

# ***WTF...Quant?***

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*The Inside Scoop on Stern's Newest Organization*

# What is QFS?

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- Derivation – Econ Theory → Models
  - “Financial Mathematics”
  
- Application
  - “Financial Engineering / Comp Finance / Quantitative Analyst” = “Quants”

# Why Choose Quant?

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## □ Reason 1: \$\$Money\$\$

- Interest Rate Model Specialist - **£70-95,000** + Bonus - ORG1813
- Fundamentals Based Systematic Strategies - Portfolio Manager - NY - **\$500k - \$1,000,000** - HUX3822
- Portfolio Management - Systematic Trading - NY - **\$350,000 - \$2,000,000** - HUX3819
- Interest Rate Structurer : Global Bank - New York City - **\$ 800K** (Total Package) - HUX3820

## □ Reason 2: Fulfilling work, which actually uses things you've learned since elementary school

## □ Reason 3: Set of skills that you train for make you the ultimate machine for any high-paying job in Finance

# What Will QFS Add to Stern?

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- An outlet for “quant”-to-bes
- Representation for one of the most important movements in Wall St.
  - Evidence? → MSc and Ph.D programs
- Chance to test your skills to the max
- Learning material that’s “too hard” for our age

# How Are We Different?

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- ❑ The Apollo Clap
- ❑ WePayYou Program
- ❑ \$Quants
- ❑ Mathlete End-of-Semester Contests
- ❑ Game Meetings
- ❑ Other Applications of Quant (Sports)
- ❑ Cheap: **Lifetime** \$25 & \$5 (Senior)

# What Will QFS Do?

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- ☐ Meetings at an understandable level
- ☐ Guest Speakers galore
- ☐ Career, interview, reading advice
- ☐ Meet others with similar passions inside & outside of Stern

DE Shaw & Co

Renaissance

CITADEL

CREDIT SUISSE

BARCLAYS

A D A I R  
C A P I T A L

Goldman Sachs

HSBC

Algorithmics

Morgan Stanley

# Goals of the QFS

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- ❑ To be humans; not math machines
- ❑ To serve the club & members
- ❑ To have fun...seriously
- ❑ To learn latest methods of making \$
- ❑ To promote quant recruiting at NYU
- ❑ To promote quant research in NYU

# Long Term Goals

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- Alumni & Professional Base of Contacts
  - Internships and Job Placement
- Modeling Software Package
  - Application of teachings
- Highly Dynamic Web-Site
  - Outlet for Quants
  - Large database of knowledge and code, etc...
- Research Projects
  - Like the current one we are doing...

# About Us

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- Varun – Pres
- Alex – VP
- Arvindh – Secretary
- Jawad - Treasurer
- Eric – Director of Marketing
- Haseeb – Director of Alumni & Guest Speakers
- Igor – Mathematics Chair
  
- Looking For: Finance Chair, Computer Science Chair, Webmaster

# Membership Benefits

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- ❑ 100 MB + *yourname@quantfs.com*
- ❑ Corporate Mingles
- ❑ Job/Internship Recruitment
- ❑ Quant Community
- ❑ Member-Only Events & Information
- ❑ Give Presentations
- ❑ Name on Site / Online Profile

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# Math Probably Sucks



Igor R. Schmertzler

# Math Probably Sucks

A no-nonsense approach

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## Agenda

- You are probably right
- Could you be wrong?
- Who cares? It makes money!
- What is it? What is a model?
- Benefits of understanding
- Where do we go from here?

# Math sucks, you are right

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- Prices are built into the stock market
  - Freshmen and Professors love to talk about efficient markets
  - In fact, there is strong evidence of efficient markets
  - Takes just one arbitrageur

# Math sucks, you are right

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- What is arbitrage?
  - Simultaneously buy X and sell Y (named differently) but equal (*ask me how after presentation*)
  - This is riskless
- Why does just one arbitrageur take away all the opportunity?
  - Arbitrageurs (people who do arbitrage) will put on the trade in arbitrarily large volume (since it produces free money) until prices are forced into the correct alignment.

# Math sucks, you are right

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- There is little quality data
  - What do we mean by little?
  - The more variation you have, the more you will need to sample and stock are very random
  - Returns measured over long time horizons seem to be more useful in some cases yet parameters change over time

# Math sucks, you are right

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- ❑ We all know that Finance majors make the most money
- ❑ Riemann died of starvation and tuberculosis
- ❑ Buffet did not get tuberculosis (fact)
- ❑ And finally, if Gauss was so smart, why is he dead?

# Math sucks, you are right

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"Why did rocket science backfire? [...] Rocket science can't substitute for common sense, says Wilford, who manages a "market-neutral" hedge fund himself. "I've seen too, too many of these quant geniuses that don't have a clue about how markets behave. When they get a shock like this, they're dumbfounded. They just don't have the intuition of what to do."

-Business Week

# What do you have to say for yourself, Math?

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## Prices are built in - A Partial Excuse

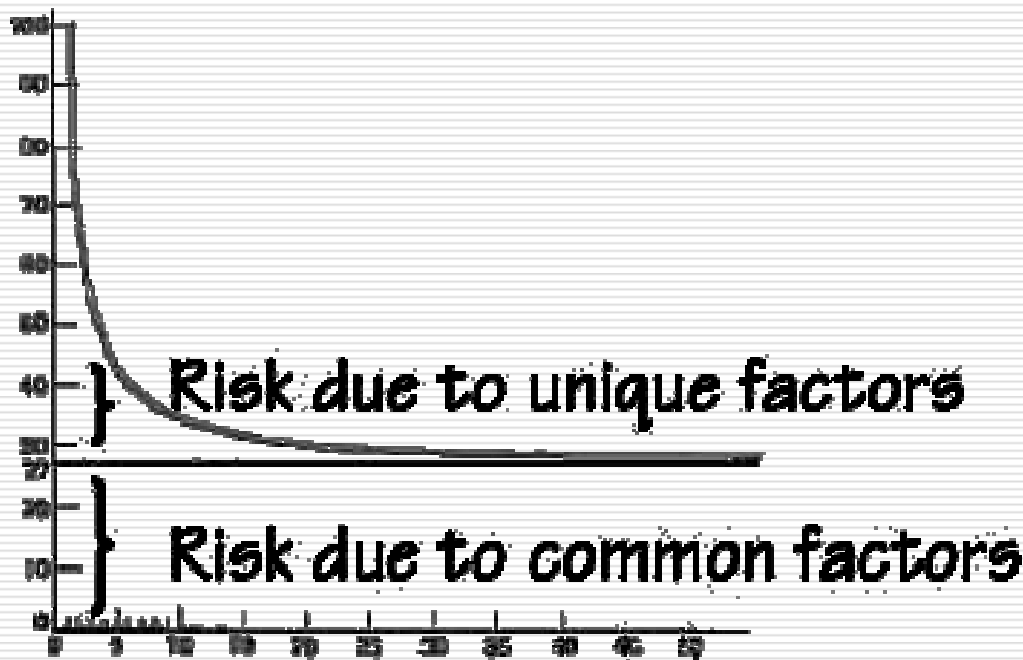
- That's actually called a "Markov Process" and there is a lot to learn
- Individual stocks maybe difficult to pick, but portfolio theory generates better returns
- Thanks Markovitz and Modern Portfolio Theory (1950's)

# Maybe math doesn't suck

Portfolio Theory

## □ Diversification

Risk



Less Risk when  
returns are not  
perfectly correlated

# Maybe math doesn't suck

Portfolio Theory – Hella Basic Math

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## □ Arithmetic vs Geometric returns

Yearly Allocation

Stock 1: +10%

Stock 2: -10%

Portfolio Gain:  $1.10 \cdot .99 = .99$  or -1%

proving once and for all that  $0 = -1$

Portfolio allocation

Stock 1: +10%

Stock 2: -10%

Portfolio Gain:  $.5 (1.1) + .5 (.90) = 1.00$

# Maybe math doesn't suck

Portfolio Theory – Continues to be basic math

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## □ What if the variation is even bigger?

Yearly Allocation

Stock 1: +20%

Stock 2: -20%

Portfolio Gain:  $1.20 \cdot .80 = .96$  or -4%

proving once and for all that  $0 = -1$

Portfolio allocation

Stock 1: +20%

Stock 2: -20%

Portfolio Gain:  $.5 (1.2) + .5 (.80) = 1.00$

# Maybe math doesn't suck

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- “It is just because we do not have enough data that we use sophisticated mathematics”  
–Kenneth Arrow, Nobel Laureate
- Ensure logical consistency
- Extrapolate all meaningful data

# Who cares, Math makes money

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- ❑ Last year James Simons of Renaissance Technologies (a hedge fund) made \$1 billion in salary alone.
- ❑ He did this by (more or less) pushing buttons on a computer to manipulate financial assets.
- ❑ Bachelors? Math.
- ❑ PhD? Math.

# How much is it worth?

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- ❑ Simons and others direct money (eventually) into building factories and creating jobs.
- ❑ This is why financial assets are such a valuable invention – they allow quick transfer of productive assets so the economy can react (reallocate) quickly around events and information.
- ❑ Worth: 1 billion dollars

# Modeling is hard work

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- Quotation attributed to Paris Hilton
- Equations attributed to less attractive people

$$-e^{-q\tau} \frac{\phi(d_1)}{2S\tau\sigma\sqrt{\tau}} \left[ 2q\tau + 1 + \frac{2(\tau - q)\tau - d_2\sigma\sqrt{\tau}}{2\tau\sigma\sqrt{\tau}} d_1 \right]$$

$$F(x) = \frac{(1/2)^{n/2}}{\Gamma(n/2)} \int_0^x t^{n/2-1} e^{-t/2} dt$$

# What is a model?

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- A simplified representation of reality (based on certain assumptions) created for a specific purpose.

- Examples: Picture, prototype, map.

Black-Scholes model, Markov model of debt,

$$\Pi = q [p - c]$$

# What is a model?

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- *Simple*: Capture the essence.
- *Representation*: Words, pictures, boxes and arrows, mathematical expressions
- *Assumption*: What to capture. What to ignore.

# What are benefits of a model?

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- ❑ Improve consistency
- ❑ Interactively explore – understand impact of variables
- ❑ Improve sell ability
- ❑ Provide theoretical groundwork for future innovations

# From Describing to Predicting

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- ❑ With each model, you not only want to fit past data, you want to predict
- ❑ What if the future does not look like the past?
- ❑ If we only have past data, how do we know which models will work best for forecasting



# Is it any good?

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- ❑ Given a model, we always want to know if it is any good.
- ❑ Let us take a Classification model that predicts what class an example datum belongs to. How do we evaluate it?

## One Evaluation Measure: Classification Accuracy Rate

Proportion of accurate classifications of examples in test set. E.g., the model predicts the correct class for 70% of test examples.

# A Model Effectiveness Question

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- ❑ Assume a model accurately classifies 90% of instances in the test set
- ❑ Will 90% accuracy cut it? 99%?
- ❑ We need a Finance volunteer to answer the question

# Consider the following...

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- ❑ In real life, 1% of the stocks are mispriced
- ❑ We build a classification model to predict if a stock is mispriced
- ❑ The model classification accuracy rate is 99%
- ❑ How good is our model?



# Confusion Matrix

Model's performance over test set:

Actual Class

		Actual Class	
		Mispriced	Fairly Priced
Predicted Class	Mispriced	0	0
	Fairly Priced	10	990

Diagonal left to right: predicted class=actual class.  
990/1000 (99%) accurate predictions.

# Classification Accuracy Rate?

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- Not enough
- After examining the examples the model misclassified
  - The model always predicts that a stock is fairly priced
  - The model misclassifies all stocks
- Conclusion: Need to examine the type of errors

# Where do we go from here?

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- There could very well be a presentation called Finance sucks
  - This is why rocket scientists need to know finance
  - We hope to expose assumptions in mathematical models
- No major financial research project can be conducted without computer science understanding
  - Unlike the common perception of lonely work, quants need to communicate across disciplines

# Where do we go from here?

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- ❑ Presentations will be more technical and more focused from now on
- ❑ Establish best time for meetings
- ❑ Positions available for application
- ❑ Build stronger connections with the quant community
- ❑ Establish outlet for businesses that normally pass on the Finance education at Stern

# Where do we go from here?

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- ❑ We are looking for a Finance Chair and a Computer Science Chair
- ❑ Each Chair will hold special topics events that require above average understanding of the subject
- ❑ Chair must be advanced junior or senior majoring in topic
- ❑ Chairs should advise research groups

# Member Benefits

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- Members will enjoy:
  - seminars to discuss research with NYU professors like Brown, Figlewski, and Avellaneda
  - corporate mingles and corporate speaking events
  - members will receive job offers directly from corporate connections
  - members will work on research for major journals
  - [youname@quantfs.com](mailto:youname@quantfs.com)

# Target Membership

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- You should be a member if:
  - you want a quant job
  - you want to go to graduate school
  - you respect knowledgeable people
  - you want to stay competitive in computerized world (eg. Goldman Trading)
  - you want to be better prepared for high level course work
  - you are from CAS in physics, chemistry, CS, economics, mathematics and are interested in finance

# Happy Valentines

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- ❑ Next time, we will have a professional speaker (TBA for members)
- ❑ Next meeting will be the first ApolloClap™
- ❑ Members are encourage to submit presentation topics
- ❑ Visit the website for goodies
- ❑ Now, go out there and get some lovin'