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| Mälardalen University |
| **Nelson-Siegel models** |
| Application of Swedish bond price |
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# Introduction

In our report, we are going to introduce the Nelson and Siegel (1987) models and use the models to find the zero coupon curve with the application in Excel /VBA for Swedish bond prices. And then also calculate the forward rates and the average error in the bond prices. Finally we will compare the curves we get from VBA.

# Nelson-Siegel models

## Background

Nelson and Siegel (1987) proposed a model to fit the term structure using a flexible, smooth parametric function. This model is capable of capturing many of the typically observed shapes that they yield curve assumes over time, such as forward curve. This model was extended by Svensson (1994). Many banks nowadays use Nelson-Siegel or Svensson model to construct zero-coupon yield curves.

## Base model

Nelson- Siegel approximating forward curve can be assumed to be the solution to a second order differential equation with equal roots for spot rates.

(1)

Where, are parameters which are constant to be estimated, and is also constant.

Integrating the N-S forward rate expression (1):

And then change the variables:

We get:

This implies the following spot yield curves:

Where are constants to be estimated.

## Extended Nelson-Siegel model

This model includes an extra polynomial exponential term comparing to the basic N-S model.

If we follow the deduction of the basic N-S model, we can get

Where are constants to be estimated.

These models used to fit the model to the bond problem and these models ensure smooth and flexible curves by applying in excel/VBA.

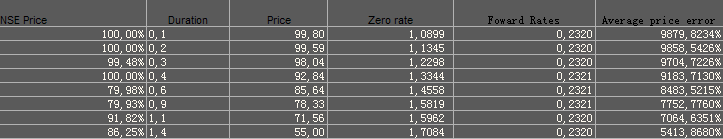
# Application in Excel/VBA

In this part, we have used the Nelson-Siegel formula to calculate the Spot rates and the forward rates of the Swedish bonds, and then construct the comparison of the price on the bond and the price calculated by the Nelson-Siegel model.

See EXCLE file (application5.xls)

# Conclusion

In our report, we have introduced a wide-applied model called Nelson-Siegel model and it’s extended model by Svensson. We then used the data from the Swedish bond prices and applied the data in Excel to get the zero coupon curve by fit to the Nelson-Siegel-Svensson model. And also calculated the forwards rates and the average error in the bond prices



By changing the data of the long-run interest rates, time to maturity and other parameters of the bonds we can get the general trend of the bonds’ spot rates.

# Reference

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