MATH 6204 (8204): Numerical Methods for Financial Derivatives

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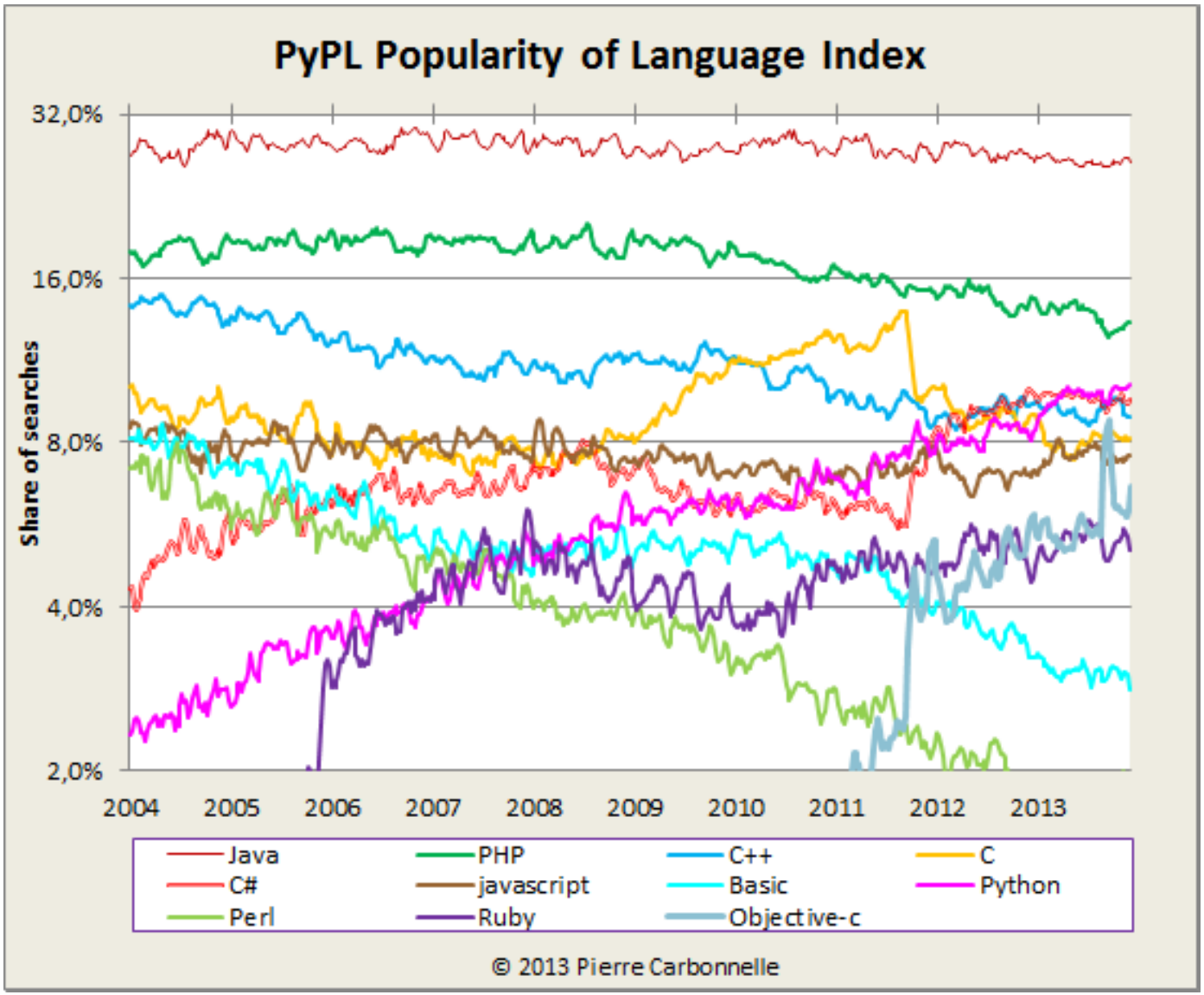
Lecture 1: Introduction to Python

What is Python?

- Python is a general-purpose programming language conceived in 1989 by Dutch. programmer Guido van Rossum.
- Python is free and open source
  - Community-based development of the core language is coordinated through the Python Software Foundation
- Python has experienced rapid adoption in the last decade, and is now one of the most popular programming languages.

- The PYPL index gives some indication of how its popularity has grown



Features of Python

- A high level language suitable for rapid development
- Relatively small core language supported by many libraries
- A multi-paradigm language
  - multiple programming styles are supported (procedural, object-oriented, functional, etc.)
- Interpreted rather than compiled

Syntax and Design

- One nice feature of Python is its elegant syntax. We'll see many examples later on.
  - The Python code makes the syntax easy to read and easy to remember.
- Closely related to elegant syntax is elegant design.
  - Features like iterators, generators, decorators, list comprehensions, etc. make Python highly expressive, allowing you to get more done with less code.
- *Namespaces* improve productivity by cutting down on bugs and syntax errors.
  - A namespace is a container for a set of identifiers.
  - Namespaces allow us to group named entities that otherwise would have global scope into narrower scopes

Python's Core Components

- Python
  - this provides the core Python interpreter.
- Numpy
  - this provides a set of array and matrix data types which are essential for statistics, econometrics and data analysis.
- Scipy
  - this contains a large number of routines including random number generators, linear algebra routines and optimizers. SciPy depends on NumPy.
- Matplotlib
  - this provides a plotting environment for 2D plots, with limited support for 3D plotting.
- Pandas
  - this provides high-performance data structures.
- IPython
  - an interactive Python environment which enhances productivity when developing code or performing interactive data analysis.

Other Useful Statistics Libraries

- statsmodels— various statistical routines
- scikit-learn— machine learning in Python (sponsored by Google, among others)
- pyMC— for Bayesian data analysis
- pystan Bayesian analysis based on stan Networks

Cloud Computing

- Cloud Computing Running your Python code on massive servers in the cloud is becoming easier and easier An excellent example is Wakari.
- See also
  - Amazon Elastic Compute Cloud
  - The Google App Engine (Python, Java, PHP or Go)
  - Pythonanywhere
  - Sagemath Cloud
  - Icloud9