

## Why FP matters to Credit Suisse

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- **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

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- **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...

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“The world’s most popular function programming language...\*”

**Microsoft Excel**

\* According to Simon Peyton Jones, et al

# The solution...

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Excel

C++ Analytics

## Excel Pros:

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- **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:

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- **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:

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- **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:

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- **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

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## Solution #2:

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- **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:

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- **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:

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

# Haskell Wish List:

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- **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

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

# A shameless plug:

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- What can you the FP community do for us?
  - ▶ Come and work for us!
    - ▶ Email [howard.mansell@credit-suisse.com](mailto: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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