Why FP matters to Credit Suisse

- Hundreds of thousands of live derivative trades
- Nightly “risk” run calculates value and sensitivity
- Computationally expensive numerical methods usually requires
- Our overnight run employs thousands of CPU’s running all night

Why FP matters to Credit Suisse

- A decent proportion of our trades are non-vanilla
- We build these “exotic” models by composing reusable model components
- Thousands of these components are glued together to produce something large
- System must be very robust and reliable
- Non-obvious interaction of components can kill us!

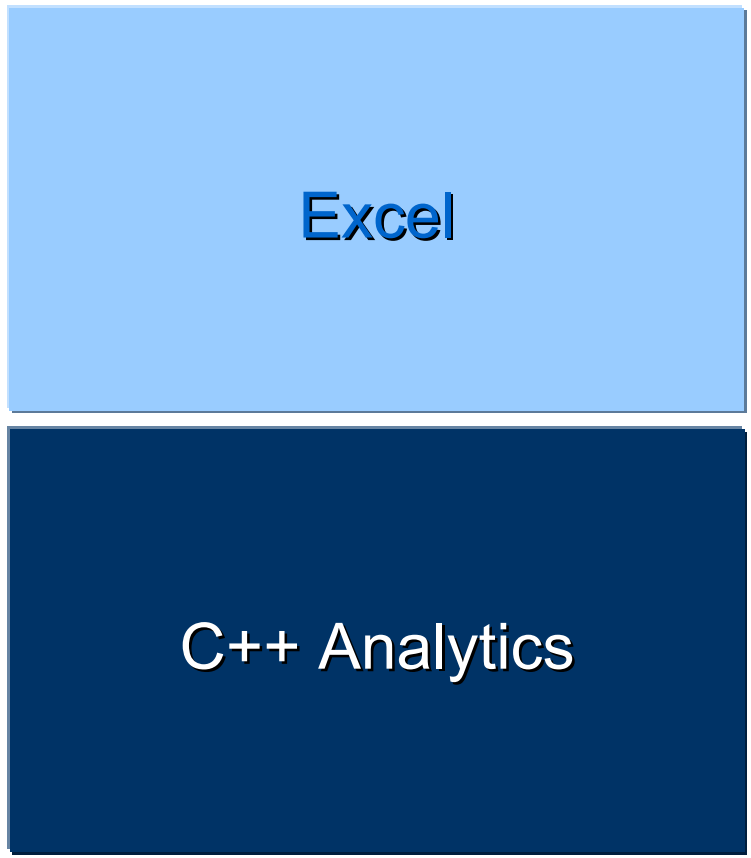
The solution…

"The world's most popular function programming language...*"

Microsoft Excel

* According to Simon Peyton Jones, et al

The solution…



Excel Pros:

- A rapid development environment – instant results
- I can call analytic functions that I have built elsewhere
- Excel does incremental recalculation
- Functions must be side-effect free so I can compose disparate functionality and get something that works
- The Excel grid provides a reasonable user interface (with a little effort)
- We can pass around non-native data types by passing around a handle to the object

Excel Cons:

- **A 0th order functional programming language**
- **We have no…**
  - abstraction
  - encapsulation
  - modularisation
- **Lots of duplication of logic**
- **Very weak type system – number, string, boolean, error**
- **UI is mixed with model internals – nothing is hidden**
- **We have to run it inside Excel**

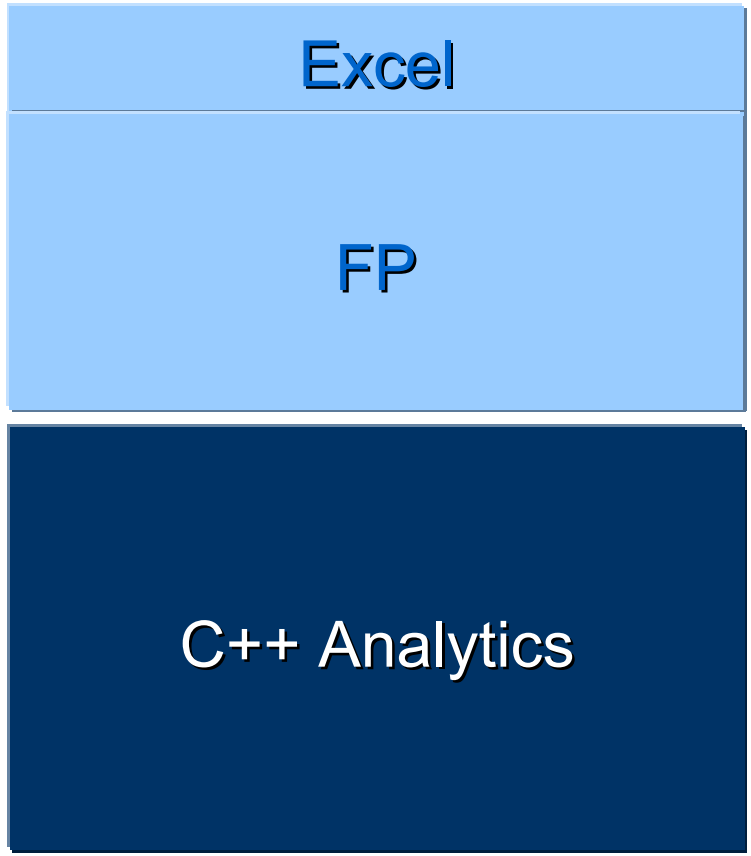
Solution #1:

- **Address Excel's issues by introducing our own functionality**
  - Introduce abstraction/encapsulation
  - Layer our own type system on top
  - Encourage appropriate factorisation
  - Provide (limited) ability to run outside Excel
- **And then we discovered that we were trying to build a functional programming language**

Solution #1 now:

- **We went looking for people with experience of implementing functional programming languages**
  - Hired Lennart Augustsson and Gabriele Keller
- **Our toolset has improved dramatically**
- **Haskell has proved to be an excellent language for implementing these kind of tools**
  - Graph processing, type checking, code generation, etc.
  - Haskell only used by a handful of people

Solution #2



Solution #2:

- **Use a real functional programming language**
- **Haskell is a good fit, other FP's are also promising**
  - The C++ code exposed to Excel is side-effect free, functional in nature.
  - Maps into Haskell libraries extremely well.
  - We have already separated the core logic of our Excel addins from the Excel interfacing.
- **Haskell could replace a large proportion of what we do in Excel**
- **Replacing the C++ is a much harder sell**

Haskell Pros:

- **A natural progression from Excel, in some respects**
- **Side-effect free functions integrate nicely into Haskell's type system**
  - And we can now handle our side-effecting I/O functions properly
- **Expressive type system**
  - More errors caught at compile time
  - But people are used to the automatic coercions
- **Terse syntax**
- **Higher-order functions etc. very powerful**
- **Claimed to be natural for mathematicians but yet to be proven**
- **Should be more suitable for writing multi-threaded code**

Haskell Cons:

- Lots of new concepts to learn
- Laziness makes space performance difficult to predict
- Terse syntax

Haskell Wish List:

- **Toolset appears “primitive”, not user-friendly**
  - Most modellers are used to Visual Studio IDE
- **Unfamiliar/inadequate “debugging” environment**
  - Modellers used to VS graphical debugger, or Excel’s immediate evaluation capabilities.
- **Performance for numerical code**
  - Not heavily tested but ghc is not really tuned for this
- **Better XML processing tools**
  - We have been using haxml
- **Microsoft interop**
  - H/Direct needs a little work
  - .Net interop would be very useful

Haskell Wish List: DLLs

- **Packaging into DLLs:**
  - Runtime/libraries in DLLs
  - Memory mgmt
  - Versioning
  - Some runtime issues

A shameless plug:

- **What can you the FP community do for us?**
  - Come and work for us!
    - Email howard.mansell@credit-suisse.com, or come and talk to one of us today.
  - Address the Haskell wish list for us.

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