ARIMA – Fixed-Income and Credit Derivatives
Assignment on Yield-Curve Estimation
Winter Term 2023

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Your task is to estimate Svensson's term structure model using the data provided in Table 1. Similar to the Nelson-Siegel specification, the zero coupon spot yield is modeled in the following way:

$$r_t = \beta_0 + \beta_1 \left[\frac{1-\exp(-t/\lambda_1)}{(t/\lambda_1)}\right] + \beta_2 \left[\frac{1-\exp(-t/\lambda_1)}{(t/\lambda_1)} - \exp(-\frac{t}{\lambda_1})\right] + \beta_3 \left[\frac{1-\exp(-t/\lambda_2)}{(t/\lambda_2)} - \exp(-\frac{t}{\lambda_2})\right]$$

Note that some model parameters ought to be restricted in the optimization, i.e. $\beta_0, \lambda_1, \lambda_2 > 0$, and $\beta_0 + \beta_1 > 0$.

Hint: The model can be estimated in the same way as the Nelson-Siegel model. The only difference is the specification of the interest rate.

The optimization can be done using your spreadsheet's solver. You are free to use alternative means for implementing the exercise, e.g. GNU/R or Octave, however, I ask you to check with me to ensure I have access to and knowledge of the technology you wish to use. Please provide the spreadsheet file (or code file + output document) which you use to solve this exercise, and a short description of where to find the relevant inputs and the results. Failure to provide readable files has to be penalized with reductions in credit for this exercise. The total number of achievable points for this exercise amounts to 10. If the solver is not working properly on your computer, you can still obtain full credit for the exercise by providing a reasonable implementation. In this case, play around with the parameter values a little bit to get at least somewhat closer to the minimum of the objective function.

In contrast to the exercises we solved in class, this assignment is not a group exercise. While I do encourage you to help your classmates by answering their questions or discussing solution strategies, I do expect you to submit individually implemented solutions. Two spreadsheets looking exactly alike are simply not acceptable, and will result in reduced credit for both students.

Good Luck!

Bond	Maturity (years)	Coupon (%)	Dirty Price
1	1	0	96.8876
2	2	5	102.3523
3	3	1.5	93.1551
4	4	2.85	94.3779
5	5	0	80.5827
6	6	0	75.1393
7	7	5.5	103.5756
8	8	0	69.9327
9	9	0	67.1027
10	10	8.35	130.8944
11	13	0	53.9137
12	15	4.25	94.5580

Table 1: Available Government Bonds