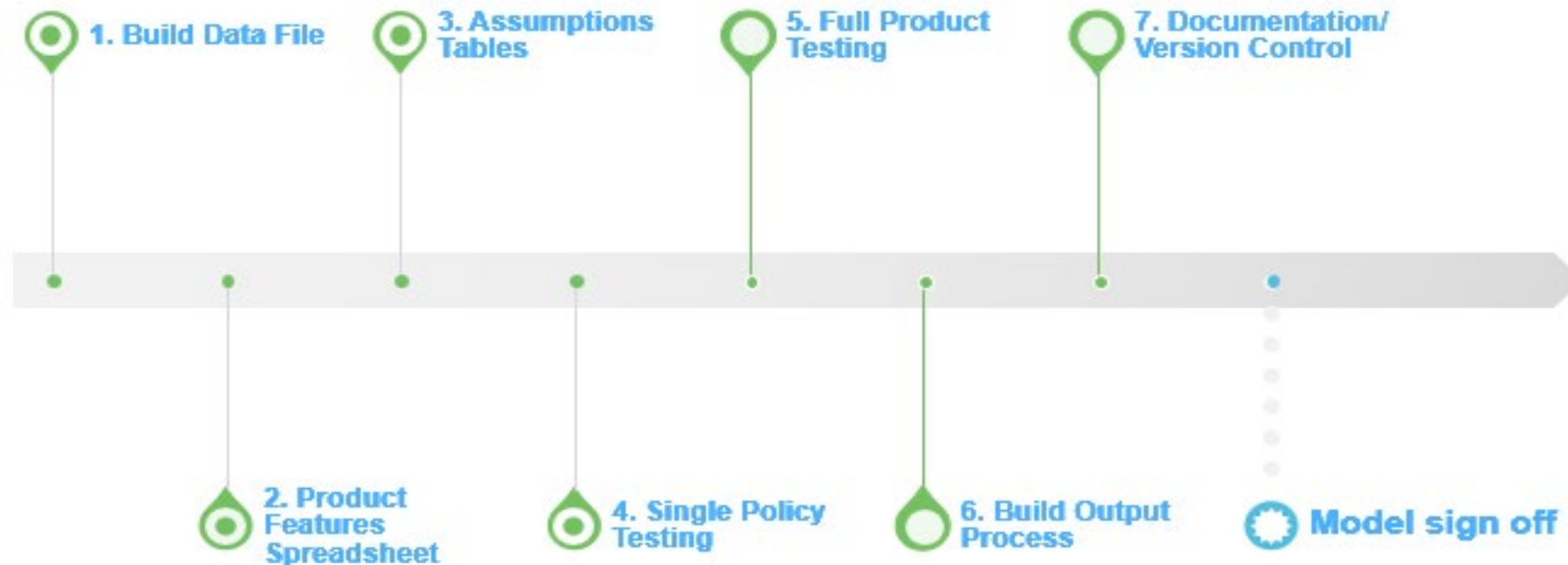
Open-Source

Trends



Case Study 1: Replacing an existing IFRS valuation process using Python

- **Previous process:**
 - Discounted cash-flow model, Access database and Excel
 - 4 days to complete monthly valuation
- **Steps involved in the migration**



Case Study 1: Build Data File

- Jupyter notebook

- Pandas
- Numpy
- Parquet

- Features:

- Loads quickly – 300k rows 200 columns
- Audit trail
- Documentation
- Summary / graphs
- Automatic checks
- Output to Excel
- Current month vs previous month
- There are no hidden steps or manual interventions

```
In [1]: import pandas as pd
import numpy as np
import os.path
import math
import time

pd.options.display.max_columns = 1000
```

Steps required

Update the following for the current valuation:

1. Extract location and file name
2. Prices location, file name and valuation date
3. Output folder location and file name
4. If any new product has two coverages, add it to the "double coverages" list

```
In [2]: ph_data_file_paths = [r"R:\XXX\AA work\Valuations\2018\Year End\Data from client\20181231_MONTHLY_VALUATION_FILE_December_XXX.tx",
                             r"R:\XXX\AA work\Valuations\2018\Year End\Data from client\20181231_MONTHLY_VALUATION_FILE_December_XXX.tx",
                             r"R:\XXX\AA work\Valuations\2018\Year End\Data from client\20181231_MONTHLY_VALUATION_FILE_December_XXX.tx"]

prices_file_paths = {"31/12/2018": r"R:\XXX\AA work\Valuations\2018\Year End\Calculations\Financial Statements\Prices and Product"}

output_folder = r"R:\XXX\AA work\Valuations\Ad Hoc\2019\Migration\v1\Data\\"
output_file_name = "mp_201812.par"
```

Import Datafiles and Fund Prices

```
In [10]: def import_single_df(file_path):
df = pd.read_csv(file_path, sep = ";", parse_dates=True, infer_datetime_format=True, skip_blank_lines=True, na_values="*", 1)
return df
```

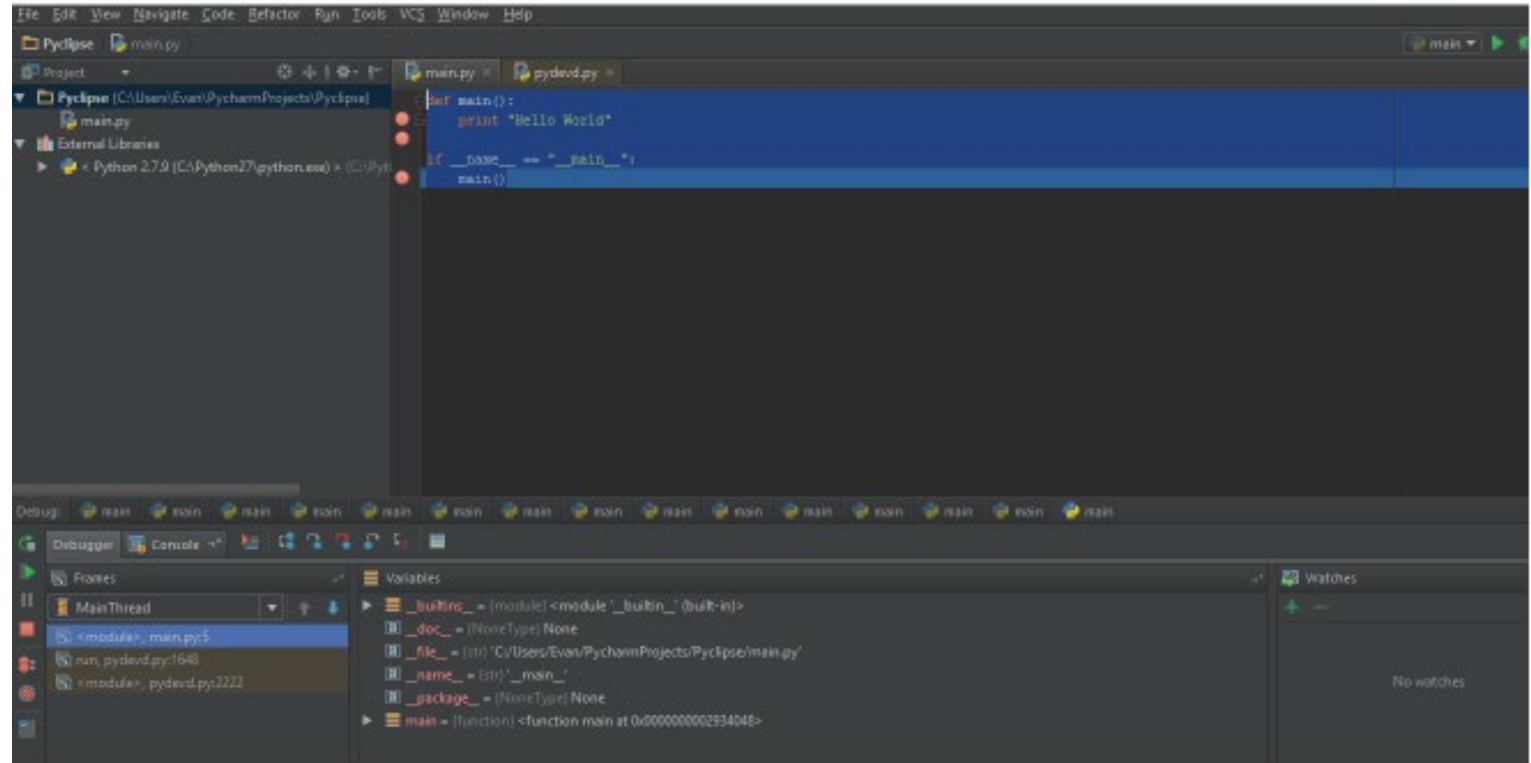
Calculate Unit Reserves

```
In [13]: def calc_unit_reserves(df, fund_df, n_funds_in_datafile=20):

# for each of the 20 fund columns in the modelpoint datafile
for i in range(1, n_funds_in_datafile+1):
```

Case Study 1: Discounted Cash-Flow Model

- Jupyter notebook – user interface
- Pycharm
 - Locked down the code!
 - Version control
 - Looks a lot like other modern development environments
 - Run and test code
 - Examine variables
- Useful tools
 - Numba – speed!!!
 - Pandas
 - SQLite



Case Study 1: IFRS Model on Python: Main Features (1/2)

- Fully automated workflow for monthly valuation

“BM” – Before Migration
“AM” – After Migration

- Time to produce monthly results:

BM



AM



80% reduction

- 80% reduction in discounted cash flow model run times
 - Pandas
 - Numba: Ultra-fast calculations (3 million policies in 1 hour)

Case Study 1: IFRS Model on Python: Main Features (2/2)

- **Fast model build:**
 - Reduction in lines of code (1000 lines of Python vs 8000 in original model)
- **Accessible data file**
- **Automated checks and analysis reports**
- **Interaction with other languages and software** e.g. SQL, Microsoft Excel/Access
- **Data storage**
 - File sizes are very small – save large volumes of policy-level data without overloading servers

Case Study 2: Solvency II Asset Look-through on Python

- **Previous process**

- 500+ asset files to look through the asset data and calculate the appropriate standard formula shocks to use
- Manual and time-consuming process in Excel – 1 week to complete

- **Revised process**

- Single Python script
- 1 hour to do the full end-to-end calculation

- **Python is a great tool for this type of work:**

- Large data set
- Identifying data quality issues
- Speed
- One location for calculations
- Informative output

Benefits and Challenges of using Python for Actuarial Models

Benefits

- Time improvements
- Greater end-to-end capability
- Faster run times
- Handle much more data
- Better output
- Risk mitigation
- Flexibility with working with other systems and software

Challenges

- Investment in skills
- Development time
- Less user-friendly interface
- Solutions can require “outside of the box” thinking

Key Takeaways

Overcoming technology-related anxiety

New technologies will open new doors

Setbacks will occur and clever solutions are required

Identifying smarter and more efficient ways to work engages the workforce

Improving Actuarial Models

BENCHMARKING

- Modelling best practices
- Assessing model maturity
- Model gap analysis
- Technical reviews

MODEL BUILD

- New products and portfolios
- Change in regulation
- Mergers and consolidation
- Replace legacy systems
- Internal model design and build

GOVERNANCE AND CONTROL

- Control data input and output
- Monitor assumptions
- Creating objective modelling frameworks
- Control existing and emerging model risks
- Model change control

MODEL VALIDATION

- First- and second-line model validation/testing
- Data validation and quality assessment
- System and process validation
- Internal model validation

AUTOMATION

- Model performance and efficiency review
- Data analytics solutions
- End-to-end process build
- Efficient profit attribution and analysis of change



For more information:

<https://ie.milliman.com/en-gb/insurance/financial-transformation>

<https://milliman-cdn.azureedge.net/-/media/country-sites/ireland/pdf/dublin-risk-financial-model-brochure.ashx>

<https://www.milliman-mind.com/>

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Q&A session

Appendix

Background information on recovery
planning

Financial Stability Board (FSB) Definitions

Recovery Plan:

“Identifies options to restore financial strength and viability when the firm comes under severe stress”

Resolution:

“When a firm is no longer viable or likely to be no longer viable, and has no reasonable prospect of becoming so”

- Regulators typically heavily involved
- Measures to write down obligations

IAIS Definitions

International Association of Insurance Supervisors

Recovery Plan:

“a plan that identifies in advance options to restore financial strength and viability if the insurer comes under severe stress”

Resolution:

“Any action by an authority, with or without private sector involvement to deal with serious problems in an insurer or insurance group that imperil the viability of the insurer or the insurance group.”

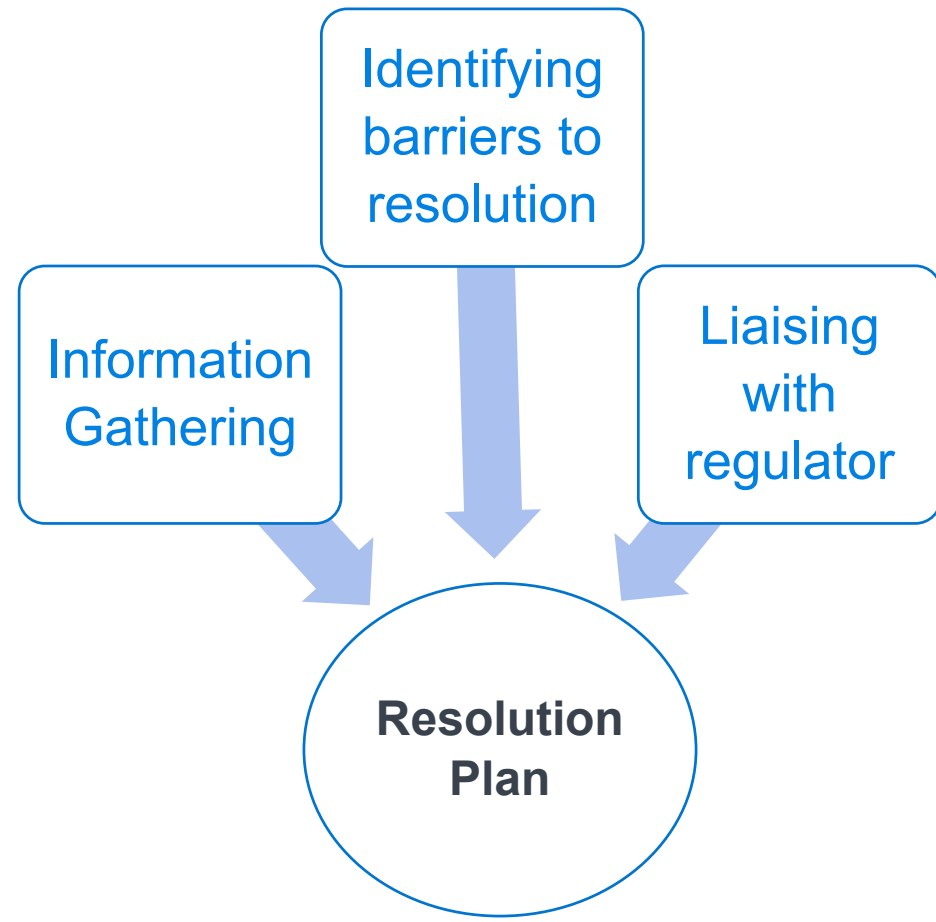
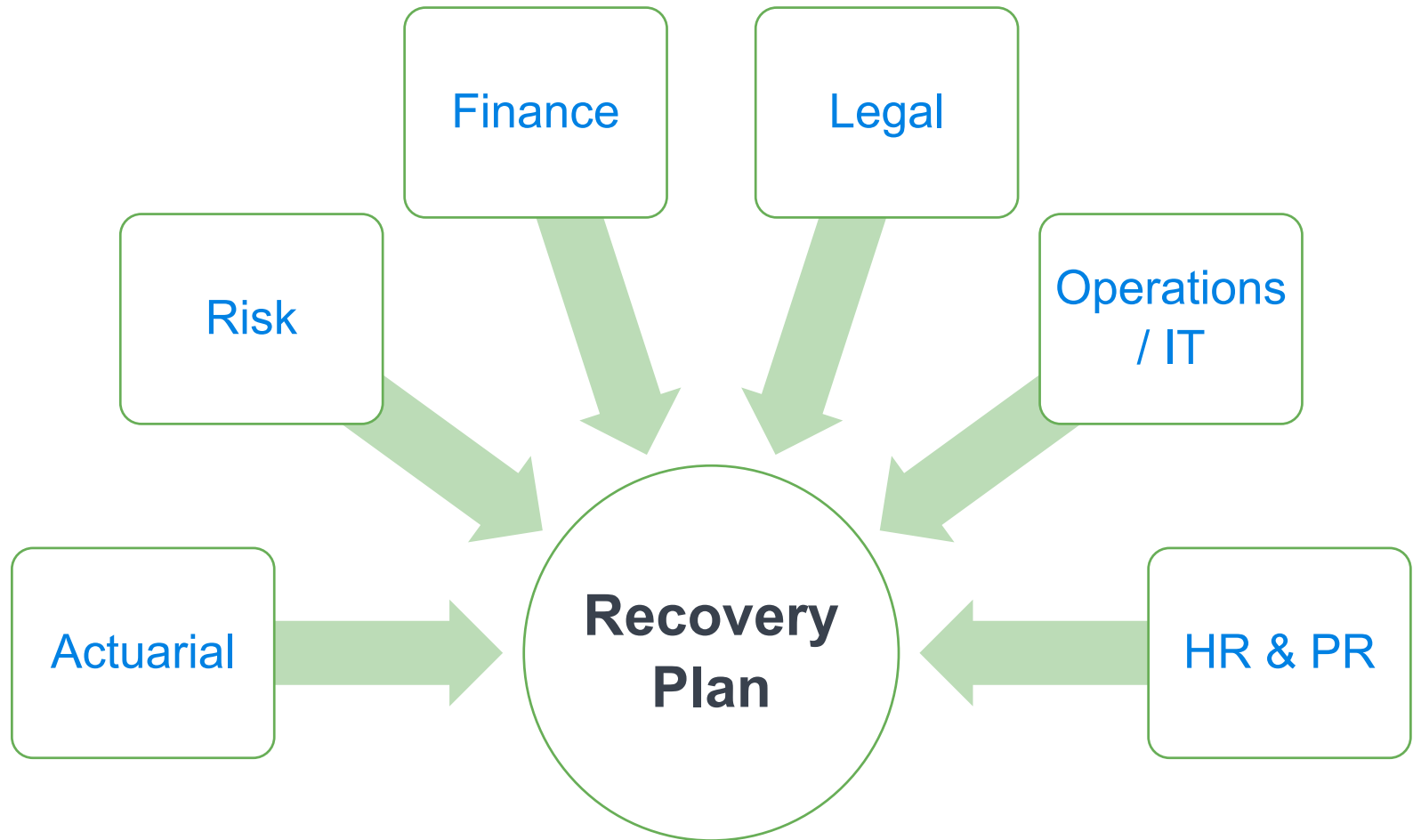
“Recovery planning can also be a useful tool for other insurers, to make crisis management and thinking about recovery options a more explicit part of enterprise risk management.”

—IAIS October 2018

“Recovery planning is, therefore, an important part of the overall risk management process of insurers and should be considered a governance arrangement within the meaning of the 2015 Regulations”

— Ed Sibley, Deputy Governor, CBI, 27 September 2019

Recovery and Resolution Regime (EIOPA)



Drafted by the company

Drafted by the regulator