



Assignment 2: Take Home Messages

General suggestions: descriptions in docs and coding patterns could be improved.

➤ docs

- ✓ Why Bootstrap is the (!) technique for calibrating discount factors?
 - it reproduces exactly quoted prices of liquid instruments in the IR market
 - it allows to report accurately P&L for liquid IR contracts
 - Non parametric approach
- And...

➤ codes:

- ✓ Insert comments and consider a naming convention for variables in order to make your code self explicative;
- ✓ Avoid copy and paste lines but encapsulate them in a proper function in order to reuse it as much as possible and improve bugs fixing



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➤ codes [cont.]:

- ✓ For the different “exercises” one could use different scripts;
- ✓ While coding lines, think how to reuse them thereafter;
- ✓ Do not implement unnecessary functions. If matlab has low level functions (to interpolate, to integrate, to optimize etc..) why not use them? To this end, dive into Matlab help and find more about *addtodate*, *busdate*, *interp1*, *datenum* and *datestr*.
- ✓ Parameters

Build a section where you set explicitly parameter values. E.g.

```
DepoDayCount = 2; %yearfrac Act/360
```

```
IBDayCount = 3; %yearfrac Act/365
```

```
SwapDayCount = 6; %yearfrac 30/360 European
```

Bootstrap: relevant dates & relevance

➤ The rule for selecting the relevant dates

keep only expiries nodes of (underlying) contracts

All other rules are not correct. E.g.

- ✓ Repeated date;
- ✓ Depos up to 6m;
- ✓ Last two futures

The first date is the settlement one whose discount is 1

Bootstrap: which interpolations/extrapolations

➤ The rule for selecting interpolation

choose the one used in the market place

✓ Interpolation

```
interp1([date1,date2],[zrate1, zrate2],date_i,'linear')
```

✓ Flat extrapolation

```
interp1([date1,date2],[zrate1, zrate2],date_i,'linear', zrate2)
```

✓ To properly compute discount factor, consider:

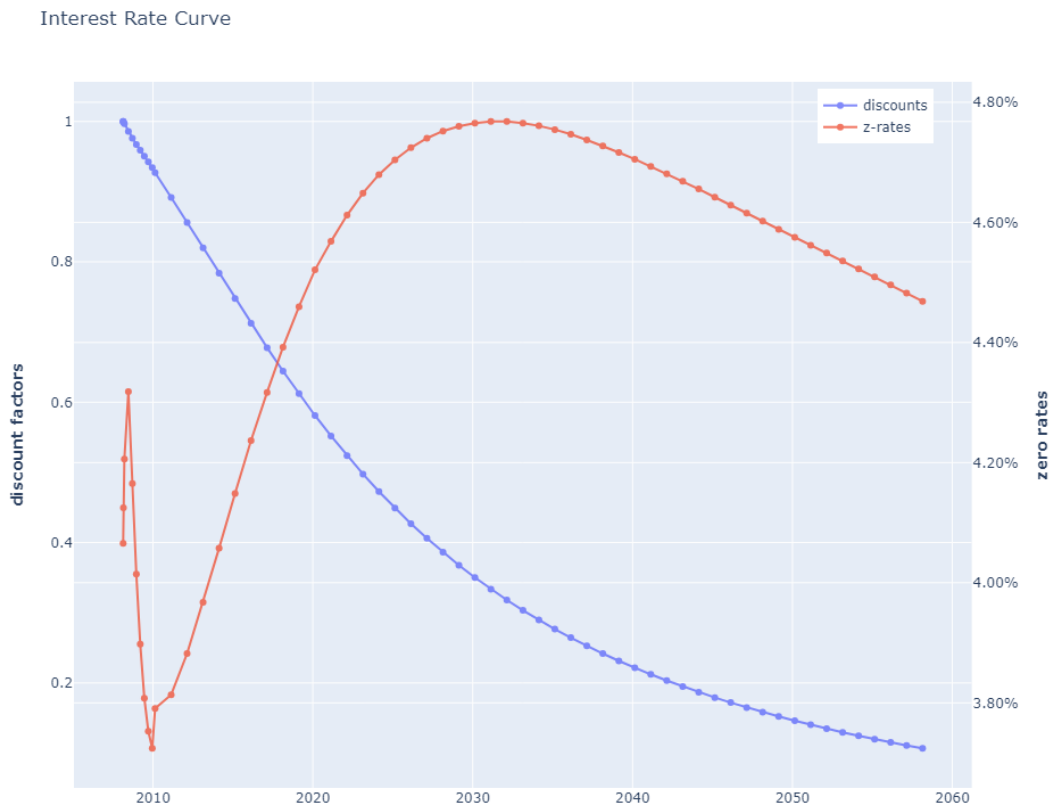
```
exp(-z_rate * yearfrac(dates(1),searching_dates,IBDayCount))
```

✓ Use of other interpolations ends up in errors of order tenth of bp (for rates) [in some cases even larger].

Do not reproduce exactly mid rates with the standard methodology used in the market

Discount Factors Interpolation

- Linear interpolation on zero rates instead of discount factors
- In case of exponential argument time-to-maturity, use Act/365 convention.



Sensitivities: Profit or Loss?

- Always consider DV01 and DV01z as a quantity with sign
 - ✓ It is crucial to understand the exposition of a portfolio
 - ✓ ... and to hedge the risk of a variation in the IR curve



$$\text{DV01} = \text{NPV_shifted} - \text{NPV}$$

- Did you consider a *Payer* Swap or a *Receiver* Swap?

DV01 (parallel shift) vs BPV & MD

- When notional is specified (i.e. 100 Mln) use it
- MacD vs DV01
 - ✓ same sensitivity in different units (& relative vs absolute)
 - ✓ in the example:

$$DV01^{(z)} = MD \times BondPrice \times 1bp$$

- BPV vs DV01

$$DV01 = BPV \times 1bp$$

A rule of thumb for a single swap portfolio