MERCER
MAKE TOMORROW, TODAY

EUROZONE MERCER YIELD CURVE (MYC) WHITE PAPER

31 AUGUST 2018

MARSH & McLENNAN COMPANIES

Description of the method

The primary purpose of the Mercer Yield Curve (MYC) is to provide a method for setting the discount rate assumption for pension and postretirement benefit calculations as required by accounting standards. This paper documents the creation and use of the MYC to determine the discount rate for a given benefit plan.

The MYC consists of half-yearly spot (i.e. zero coupon) rates and is developed based on pricing and yield information of the constituent bonds.

Step 1: Select bond universe

The bond universe used for each MYC differs according to the availability of bond pricing data in each market. More details of the specific bonds used for the various MYC editions can be found in the appendix to this document.

We exclude bonds that are callable, make-whole, sinkable, putable and those that have floating coupon rates. Although one could, in theory, adjust for embedded options in the excluded bonds, focusing on option-free bonds provides a homogenous data set for constructing the yield curve and eliminates the need for additional assumptions about the value of the embedded options.

Step 2: Determine best-fit regression lines of yield-to-maturity as a function of time to maturity and use regression equations to estimate the par coupon yield curve at selected maturities

Using the relevant bond universe, regression analysis is used to find the best-fitting regression curve that links yield-to-maturity to time to maturity. Our regression analysis is based on a fourth-degree polynomial of yield-to-maturity as a function of the natural logarithm of time to maturity, which gives a good fit to the data at both long and short maturities. We determine the best fit using least squares regression, which minimises the sum of the squares of the difference between the actual data points and the regression line. The regressed coupon yield curve is thus smoothly continuous along its entire length and represents an unbiased “average” of the observed market data that takes into account all the information for both a single maturity and across all maturities. Other curve fitting methodologies (splines, for example) require subjective judgment as to how the yield curve should be segmented and present the problem of discontinuities or other anomalies at the “knot points” between successive segments.

In order to eliminate outliers, we exclude bonds where the yield-to-maturity is more than two standard errors from the regressed yield-to-maturity based on the initial calculation. The regression analysis is then rerun on the reduced data set to determine the final coupon yield curve.

Step 3: Convert par coupon yield curve into the equivalent zero coupon spot rate curve

We convert the regressed coupon yield curve into a spot rate curve using the technique known as bootstrapping, which assumes that the price of a coupon bond for a given maturity equals the present value of the underlying bond cash flows using zero-coupon spot rates. This principle is equivalent to requiring that there is no arbitrage, i.e., there is no opportunity to make risk-free profits. In making this conversion, we assume that the regressed coupon yield at each maturity date represents a coupon paying bond trading at par. We also convert the bond-equivalent (compounded semi-annually) yields to effective annual yields during this process.

Step 4: Extrapolate the curve where sufficient data is not available

Depending on the bond universe used, the spot curve may need to be extrapolated or augmented where there is insufficient bond data to develop a reliable curve. Details of the extrapolation methods used for each MYC edition can be found in the appendix to this document.

Step 5: Match pension (or retiree medical) cash flows to the spot rates

Expected benefit obligation cash flows are matched to the appropriate spot rates and discounted back to the measurement date. Cash flows after the latest point on the spot curve are discounted assuming that the spot rate at that point remains constant until the last of the cash flows.

Step 6: Determine single equivalent discount rate

Once the present value of the cash flows as of the measurement date has been determined, a single equivalent discount rate is calculated, i.e., the one rate that, if used to discount all expected cash flows, results in the same present value.

Discount rates for sample plans

As benefit obligation specific cash flows are not always available, a range of sample pension plans is available (usually young, average, mature, pensioners) with varying expected cashflows for some countries. Equivalent single discount rates for these sample pension plans can be used as a guide to selecting an appropriate discount rate by considering the nature of the cashflows and the duration of the plan's liabilities.

Using the MYC

The appropriate discount rate should ideally be determined by reference to the cash flows of the liabilities. As noted above, the discount rate can be approximated based on the profile of the liabilities.

Benefit obligations often have cash flows that are considerably longer than those of the bonds underlying published indices. Consequently, when applying the MYC the longer term cash flows are discounted at spot rates that lie beyond the constituents of the indices. As a result, if the curve is upward sloping the single equivalent discount rate will be higher than those derived from indices and vice versa if the curve is downward sloping.

Appendix

Eurozone

Bond universe

Details of corporate bonds in issue and their bid-prices are provided by Thomson Reuters. Bid prices are generally available for all publicly traded corporate bonds, ensuring that we have the largest available pool of market information. While we would ideally like to have actual trading prices, the small number of actual trades for which pricing information would be available on any given measurement date would significantly reduce the number of bonds in our universe. We select bonds denominated in euros that have at least EUR 50 million in issue outstanding. We include corporate bonds rated AA by at least one of S&P Global Ratings and Moody's Investors Service with bond ratings obtained from Thomson Reuters. Only bonds with at least 6 months to maturity are included and, where a bond has more than 50 years to maturity, additional checks are made to ensure the bond is actively traded. Zero coupon bonds are included, with their maturity term equal to that of a par bond with a coupon rate equal to the yield on the zero coupon bond.

Extrapolation

Spot rates are derived from the regression from time 1 to the average maturity term of the longest five AA corporate bonds included in the regression, with a maximum of 30 years, the transition point.

The spot rates from that duration onwards until time 50 are determined by holding the spread above treasury rates constant. The treasury curve is calculated by applying the methodology described above, but using AA-rated bonds issued by central government entities instead of AA-rated bonds issued by corporate entities.

The corporate bond spot rates from the transition point until time 50 are determined by holding a constant spread above this treasury curve.

Application to long dated cash flows

The cash flows after 50 years are discounted assuming the 50 year spot rate remains constant beyond 50 years.

MERCER
MAKE TOMORROW, TODAY

1 Tower Place West,
Tower Place,
London
EC3R 5BU.