

Popularizing QuantLib among students: past experience and future perspectives

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Disclaimer: this talk presents my personal point of view, not necessarily that of IDS GmbH

Students – why bother?

- **Strategically:** Being quant is not as sexy as before (probably BigData and AI are currently what Quantitative Finance was 15 years ago)
→ competition for young talents in financial branch gets tougher (sustainable HR).
- **Tactically:** Werkstudenten (working students) are normally really hard-working (esp. if they are hungry foreigners from non EU-countries). Just guide them and the pay-off will come!

- **Personally:** Some of today students might become CEOs in a couple of decades. Gratitude is a rare trait* nowadays but probably they will remember their mentor (or somewhat less lofty: *„Once you’ve got that job, the firm will generally be willing to send you on at least one training course. Please consider attending one of mine“* [from Mark Joshi’s wannabequant-guide])
- Last but not least: *„when a man has anything to tell in this world, the difficulty is not to make him tell it, but to prevent him from telling it too often“* (Bernard Shaw, Ceasar & Cleopatra, Act IV)

*we will come to traits once more, although in somewhat other context ;)

Brief on my humble person

- First encountered QuantLib in 2007 as a graduate student @ University of Ulm
- Developed calculation kernels in C++ for banks and insurance companies after graduation
- Tried to grasp QuantLib during my free time and use it as the *Zweitrechentool* (with very modest results until Dimitri Reiswich's [tutorials](#) were published)
- Dig[ged] deeply in fundamentals (have a look at my [Measure Theory](#) & [LIBOR Market Model](#) tutorials). Don't do it anymore because *es rentiert sich nicht*

- Have NOT contributed any code to QuantLib [so far], but brought a lot of efforts to make it popular (both among students and employers... and even among [mere mortals](#))
- Wrote a successful book „Knowledge rather than Hope: [A Book for Retail Investors and Mathematical Finance Students](#)“, tried to write a [book on QuantLib](#) (dropped since there was [little payment-willing demand](#)*)

*Remorse: I, myself, have still not bought [Luigi's book](#), but I will, promised!

- Finally got an excellent job offer from [IDS GmbH](#) – [Analysis and Reporting Services](#) (subsidiary of [Allianz SE](#)) due to my QuantLib enthusiasm!

At IDS, we – the GRIPS Team – watch the *global* fixed income market and use QuantLib[XL] to fit more than 700 yield curves each day.

**„Connecting dots“ is far from being trivial...
don't you believe?!**

Well, get back to my student time

A „homework“ I got as I applied to WestLB (now: RestLB) as a junior quant:

| Market Data | Bond 1 | Bond 2 | Bond 3 | Bond 4 | Bond 5 | Bond 6 | Bond 7 | Bond 8 | Bond 9 | Bond 10 | Bond 11 |
|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|
| Maturity in y | 1,7 | 2,1 | 3 | 3,8 | 4,6 | 5,6 | 6,5 | 7,2 | 8 | 9 | 5,4 |
| Coupon (annual) | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 4 |
| Principal | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Present Value | 104,2 | 110 | 103 | 105 | 100 | 103 | 96 | 103 | 92 | 98 | ??? |

Zero rate from 0 to 1 year is assumed constant and equal to 0,02

Question: What is the present value of bond 11 using a bootstrapping algorithm?

The maturities $m(i)$ of bonds 1 to 10 may be assumed to be increasing and chosen so that $m(i+1)-m(i)\leq 1$

Please use annually compounded rates.

Both Excel-based and VBA-based solutions are accepted.

Dude, why don't you accept QuantLib?!

Why it is so hard to teach students QL

- C++ is not programmers lingua franca anymore
- Students are really overloaded with their curriculum.
- [German University] Professors are often arrogant ... „virgins teaching sex in ivory tower“ (Pablo Triana). Just [look!](#)

Literature: Filipović, D. *Term-Structure Models. A Graduate Course*, Springer Finance Textbook, Springer Verlag Berlin Heidelberg 2009 (accompanying)

Brigo, D., Mercurio, *Interest rate models—theory and practice*, Springer-Verlag, Berlin 2001.

Carmona, R. Tehranchi, M. R. *Interest Rate Models: an Infinite Dimensional Stochastic Analysis Perspective*, Springer-Verlag 2006

Cairns, A. J. G., *Interest rate models*, Princeton University Press 2004.

Zagst, R., *Interest-rate management*, Springer-Verlag, Berlin 2002.

- Luigi's brainpower is enormous ... but he might have naively assumed that every QuantLib user is as smart and experienced with C++ as he, himself:

„take the Black-Scholes formula, which is the most basic in a Quantitative Finance library, if you look for it in QuantLib you'll find no single, simple function which gives you the Black-Scholes price for an option.“ ([Open Source Finance 1. QuantLib - An Interview with Luigi Ballabio](#))

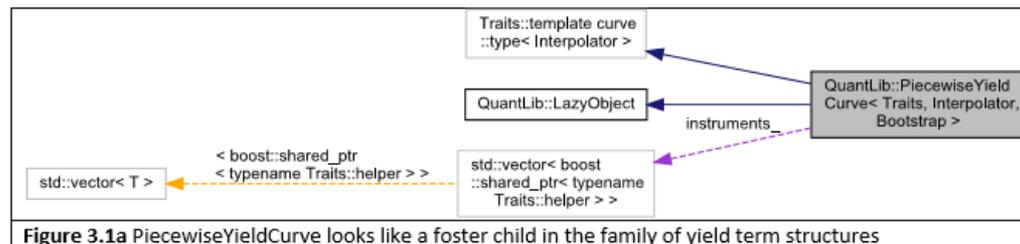
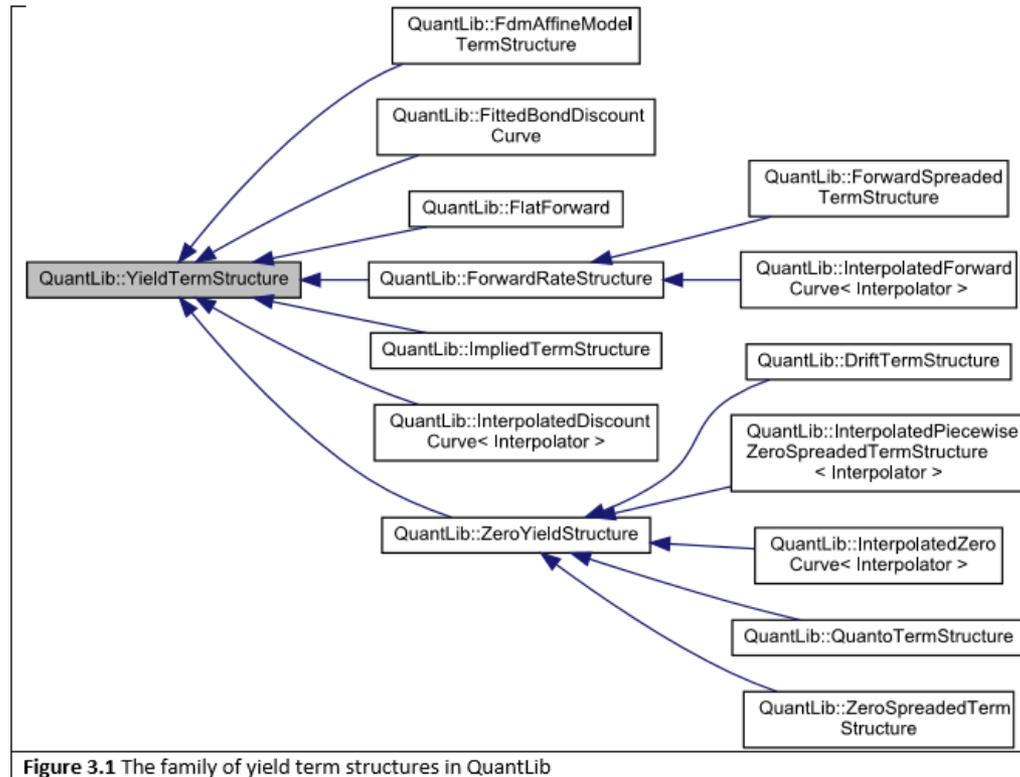
Some more examples?!

Michael Mayer (the author of [Continuous Stochastic Calculus with Applications to Finance](#) and [Project Martingale](#)) was really impressed as I showed him factory functions

```
MyOption::Type type(MyOption::Call);  
MyOption optionMade=MakeMyOption()  
.withType(type) .withMat(mat) .withSpot(spot)  
.withForRate(rf) .withStrike(strike) .withVol(vol)  
.withDomRate(rd)
```

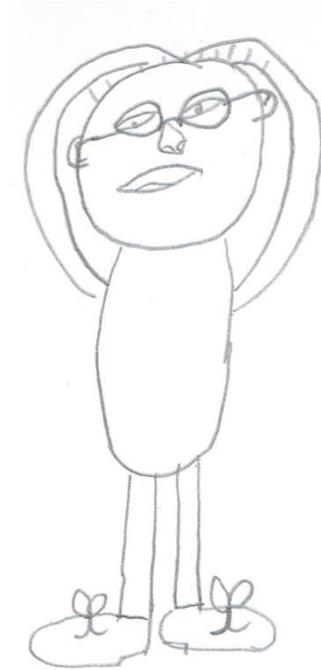
(which I, myself, learnt from [Dimitri Reiswich](#))

Due to `<<Traits>>` usage, [Doxygen](#) fails to recognize the relationship of **PiecewiseYieldCurve** and **YieldTermStructure**



State of art

| Student |
|--|
| + _knowledge: low + _motivation: low + _tiredness : high |
| + study () : learn by heart + practice () : //ToDo |

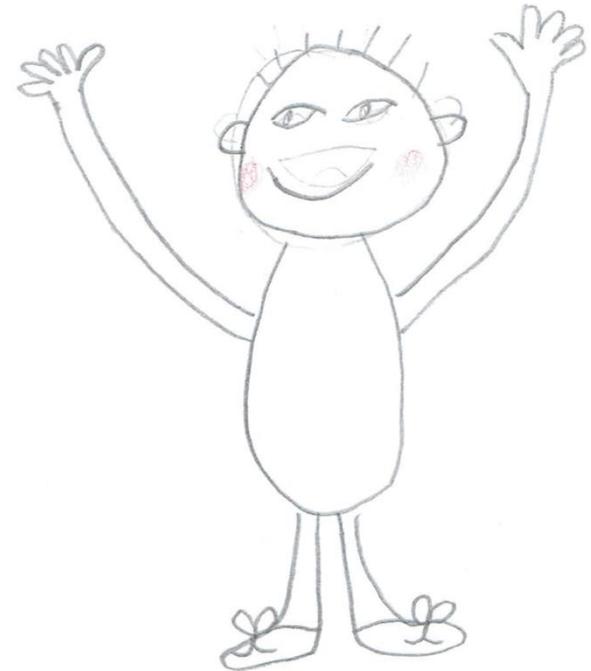


Overload? Overload!

Should be

| GoodStudent::Student |
|--|
| + _knowledge: high + _motivation: high + _tiredness : low |
| + study () : deeply understand the stuff + practice () : work with real data & code |

| Friend class Employer |
|--|
| + _salary: high + _tasks: interesting + _mainTool : QuantLib |



Drawing courtesy Elisabeth Nekrasov

I know that object properties should be private... the reality, however, is that subject (i.e. person's) properties are often publicly visible 😊

Questions?

THANK YOU FOR YOUR ATTENTION!