Notes on the estimation for the Finnish term structure

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1.   Nelson and Siegel method as applied at the Bank of Finland

The daily term structure of interest rates for Finland is estimated using the methods developed by Nelson and Siegel (1987).[2] Given the parameter vector, β, and maturity, m, the *instantaneous forward rate* is defined as follows:

$$f(m, \beta) = \beta_0 + \beta_1 \exp\left(-\frac{m}{\tau_1}\right) + \beta_2 \frac{m}{\tau_1} \exp\left(-\frac{m}{\tau_1}\right) \tag{1}$$

The corresponding spot rate (zero coupon interest rate) is:

$$s(m, \beta) = \beta_0 + (\beta_1 + \beta_2) \frac{1 - \exp(-m/\tau_1)}{m/\tau_1} - \beta_2 \exp\left(-\frac{m}{\tau_1}\right) \tag{2}$$

The parameters β_0 (labelled as BETA0 in the database), β_1 (BETA1), β_2 (BETA2), and τ_1 (TAU1) are estimated using the following assumptions:

- The estimation is based on the minimisation of the yield errors (based on the maximum likelihood method assuming that yield errors follow normal distribution).

- The spot curve is usually but not always forced to pass the overnight rate. When it is, the instantaneous forward rate with zero maturity corresponds to the overnight rate.

- The data consist of the following instruments: Eonia (pre-1999: Finnish overnight rate), one-, three-, six- and 12-month money market (Euribor interbank offered rate (actual/360), %, daily fixing) rates (pre-1999: Helibor), and a variety (four to seven different bonds) of government benchmark bonds (average of primary dealers' bids/offers at 1 pm). The data are from the Bank of Finland database. No tax corrections are made.

When the estimated parameters are used to compute spot or forward rates using the above formulas, the following applies: *time to maturity is expressed in years*; the size of the parameters is as given. The results are expressed as annualised rates.

2.   Metadata

BETA0   Nelson-Siegel parameter beta 0; estimate based on the minimisation of the yield errors; original data from O/N up to 12 years of maturity.

BETA1   Nelson-Siegel parameter beta 1; estimate based on the minimisation of the yield errors; original data from O/N up to 12 years of maturity.

BETA2   Nelson-Siegel parameter beta 2; estimate based on the minimisation of the yield errors; original data from O/N up to 12 years of maturity.

TAU1   Nelson-Siegel parameter tau 1; estimate based on the minimisation of the yield errors; original data from O/N up to 12 years of maturity.

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[2]   C Nelson and A F Siegel, "Parsimonious modeling of yield curves", *Journal of Business*, 60, 1987, pp 473-89.