



Compliance and Risk Management in 21st Century

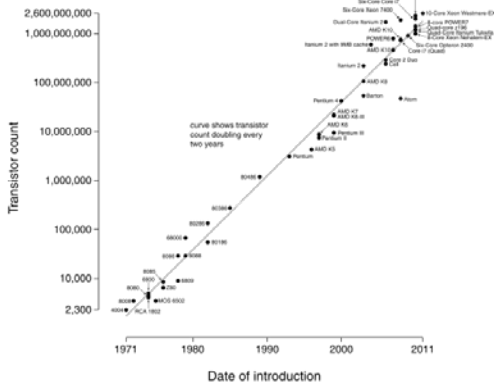
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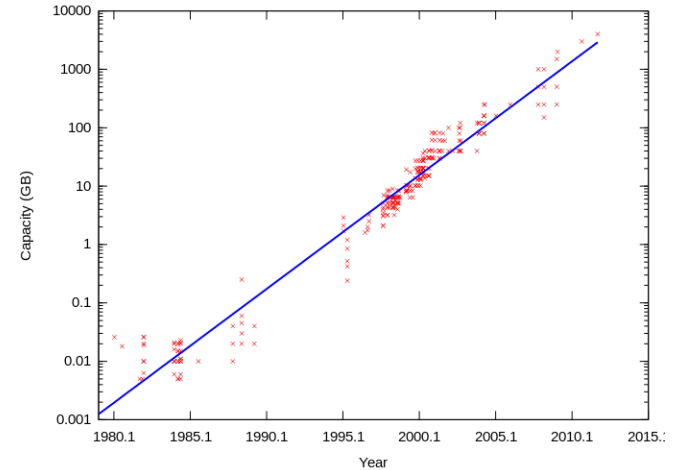
Convergence of disciplines: Rise of the Algorithms

Computing Power

Microprocessor Transistor Counts 1971-2011 & Moore's Law



Storage Capacity



Internet
Broadband
Smart Routers
High speed Networks

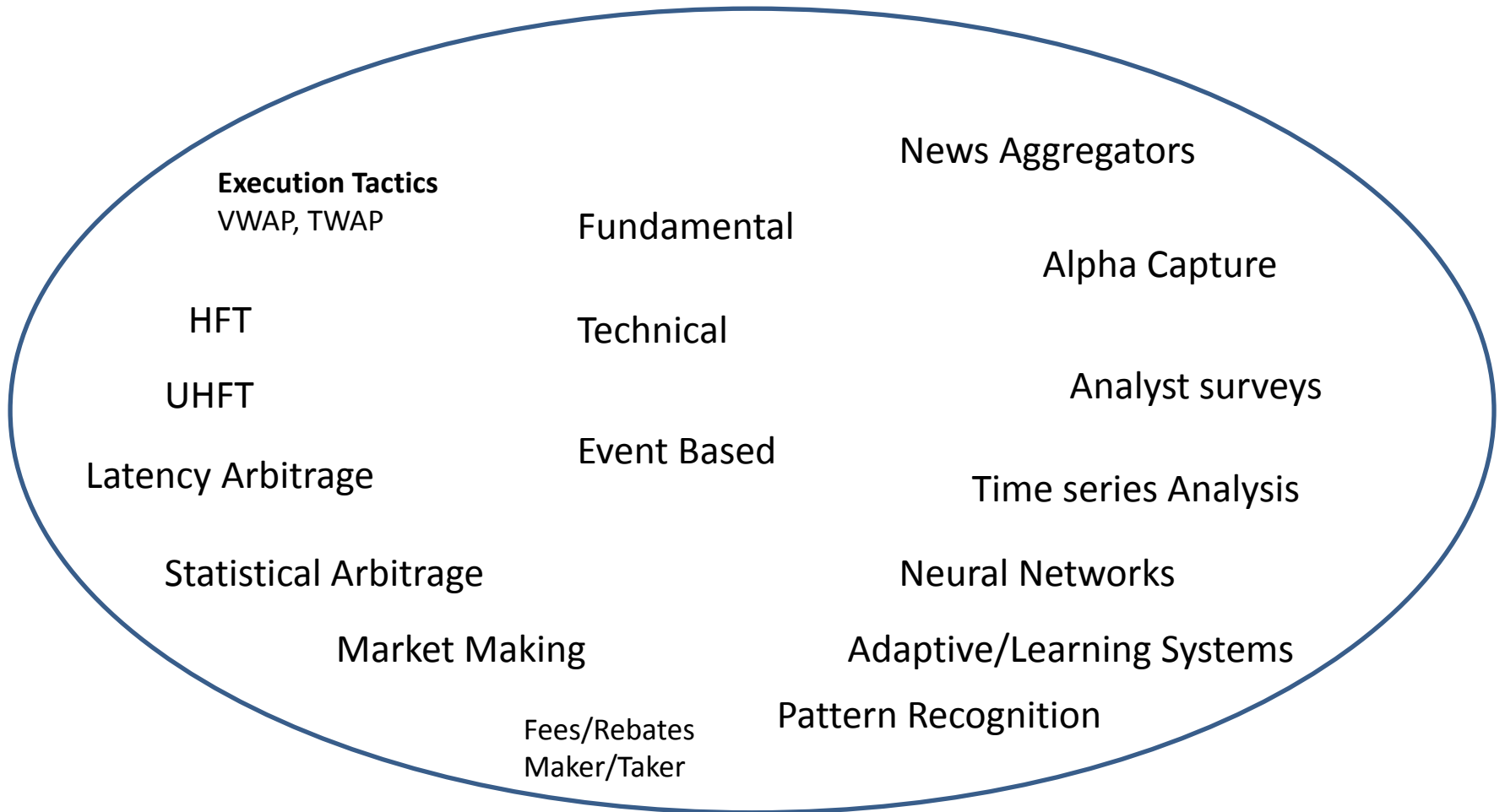
ECN/ATS
DMA
Electronic Market Making
Dark Pools
Tick Sizes
Co-Location

Algorithmic/Computerized Trading

Computer Science
Statistics
Data Mining
Artificial Intelligence
Econometrics
Financial Engineering
Behavioral Economics

GLOBALIZATION
Connectivity of the markets
24/7 News
Global social networks

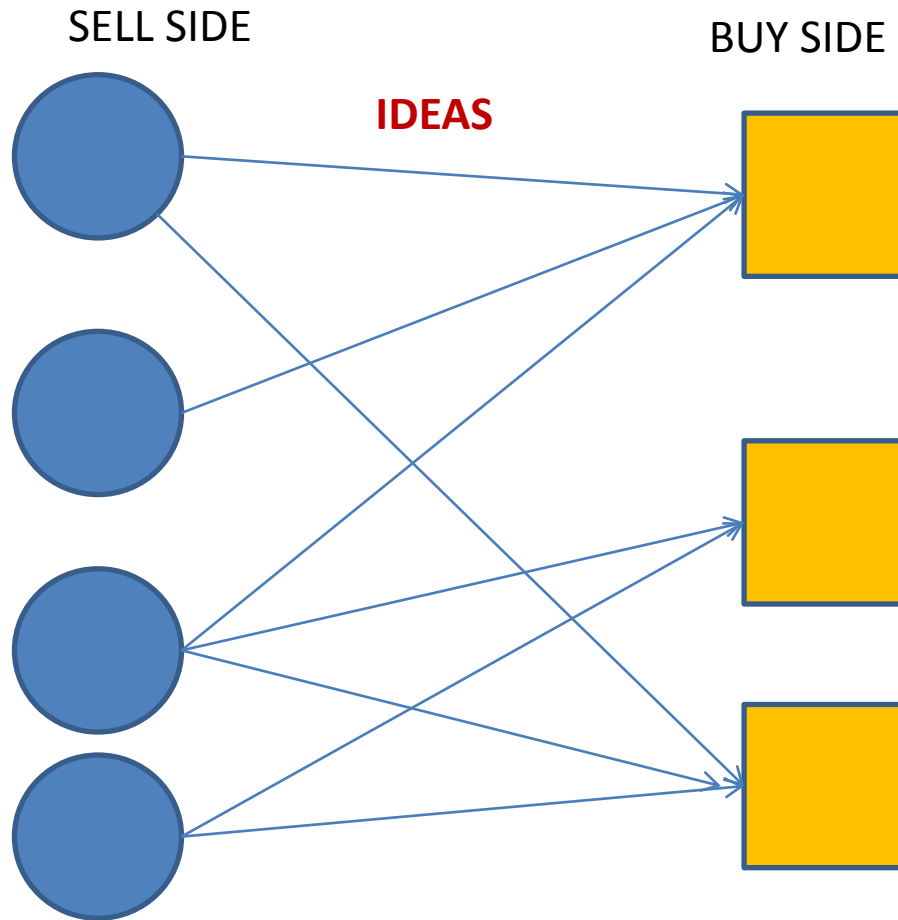
Algorithms come in many fashion



Alpha Capture Systems

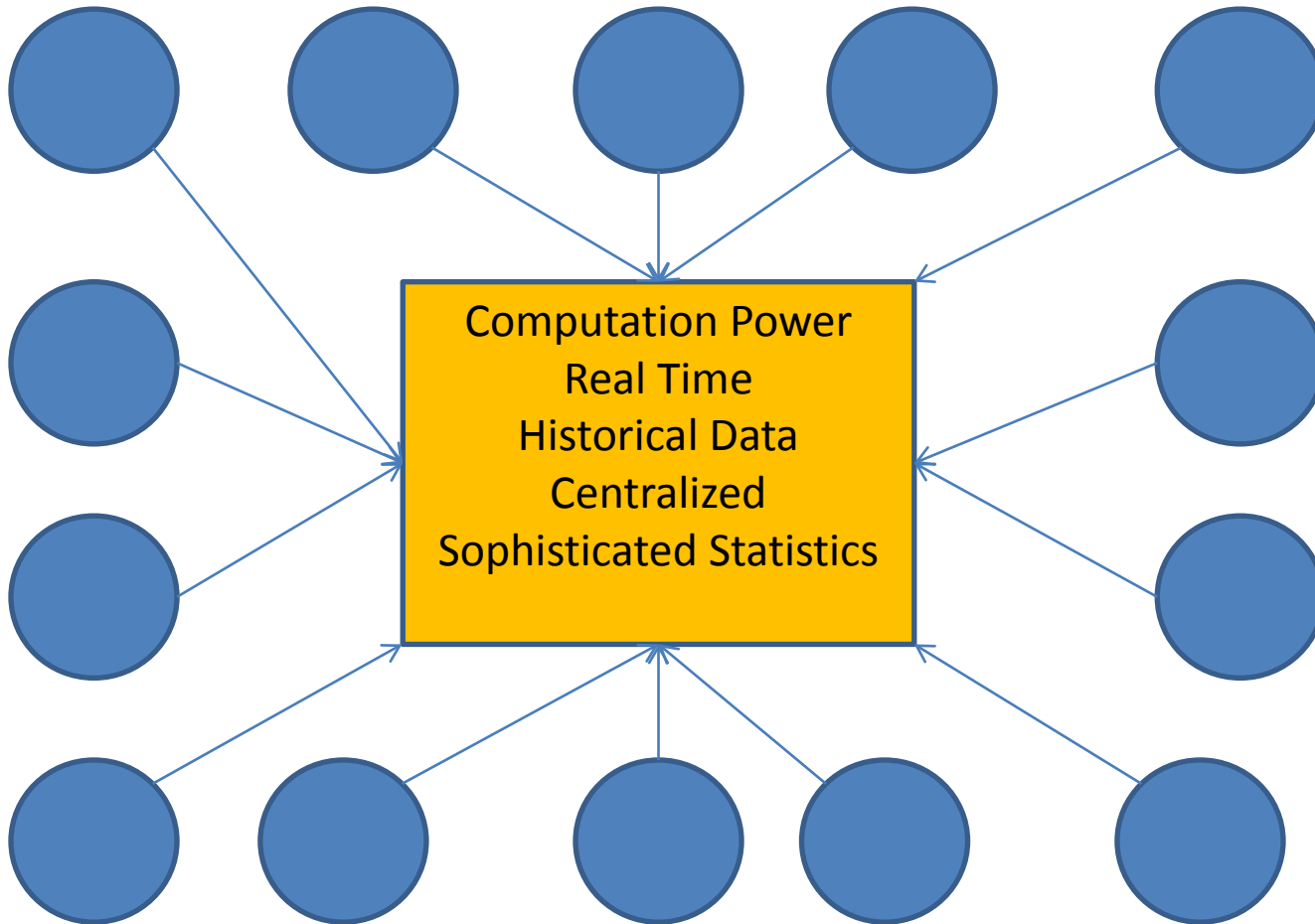
- Started with Marshall Wace in 2001 in UK
- Web based systems to capture trading ideas coming from contributors: sales desks, analysts
- More than buy or sell ideas
- Becoming more and more common place

Trade Idea Flow: Old Model



- Decentralized
- Minimal Computational Power
- Minimal use of Historical Data
- No Statistical Analysis

Alpha Capture Systems: New Model



A Few of The Risk Factors for Alpha Capture

- Material non-public information
- Compliance requirements both at the contributing and receiving firms
- Compensation Structure
- Difficulty in establishing cause-effect relationship between contributor ideas and executed trades
- Regulation arbitrage: lack of strong controls in overseas markets

High Frequency Trading

Ultra High Frequency	1 millisecond to 1 second
High Frequency	1 second to minutes
“Slow”	Minutes to hours

Research By Tabb Group		
US	21% in 2005	56% in 2010
Europe	9% in 2007	25-35% in 2010
Asia		10-30% in 2010

High Frequency Trading: Good or Bad?

SUPPORTERS

- Increases Liquidity
- Makes markets more efficient
- Decreases Volatility
- Natural evolution of markets
- Cancellations are natural
- Does not need more regulation

STRATEGIES

- Liquidity Providing
- Trading the Tape
- Statistical Trading
- Market Making
- Momentum Trading
- Technical Trading
- **OTHER: ? ? ?**

OPPONENTS

- Liquidity Fleeting: not real, not there when needed
- Distorts the markets: self similarity, correlation
- Increases Volatility
- Privileged access to markets, data
- Huge number of cancellations to manipulate markets
- Significant Number of ODD LOT trading
- Needs more regulation

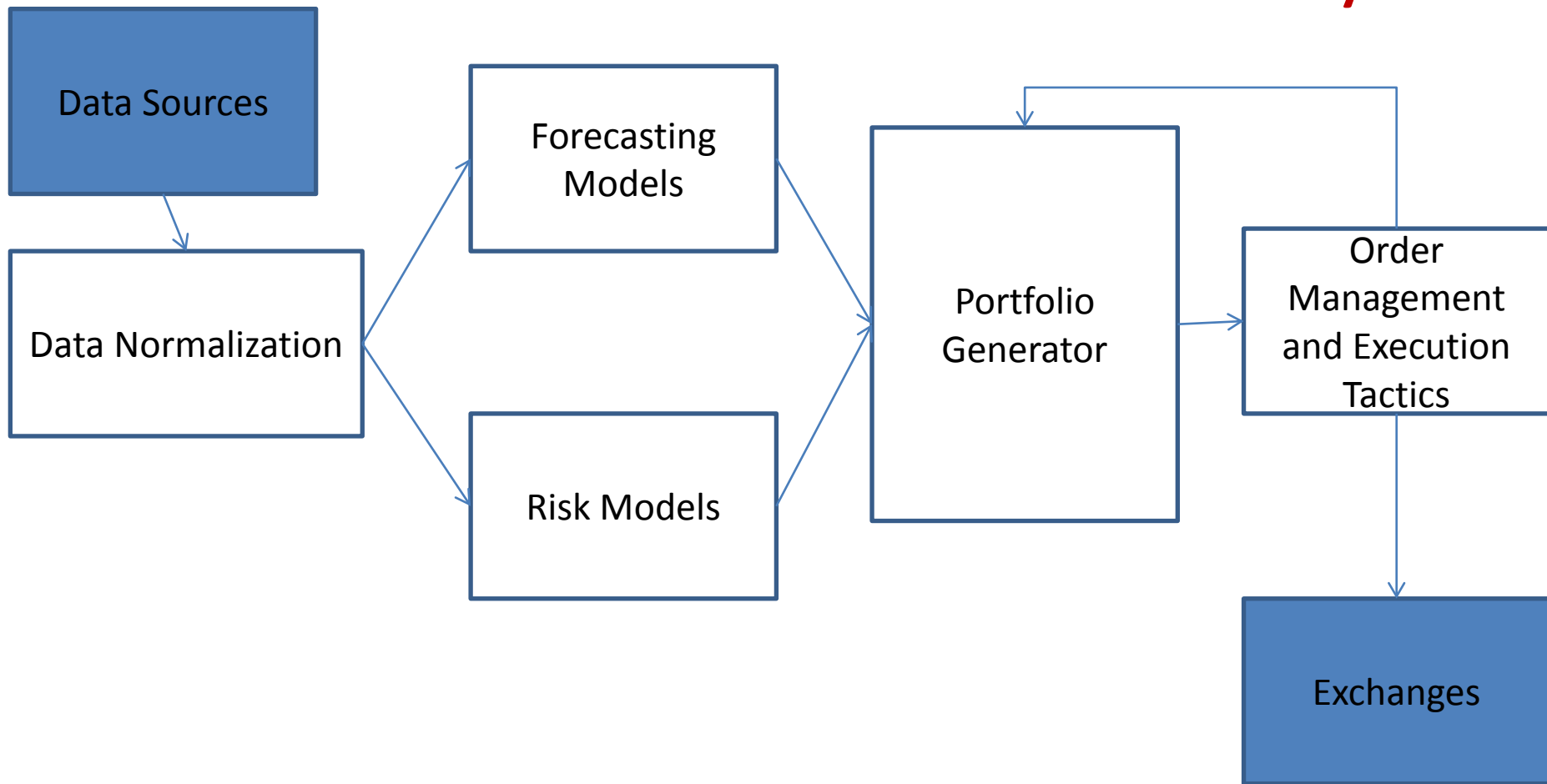
• ACADEMIC RESEARCH

- J. Brogaard, July 2010: HFT and its impact on market quality.
- J. Hasbrouck and G. Saar, Oct 2010: Low-Latency Trading
- R. Smith, June 2010: Is HFT inducing changes in market microstructure and dynamics?
- R. Cont, September 2011: Statistical Modeling of High-Frequency Financial Data
- M. O'Hara, July 2011: What's Not There: The Odd-Lot Bias in TAQ Data

**JURY IS OUT ON HFT
HFT IMPACT IS REAL
RESEARCH INCONCLUSIVE SO FAR**

Out On The Field

What We Hear: Nice and Orderly

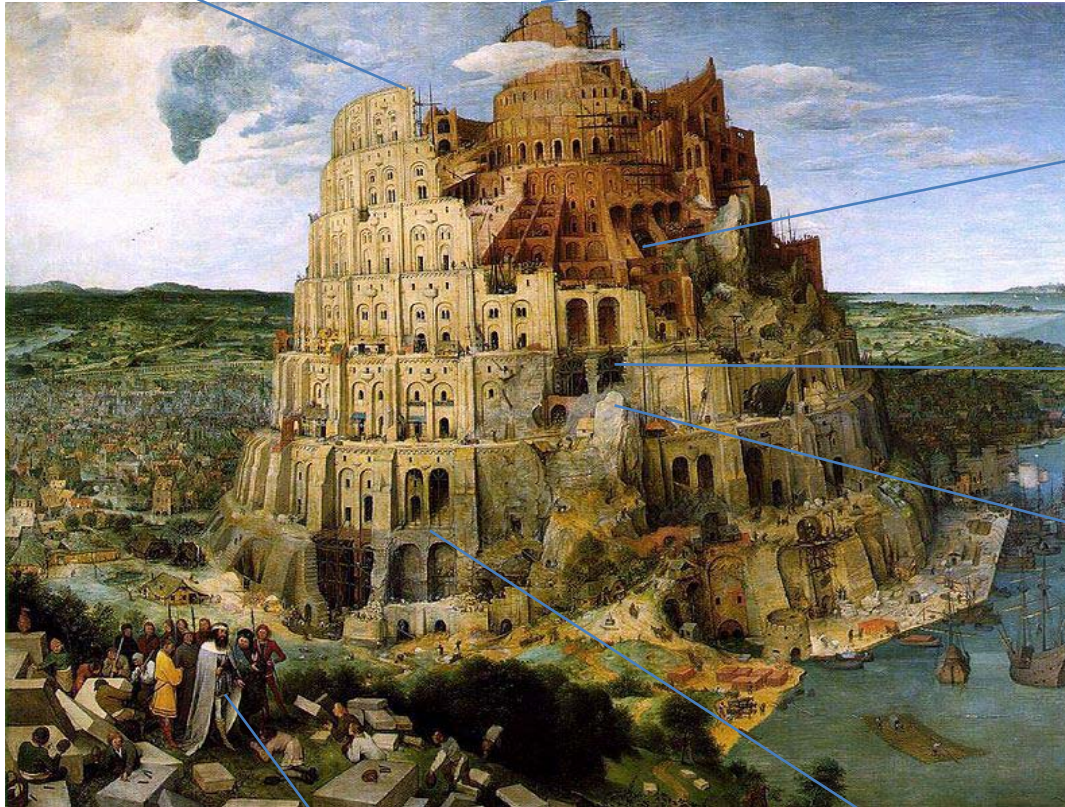


REALITY IS DIFFERENT: What We See

Land of many languages: Lost in Translation

Micro second latency

Alpha \$\$\$



Risk Metrics, VaR, Stress Tests, Cross Business Impact

C++, Python, Java, Matlab, FPGA

Optimization, Information Ratio, Covariance Matrix

Cross Trades, wash trades, churning, layering ...

Interaction of Algorithms



Compliance and Risk Management Challenges

- Proper documentation of models, systems and processes
- Proper testing of the models and systems:
 - Can they start or accelerate market events?
 - How do they behave individually and in aggregate under stress environments?
 - How do the changes in models tracked?
- Most compliance personnel do not have the background to understand, monitor or test the models
- Models and Systems evolve faster than Risk or Compliance processes
- In my opinion, traditional compliance need to become Quantitative Compliance: Financial Engineering requires Compliance Engineering.

A Robust Risk and Compliance Process

