Mercer

Eurozone

Mercer Yield Curve

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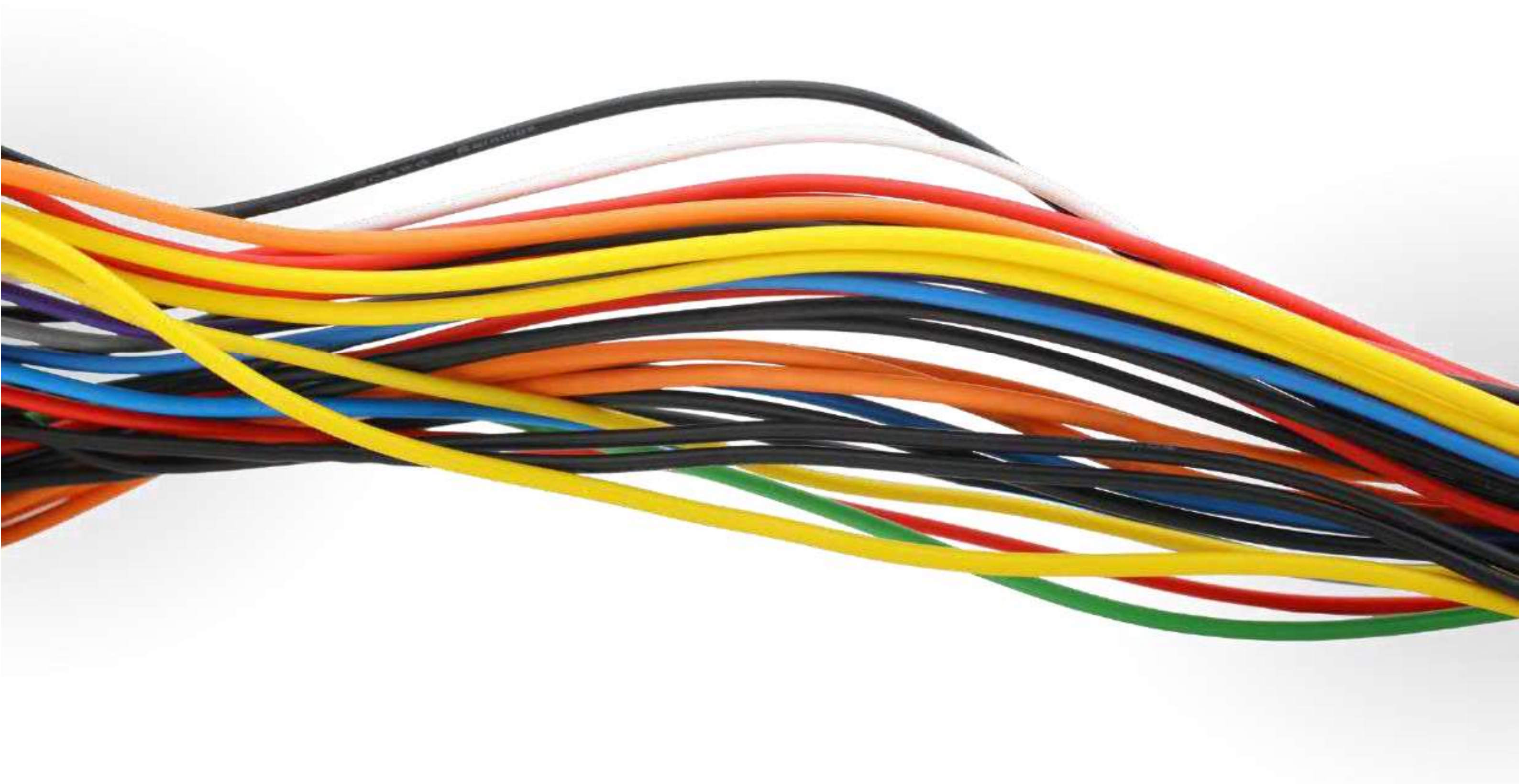

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Introduction

Mercer has developed the Eurozone Mercer Yield Curve (MYC) to help Finance Directors choose the most appropriate discount rate for calculating retirement or other post-employment liabilities in accordance with International and US GAAP. Mercer actuaries use this model to develop an approach that is specific to each scheme and reflect its liability profile.

The MYC consists of half-yearly spot (i.e. zero coupon) rates, developed from pricing and yield information on high quality corporate bonds. This paper describes the steps used to construct the MYC.

Step 1. Select bond universe.

The MYC is based on corporate bonds which:

- Are Euro denominated
- Are rated AA by at least one of Moody's and S&P Global Ratings
- Have at least €60 million in outstanding issue
- Have predictable cashflows (i.e. not callable bonds, make-whole bonds, puttable bonds, bonds with floating coupon rates or certain sinkable bonds)
- Are not collateralised (collateralised bonds are asset backed securities rather than loans taken by companies for business purposes so we do not view them as 'corporate' bonds)
- Are not government related (government related bonds are issued by a company where a government is the majority stakeholder so we do not view them as 'corporate' bonds)
- Have at least 6 months to maturity and, where they have maturity greater than 50 years, satisfy additional checks to ensure it is reasonable to assume they are actively traded.

Where they exist, 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.

The process of creating the list of bonds is based primarily on data from Refinitiv, supplemented by publicly available information.

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.

The model uses bid price corporate bond data provided by Refinitiv. Bid prices are generally available for all publicly traded corporate bonds, ensuring that we have the largest available pool of market information.

Having selected the high quality bonds that meet the criteria described in Step 1, regression analysis is used to find the best fitting curve that links yield-to-maturity to time to maturity of the selected bond yields. The regression is based on a fourth-degree polynomial of yield-to-maturity as a function of the natural logarithm of time to maturity. We determine the best fit using least squares regression, which minimizes the sum of the squares of the difference between the actual data points and the regression line.

In order to mitigate the effects of bonds that appear to be outliers, we exclude or weight bonds depending on how their yield to maturity compares to the regressed yield-to-maturity based on the initial calculation. We exclude bonds where the difference is more than 2.1 standard errors, and apply a weighting decreasing linearly from 100% to 0% where the difference is between 1.9 and 2.1 standard errors. The regression analysis is then rerun on the reduced data set to determine the final maturity yield curve.

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

We convert the regressed maturity 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 cannot be any arbitrage opportunities to make risk-free profits. In making this conversion, we assume that the regressed coupon yield at each maturity date represented a coupon-paying bond trading at par.

During this process we also convert the bond-equivalent (compounded semi-annually) yields to effective annual yields.

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

The spot rate at time 0.5 is determined from the spot rate at time 1, by holding the spread between the derived spot rate and the nominal gilt spot rate constant.

From time 1, spot rates derived from the regression are used until the duration equal to the weighted average maturity term for the longest available corporate yields whose weightings sum to five, with a maximum of 30 years. This is done to produce a more stable curve than would be the case if we used the longest maturity term only.

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 in steps 1, 2 and 3, but in step 1 we pick AA-rated bonds issued by central government entities instead of AA-rated bonds issued by corporate entities.

Step 5. Determine single equivalent discount rates for sample cashflows.

The MYC can be used directly to calculate liabilities. However, it is sometimes more convenient to create a single equivalent discount rate which produces broadly the same liabilities as using the full yield curve. Doing this calculation requires scheme specific cashflows, which are not always available.

The final step of creating the MYC is therefore to calculate single equivalent discount rates for sample cashflows of varying durations. To do this we use the cash flow discounter, which assumes that MYC spot rates remain constant from time 50 onwards. The sample cashflow single equivalent rates can be used as a guide to the most appropriate scheme discount rate, by considering the duration of a specific scheme's liabilities relative to those of the sample schemes.

Discount rates for sample plans

The scheme profiles have been derived from the cashflows of Eurozone schemes. It is difficult to categorise the profiles in terms of liabilities as these can differ considerably from one country to another. For example, in Belgium, pension liabilities are for lump sums only, while in the Netherlands pensions in payment are increased with limited price increases or with discretionary increases. The provision in Ireland is similar, with non-increasing pensions being most common, but with a significant minority providing increases on a guaranteed or discretionary basis, either linked to inflation or a fixed annual percentage.

The sample scheme profiles, with a description of the scheme liabilities which could fall into that category, are shown in the table below. Note that 'young', 'younger' and 'older' refer to the relative duration of the liabilities of the members in that country, not just their actual ages.

Scheme profile	Approximate duration (years)	Possible description based on scheme liabilities
Very short	2 to 3	Belgium very short liabilities
Short	5 to 6	Belgium short liabilities
Retiree	12 to 14	Pensioner only or mainly pensioner German scheme
Shorter intermediate	16 to 19	Ireland (20% older deferreds, 80% pensioners) Netherlands (20% older deferreds, 80% pensioners) or mixed German scheme
Intermediate	22 to 26	Ireland (30% older actives, 20% deferreds, 50% pensioners) Netherlands (25% older actives, 30% deferreds, 45% pensioners)
Longer intermediate	26 to 29	Ireland (50% younger actives, 25% deferreds, 25% pensioners) Netherlands (65% younger actives, 25% deferreds, 10% pensioners)
Long	31 to 34	Ireland (85% young actives and 15% young deferreds, few pensioners) Netherlands (80% young actives, 20% deferreds)

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