

Willis Towers Watson

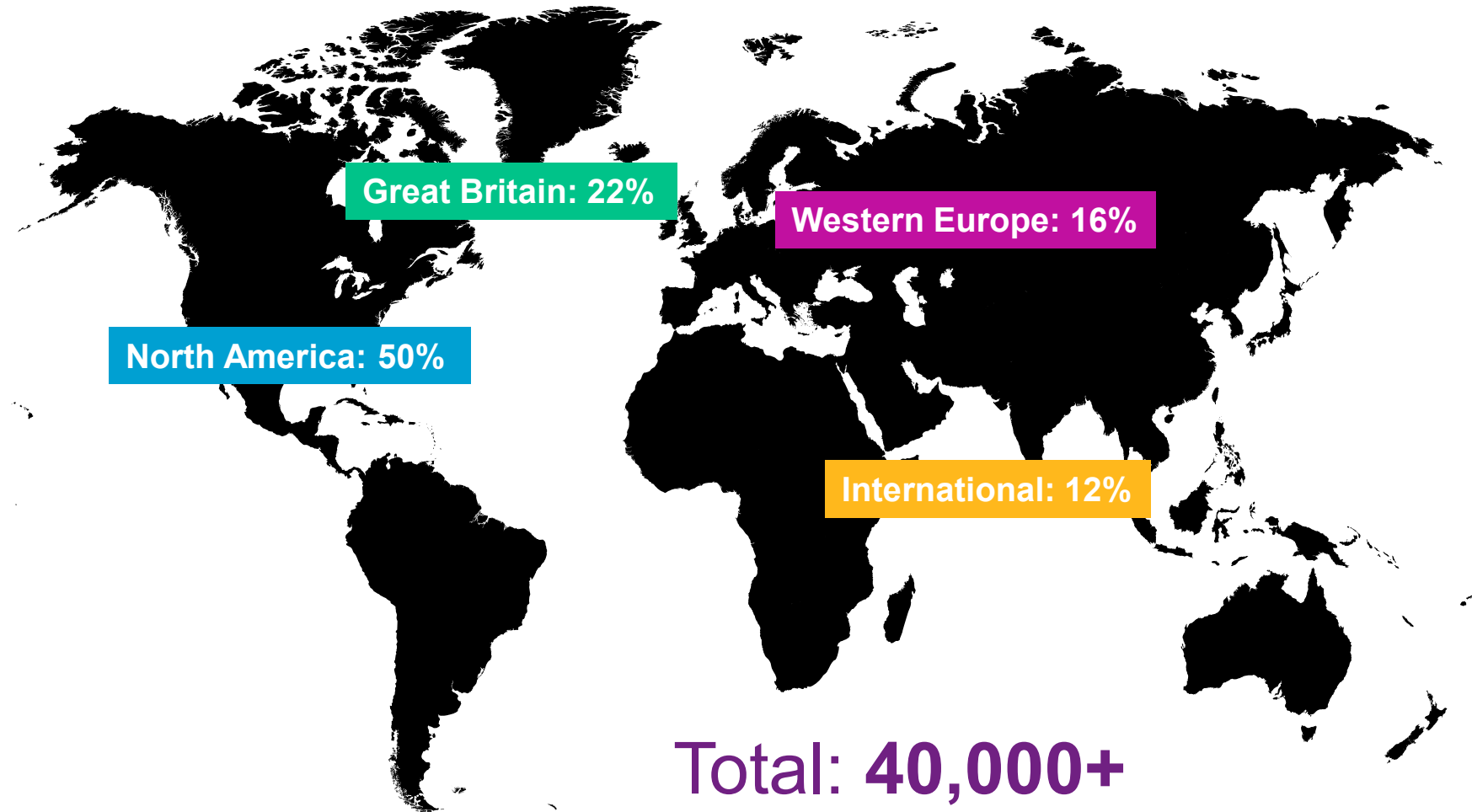
Data and Modelling in the Pension Funds World



About Willis Towers Watson

Willis Towers Watson (NASDAQ: WLTW) is a leading global advisory, broking and solutions company that helps clients around the world turn risk into a path for growth. With roots dating to 1828, Willis Towers Watson has over 40,000 employees in more than 120 countries. We design and deliver solutions that manage risk, optimize benefits, cultivate talent, and expand the power of capital to protect and strengthen institutions and individuals. Our unique perspective allows us to see the critical intersections between talent, assets and ideas – the dynamic formula that drives business performance. Together, we unlock potential. Learn more at willistowerswatson.com.

Willis Towers Watson around the world



Willis Towers Watson in Portugal



The Lisbon Service Centre

- Actuarial valuations of pension funds – financial mathematics, modelling, liabilities/assets, cashflows, funding levels, stochastic processes
- Data Solutions – data quality, reconciliation exercises, data construction, data digitisation

Pension funds

Features



What are they?

- Plans to provide income during retirement
- Provide for current and future pensioners
- Are sponsored by employers/companies
- Can be very large in terms of value of assets
- Are very large investors and play an important role in the stock market

Commonly of the order of \$ billions



How are they managed?

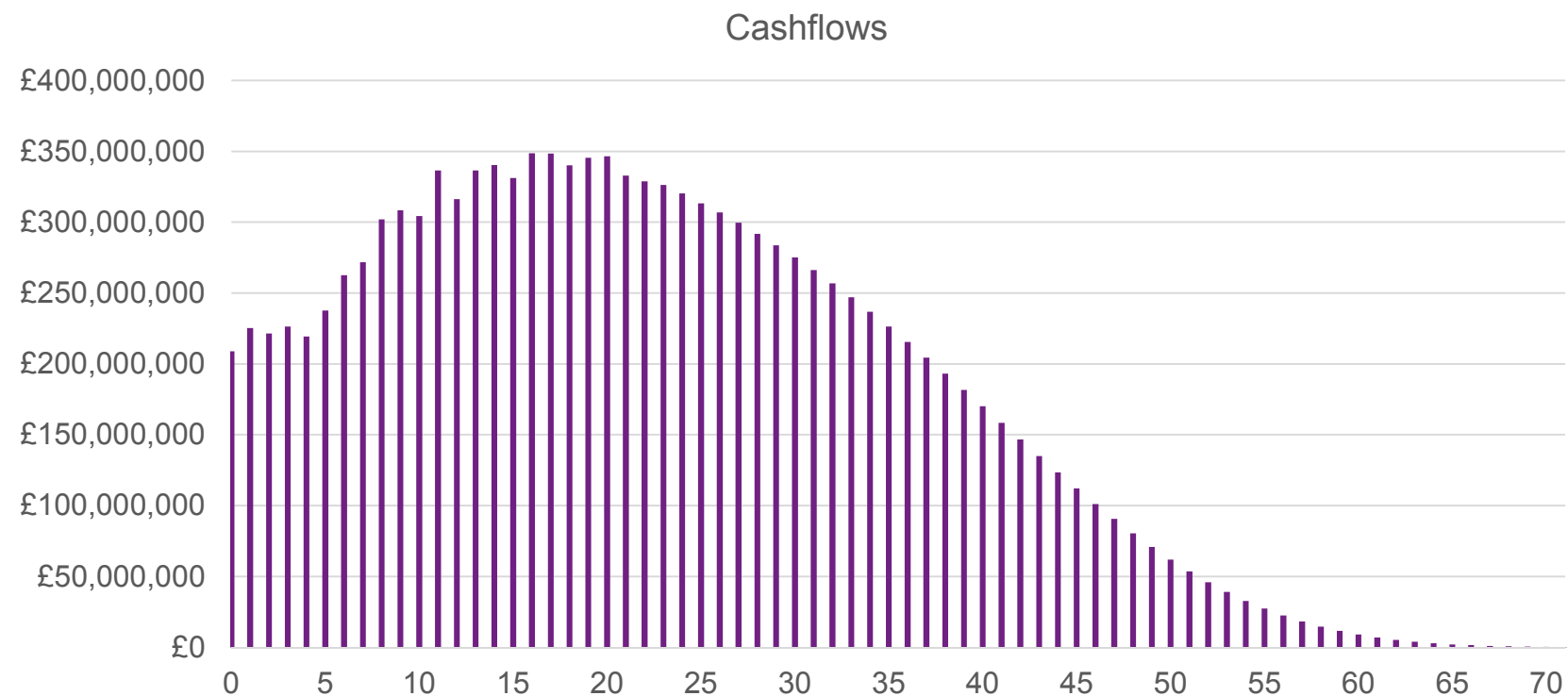
- How do we determine how much money is needed to provide pensions for a population?
- How do we calculate contribution rates?
- How do we account for uncertainty of longevity?
- How do we account for uncertainty of market conditions?
- How do we determine how much money to hold now and how much to invest?

Can be a difficult question to answer

Actuarial valuations

- An actuarial valuation is the process of assessing the **liabilities** that a pension fund is responsible for and determining the funding level by comparing them to the value of the **assets**
- In a nutshell, it aims at calculating a number that represents the current value of all future payments that the scheme is responsible for paying
- But they also calculate on a year-by-year basis the amounts that need to be paid off the fund's assets to provide for the pensions due each year (**cashflows**)
- They use mathematical models based on statistical methods, probability theory, finance, economics and computer science to model cashflows, evolution of market conditions, mortality, marital status percentages and other factors that can impact a pension fund
- They may use stochastic processes to model the random nature of mortality, inflation, interest rates, etc.
- Require large computational power because they model the streams of pension payments for each individual pensioner in a particular fund
- Typically run a number of different scenarios under different economic and demographic assumptions

Actuarial valuations – Liabilities



- Cashflows are generated to simulate a number of economic and demographic assumptions
- These assumptions reflect different scenarios
- They model the expectation of how much the scheme must pay out each year to meet its responsibilities

Actuarial valuations – Liabilities

Economic variables

Functions (sub-models)

- Discount rates (investment return)
- Salary escalation
- Inflation
- Revaluation rates
- Statutory pension increases rates

Demographic variables

Statistical tables

- Mortality
- Ill-health
- Retirement
- Deferment (moving)
- Marriage percent

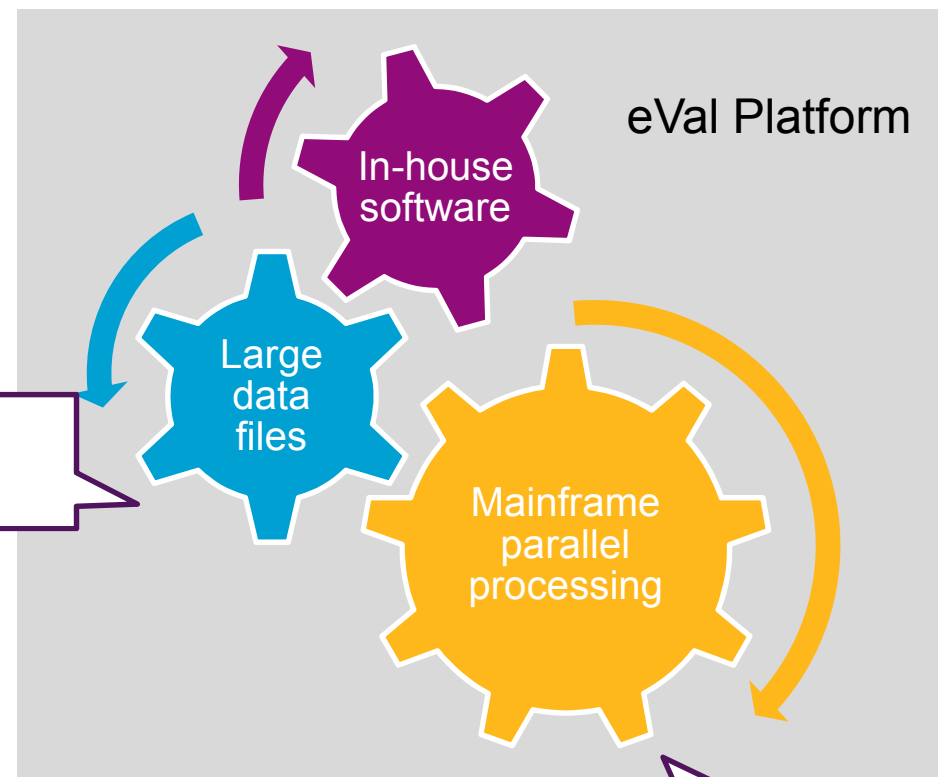
Modelling

- Discrete/Continuous
- Timing adjustment
- Materiality
- Judgement
- Sensitivities

Results:

- Cashflows (all sorts of breakdowns)
- Individual results by member
- Metrics and projections

eVal Data



eVal Liabilities

Actuarial valuations – Risks

- What is the need to run these models?



- Many funds have massive liabilities, of the order of tens of billions
- Small levels of underfunding represent significant issues in the sponsor companies books
- Underfunded pension funds may not be able to provide pensions



- Longevity – Health care may lead to much longer lives and underestimation of liabilities
- Investment return – Return on investments can be uncertain (in particular for certain classes)

Actuarial valuations – Assets



- In addition to performing the calculation of liabilities and cashflows, funds are also advised on the best strategies to invest their assets



- Typically the investment strategies aim at timing future asset sales and revenue streams (dividends, rents, etc.) to match the outbound cashflows needed to pay the pensions due each year



- This is known as asset-liability matching

Data Solutions – why is reliable data important in the pensions world?



- Allows pension funds to comply with statutory regulations and pay members their full pension entitlement



- Helps actuaries determine accurate funding levels



- Reduces risk – missing or poor data may represent a large but unrecognised liability that the fund is liable for paying



- Enables pension funds to enter de-risking/hedging transactions with insurers



- Better quality data helps secure better deals and lower premiums when negotiating with insurance companies – they too don't want to be liable for an undisclosed liability

Data Solutions – what do we do at Willis Towers Watson

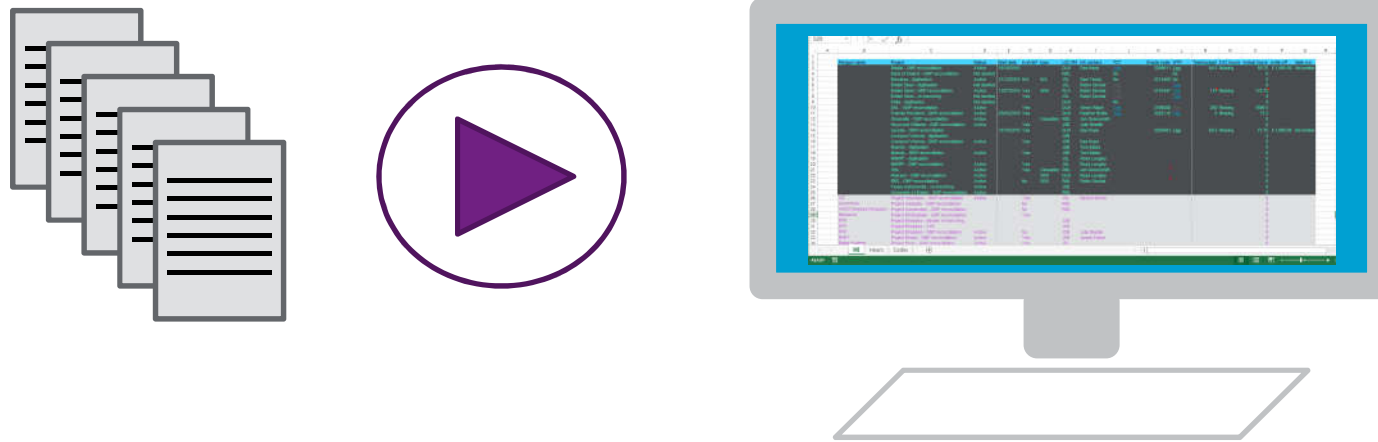
Data reconciliation	Digitisation	Data cleanse / construction
<p>Reconciliation of:</p> <ul style="list-style-type: none">▪ Population▪ Pension amounts▪ Pension fund's data▪ Government records <p>Many of our data reconciliation projects are supported by digitisation work – see next</p> <p>Iterative approach to resolve all records in the data</p> <p>Interaction with GB government agencies to resolve discrepancies between government and scheme records</p>	<p>Process for converting physical records to digitally readable data. Digitisation steps:</p> <ul style="list-style-type: none">▪ Conversion from physical to PDF format (currently not done at the LSC)▪ Classification of documents into sets of the same type based on content▪ Extraction of data from PDF images into Excel or database formats	<p>Re-calculation of pension benefits based on historic data</p> <ul style="list-style-type: none">▪ Re-tranching exercises▪ Contingent spouse pensions – construction of CSP data on the basis of historic member data▪ Correction of pension amounts and benefits in the administration systems of the pension funds

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Data Solutions – Digitisation

- Process to convert information from a physical support (paper, microfiche, etc.) to editable digital format –excel, databases, etc.



0 100 200 300 400 500 600 700 800 900 1000
Hours

Data Digitisation



Manual Extraction



- State of the art software
- Machine learning algorithms and SW training
- Time and cost savings
- Fully integrated solution

Lisbon Service Centre

In numbers

105

Colleagues in the Lisbon
Service Center

29

Average age

50/50

With engineering or
economics background

3

With PhDs

27

Working on Data Solutions

6

alumni from Physics

Highly specialised and analytical work that requires
numerical and problem solving skills

Organisational and project management skills are equally important because the LSC
works with a large programme of clients

Willis Towers Watson

Contacts

Emails: ana.rosa@willistowerswatson.com
diogo.moreira@willistowerswatson.com

Website: www.willistowerswatson.com

Linkedin: <https://www.linkedin.com/company/willis-towers-watson>