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:

<table>
<thead>
<tr>
<th>Market Data</th>
<th>Bond 1</th>
<th>Bond 2</th>
<th>Bond 3</th>
<th>Bond 4</th>
<th>Bond 5</th>
<th>Bond 6</th>
<th>Bond 7</th>
<th>Bond 8</th>
<th>Bond 9</th>
<th>Bond 10</th>
<th>Bond 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maturity in y</td>
<td>1.7</td>
<td>2.1</td>
<td>3</td>
<td>3.8</td>
<td>4.6</td>
<td>5.6</td>
<td>6.5</td>
<td>7.2</td>
<td>8</td>
<td>9</td>
<td>5.4</td>
</tr>
<tr>
<td>Coupon (annual)</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Principal</td>
<td>100</td>
<td>100</td>
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<td>100</td>
</tr>
<tr>
<td>Present Value</td>
<td>104.2</td>
<td>110</td>
<td>103</td>
<td>105</td>
<td>100</td>
<td>103</td>
<td>96</td>
<td>103</td>
<td>92</td>
<td>98</td>
<td>???</td>
</tr>
</tbody>
</table>

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)<=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:**

• 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

```cpp
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

<table>
<thead>
<tr>
<th>Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ _knowledge: low</td>
</tr>
<tr>
<td>+ _motivation: low</td>
</tr>
<tr>
<td>+ _tiredness : high</td>
</tr>
</tbody>
</table>

+ 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!