Willis Towers Watson **IııI**

STAR RW

Real-world economic modelling

STAR RW combines advanced statistical modelling techniques with trusted technology to generate detailed, realistic economic scenarios. With STAR RW, you can assess capital requirements, formulate an investment strategy and construct investment portfolios.

An introduction to STAR RW

STAR RW is our suite of real-world asset modelling tools, designed to help you to make business-critical decisions in the diverse areas of capital requirements, portfolio construction and risk management. At the core of the suite is our real-world Economic Scenario Generator (ESG). It is complemented by a related family of applications that can be tailored to your modelling needs. The ESG models a realistic view of world economies, taking into account both historical statistical behaviour of markets and overlaying Willis Towers Watson's forward-looking house views.

Including the views of Willis Towers Watson's experts is powerful because, although the past can give us deep insight into markets and their interconnections, it is not always a good guide to the future. The overlay of intelligent, forward-looking insight adds to the realism of the model by placing the data in the context of the economic environment and its risks and trends. The thinking behind this overlay is provided by a diverse group of senior investment industry experts drawn from across our business with decades of experience from different industries and world regions.

Of course any overlay reflects one view of the world and users may wish to explore the impact of different views. This is why we give users the ability to remove this overlay for a view based purely on past performance if they wish, as well as offering tools to adjust the scenarios to target alternative assumptions through our STAR REVO tool and to create and test other scenarios through STAR Scenario Builder.

These are just some of the tools in a comprehensive and integrated software suite that allow you to shape a modelling solution to your business requirements.
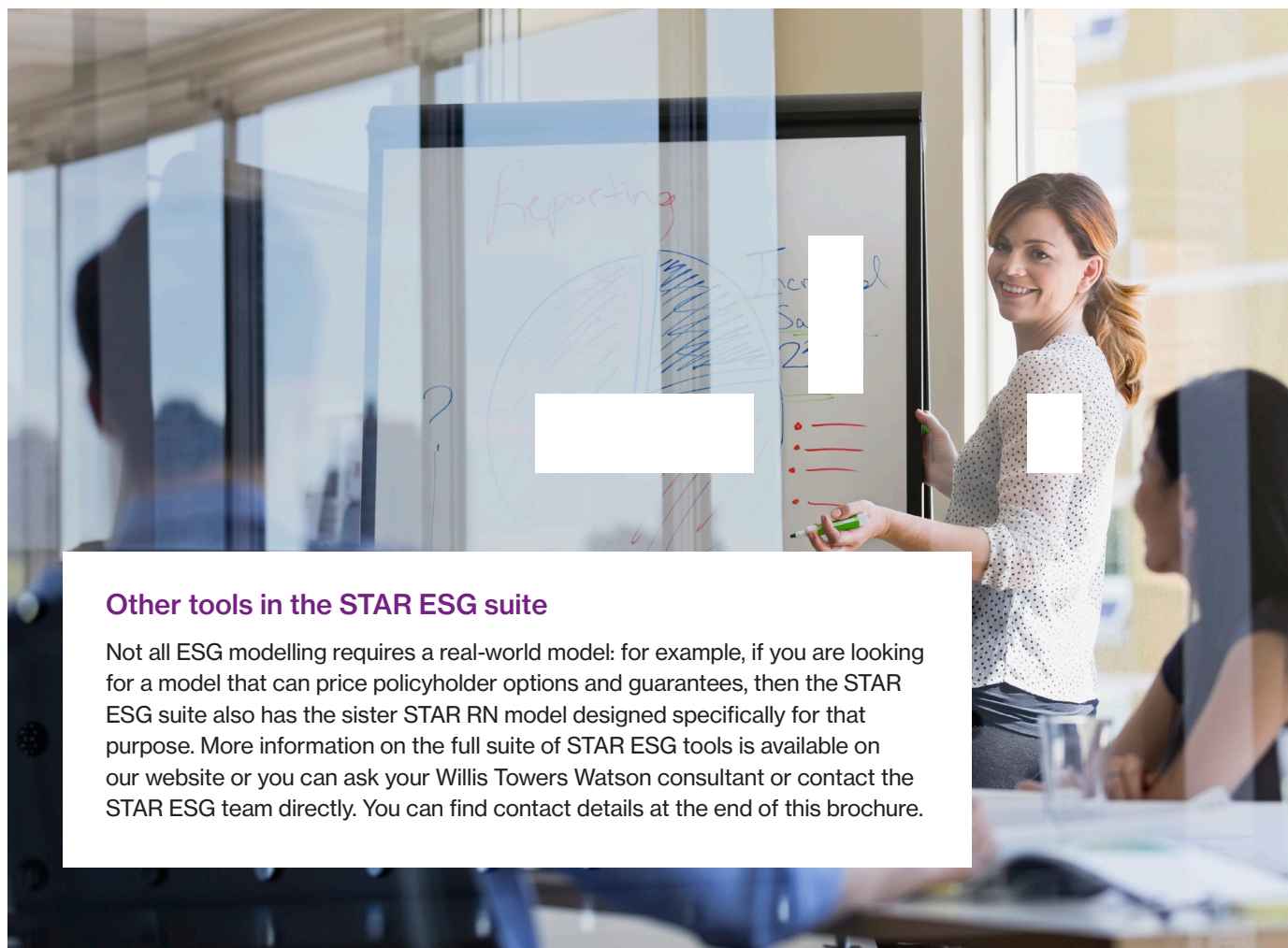
Other tools in the STAR ESG suite

Not all ESG modelling requires a real-world model: for example, if you are looking for a model that can price policyholder options and guarantees, then the STAR ESG suite also has the sister STAR RN model designed specifically for that purpose. More information on the full suite of STAR ESG tools is available on our website or you can ask your Willis Towers Watson consultant or contact the STAR ESG team directly. You can find contact details at the end of this brochure.

Why choose STAR RW as your ESG?

Your real-world ESG will be integral to decision making on capital efficiency and risk and reward trade-offs that will contribute to the success of your business. It is therefore important you choose the right ESG solution.

We believe there are three key areas to focus on when finding the ESG solution for you. First, the ESG should have

the coverage in terms of both breadth of asset classes and depth of modelling detail you need to produce the required granularity of management information. Second, it should be a tried-and-tested product from a firm you can trust and that is able to support your team. Third, it must be easy to use and fit seamlessly into your business processes. We believe STAR RW offers you a complete solution that meets all three criteria.

The coverage you need

The support of a firm you can trust
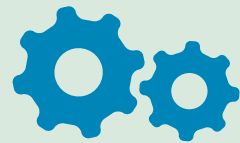
A painless operational fit to your business

Whatever you need to model, we've got it covered

STAR RW has broad coverage of over 25 global currencies and economies and a comprehensive range of asset classes. On top of this, users have the flexibility to parameterise a number of asset holdings down to the security level within asset classes and to define baskets of these securities with bespoke rebalancing rules. We

find these cover the vast majority of users' requirements, although we are happy to discuss the addition of new currencies and asset classes where there is a demand. In short, we can cover the wide range of assets and economies needed by our diverse global user base.

A breadth of world currencies and asset classes

Portfolios ABS ₣
Swaps ₱ Alternative credit Gilts R$ Bond futures
CMO ₹
Covered bonds CMBS € Cash MBS
Index-linked gilts Equity Municipal bonds
₩ FX £ Floating rate notes
Linked bonds $ Sovereign credit ฿ Derivatives ¥
Property C$ Corporate bonds

Deep expertise applied to advanced models

STAR RW uses advanced economic statistical models to capture the real-world behaviour of economic variables and asset classes.

The baseline economic variables are generated first in each economy at a granular level. Real and nominal interest rates are modelled as yield curves with full-term structure. Credit spreads are modelled with a full rating and term structure, with allowance for migration of credit rating as well as defaults and variable recovery rates. As in the real world – given market experience over recent years – we also allow nominal interest rates to be negative.

Other economic quantities can be modelled too, including GDP, dividend yields, exchange rates, LIBOR, and different inflation measures including wages, RPI and CPI. The economic variables are linked by an econometric cascade capturing the linkages between them and ensuring the model tells a coherent economic story. A student-t copula correlation structure ensures that modelling of low-probability but high-impact events reflect real-world behaviour, enabling a more realistic assessment of tail risks.

The STAR Asset Model produces asset values and returns derived directly from the economic models, preserving the coherence between asset returns and their underlying drivers as well as between assets and liabilities – such consistency is critical for firm-wide enterprise risk management (ERM) or asset/liability modelling (ALM) studies.

A product and a provider you can trust

Trust in your ESG is crucial if you are going to use it to support business-critical decisions. So, what should you look for in your provider?

An established product backed by an established firm

At Willis Towers Watson, we use and trust STAR RW ourselves – it is our own tool used by our own consultants globally for advising insurers, pension funds, sovereign wealth funds, endowments and foundations. Worldwide, our Investment business has over 900 consultants and the Risk Consulting and Software business has over 1,200 consultants advising clients on investment and risk. As such, STAR RW is critical to our consulting business and so you can trust that STAR RW has the backing from Willis Towers Watson.

We do not sit still. We are constantly improving the STAR ESG suite of models to keep pace with a changing world to ensure our consultants and clients have the best decision-making tools at their fingertips.

Tried and trusted by a diverse user base

Our user group is diverse and established. STAR RW is licensed by regulators, P&C insurers, life insurers, pension funds, as well as our own teams. Users trust it to plan investments and model risks on trillions of dollars of assets.

This adds up to years of road-testing, validation and incremental improvements, with feedback provided across a diverse range of industry experts. Much of this experience has been gained through a turbulent period of economic history and regulatory change where models have been tested to their limits and previous perceived certainties challenged.

More than just software: we deliver business solutions

Willis Towers Watson is not just a software provider but a global consulting firm. We care about relationships and our mission is to change investment for the better. When you buy a model from Willis Towers Watson, you are not just buying software from a provider but a solution from a business partner with a vision that we think resonates with our clients.

Our team of experts in diverse specialist fields with industry backgrounds stand ready to help you find the best solution for you, to train your team and support your use of STAR RW as you integrate it into your business.

A smooth operational fit for your business processes

Simple to integrate and use

STAR RW is a scalable toolset designed to integrate easily into your business systems and processes. There are a number of options to deploy STAR RW, which can be tailored to your needs. A popular way is to license the STAR RW library as a software package, built on Willis Towers Watson's proprietary Igloo platform. Processing can be parallelised and scaled for higher-speed solutions – useful for more in-depth models or where high numbers of simulations are required – which can go up to hundreds of thousands. Alternatively, data-only packages are available if you wish to maintain your own software using the STAR RW simulations as a feed.

STAR RW is a modular suite of tools based around the STAR ESG, which generates the core economic simulations in each currency. It includes the STAR Asset Model to create the asset class returns you need with flexible parameterisation. Asset classes can be modelled down to individual security level or bespoke baskets of assets. It also includes the STAR Portfolio Model which is used for modelling returns on portfolios of assets, allowing for user defined tax rules and rebalancing strategies.

Other STAR ESG modules can be licensed separately with this, including:

- **REVO** – for stressing the ESG in a quick and intuitive way by overlaying views or stresses but maintaining the underlying cascade structure of the model
- **Strategic Asset Allocation (SAA)** – for portfolio-level efficient frontier and optimisation analysis given user-defined constraints
- **Scenario Builder** – for creating deterministic scenarios or transformations of the ESG

The output simulations from STAR RW can be exported in simple CSV or text file formats, or to databases, for feeding downstream applications including tailored Igloo modules, ReMetrica, Simulum and Risk Explorer. We can work with you to find the best solution for your business so you can integrate STAR RW seamlessly.

Open, documented and supported

STAR RW licensees receive a range of documentation, from a high-level overview to full technical documents detailing models, assumptions, limitations, calibration and validation processes – directly supporting client Solvency II regulatory submissions.

All algorithms used are fully documented making it easy to be confident in the underlying calculations – useful for gaining and demonstrating understanding of the model and supporting your regulatory submissions, including Solvency II. The open architecture and documentation allow users to understand each model to a degree that would be impossible in a black-box tool.

Overarching all of this, our STAR ESG team offers an expert support service and can advise clients in regulatory meetings where helpful.

Intuitive and flexible models and outputs

STAR RW is built to be intuitive to use and flexible enough for you to shape it for a variety of purposes. Its features include:

- Flexible parameterisation, stress testing and optimisation tools
- Focus on the full distribution of results including tails, average levels and volatility
- Quarterly calibrations

- Ability to run flexible time steps (for example, daily, monthly, quarterly, annual)
- A single model for one year or multi-year time horizons
- Granular analytics package
- Tailored charting

Whatever you need to model and however you want to analyse your outputs, STAR RW offers you the flexibility you require.

1y Spot Rate: Without WTW Overlay

1y Spot Rate: With WTW Overlay
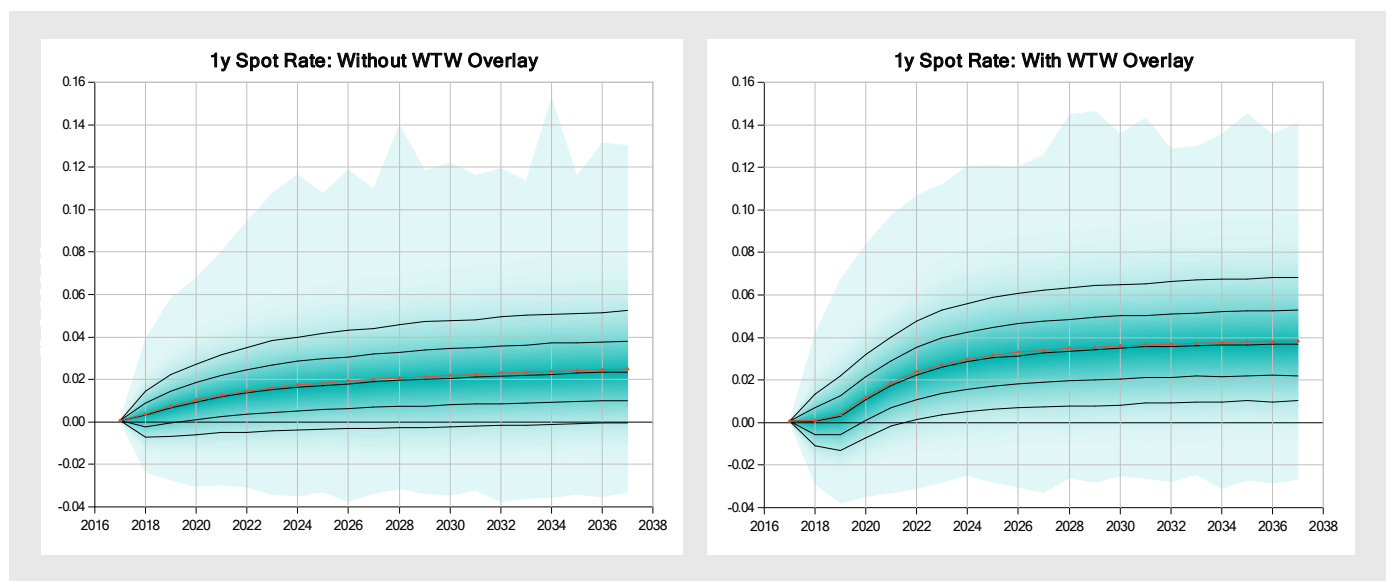
A complete solution for your risk and financial modelling needs

STAR RW supports an extremely broad range of business processes, from ERM to portfolio construction, strategic asset allocation to regulatory capital modelling and business planning.

Whatever you need to model, we have it covered with a product and provider you can trust and a supported solution that gives you a smooth operational fit to your business.

Further information

To find out more, go to our website, email us at
TW.INV.Contact.STAR.ESG@willistowerswatson.com
or give us a call – we would be delighted to help you:

Tim Wilkins
+44 1737 274152
tim.wilkins@willistowerswatson.com

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 40,000 employees serving more than 140 countries. We design and deliver solutions that manage risk, optimise 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.

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