Hymans Robertson's Economic Scenario Service: An overview

Introduction

This document provides a summary of the main features of the ESS models and the statistical quantities we target in our calibration process. It is addressed to audiences seeking a brief introduction to the ESS and should not be relied upon as a full description of the modelling or calibration process.

Fundamental approach to scenario generation

The ESS contains models for a wide array of asset classes. These asset classes are constructed by modelling fundamental risk factors such as inflation risk, credit risk, and equity market risk, and combining them together in a way that reflects the risks to which those investible asset classes are exposed.

The fundamental building block of all asset classes within the ESS is the interest rate model. An essential feature, and an important assumption regarding interest rate's projection, is the long-term yield normalisation level. This is the level to which interest rates tend over long (30+ year) time horizons. Our model uses the market yield curve to guide the path that interest rates take over the first few years, and then gradually blend towards the yield normalisation assumption by the 30th year. The ESS yield curves also match the market curves at the projection inception.

The return on risky assets is obtained by adding a layer of additional risk-related returns on top of risk-free interest rates. For instance, growth asset average returns (e.g. UK equity returns) are modelled as the risk-free cash return plus a risk premium; credit-risky bond yields are obtained by adding credit spreads, to the yields on government bonds etc.

The UK economy is taken as the base economy within the ESS. Five foreign economies are modelled: US, EU, Japan, Emerging Markets and Asia Pacific excluding Japan.

Interest rates

For the UK economy, interest rate modelling follows a *regime* structure. Accounting for the uncertainty around the level of yield normalisation (i.e. long-term economic growth rates), we assume short and long maturity nominal rates tend (on average) towards one of three distinct levels or *regimes,* set at: the long-term historical average (4.50% p.a.); broadly in line with current levels (1.50% p.a.); and an intermediate level (3.00% p.a.). The regimes implicitly assume a positive relationship between long-term real interest rates and expectations for economic growth under different plausible outlooks. No regime structure is assumed for other economies for simplicity and tractability.

In each simulation trial, the parameters that determine the yield normalisation level are drawn from three distinct regimes mentioned above. The historical volatility of the rates and the correlation between interest rates of different maturities have been used as calibration targets. A similar approach is adopted for the foreign economies but without any regime structure.

Inflation

For the UK, inflation is calibrated to historical RPI data. Expected long-term RPI and CPI rates are in line with the current Bank of England target of 2% p.a., except in the low yield normalisation regime where it is 1% p.a. The *RPI-CPI wedge,* that is the average difference between projected RPI and CPI rates, is set to 1% p.a. over the short-term ultimately transitioning to zero after 2030, when the RPI measure will switch to CPIH.

The ESS also contains a Limited Price Indexation (LPI) model for the UK economy. This can simulate market consistent LPI curves at all maturities and with various combinations of caps and floors.

Growth assets

The risk premia on growth assets (e.g. equities) are relatively stable over time. On aggregate, the average excess return for developed equity markets (e.g. UK equities) is 3.50% p.a., broadly in the centre of the range

suggested by empirical studies[1] (2.50% - 4.00%). A similar approach is adopted to model other regional equities and growth assets. Further, stylised factor equities with smart-beta offerings are implemented for the UK and US economies for size, value, momentum, income, quality, low volatility, as well as their multifactor variants.

Credit portfolios

Credit portfolios are modelled as collections of corporate bonds of a given maturity, credit rating and liquidity. Bonds are subject to default, downgrades, or illiquidity events. The probabilities of these events, together with corresponding recovery assumptions, are used for pricing credit risky instruments. The portfolio value at each point in time is built up from the value of the bonds within the portfolio at that time, based on the rebalancing strategy specified at inception.

Initial credit spreads are fitted to observed market spreads for a selection of ratings, and the long-term credit spread levels specific to each rating is assumed, for example 0.50% p.a. for AAA bonds and 2.40% p.a. for BBB bonds. We also model illiquidity risk in a similar fashion, with additional illiquidity spreads to compensate for that risk. By modelling a wide variety of bonds with different ratings, maturities, and liquidity levels, the ESS can model a variety of fixed income assets such as private lending and high-yield debt.

FX rates

There are models for foreign exchange (FX) rates relative to GBP. This gives a wider coverage of asset classes over different economies denominated in different currencies. Our approach allows explicit characterisation of FX risks for such assets or holdings and, if desired, currency hedges to remove the influence of FX driven fluctuations. We assume that FX risk is unrewarded, i.e. that is there is no additional expected return for assets bearing FX risk.

Correlations

The correlation matrix controls the joint dependency of the modelled risk factors in the ESS and is an input for the model projections. It lets us embed realistic assumptions about the relationships between risk factors, for example between interest rates and inflation, or equity and property return. Entries in the matrix have been calibrated so that asset returns correlations are broadly consistent with historical data.

Funds and portfolios

Core asset classes are modelled as “pure” exposures to certain risk factors, e.g. our UK equity model maps directly to our model of UK equity market risk. In addition to those core asset classes, we also model a variety of funds in the ESS, which are derived from the underlying risk factors in the ESS. Modelling funds as combinations of different risk factors provides a flexible framework for modelling a wide array of investible asset classes with realistic behaviours.

Outputs

The ESS generates a simulation of 5000 trials of asset returns and other economic variables, typically over monthly time-steps over a 100-year projection horizon, but this can be varied according to our clients’ needs. These scenarios form a key component of virtually all stochastic modelling work that Hymans Robertson undertakes.

We also produce summary statistics that provide a snapshot of the model’s outputs; these summary statistics are useful for understanding the consequences of the assumptions embedded within the ESS’s models. The ESS Team would be very happy to provide additional information about the models on request.

For further information please contact: ESSTeam@hymans.co.uk

[1] Credit Suisse Global Investment Returns Yearbook 2020. The study is based on an analysis of historical equity excess returns, adjusting for one-off or unrepeatably structural shifts.