

FAC Summer Project '24

Deciphering Decisions

Merging Behavioural Finance and Game Theory



Timeline

Week 1–2 Overview of the Financial Markets and Basics of Python

- Numpy, Pandas and other related libraries.
- Indicators, Equirty and Derivatives
- Coding of strategies and calculating important ratios.

Week 3–4 Behavioral finance and game theory

- Introduction to Behavioral Finance: Understanding the psychological underpinnings of financial decision-making, including heuristics, biases, and emotions.
- Prospect Theory: Exploring how individuals evaluate gains and losses, and the implications for investment decisions.
- Cognitive Biases: Studying common biases such as overconfidence, anchoring, and confirmation bias, and their impact on investment choices.

Timeline

Week 5–6 Application of Game Theory in trading

- Game Theory and Market Microstructure: Exploring how game theory models can elucidate market microstructure phenomena such as order execution and liquidity provision.
- Behavioral Game Theory: Integrating insights from behavioral economics into game theory to account for irrational behavior and bounded rationality among traders.
- Evolutionary Game Theory: Applying evolutionary game theory to understand the emergence and persistence of trading strategies in evolving market environments.
- Practical Applications: Applying game theory concepts to real-world trading scenarios, algorithmic trading strategies, and market dynamics.

Timeline

Week 7 Some Advanced Topics

- Introduction to Complex Systems: Understanding complex systems theory and its relevance to financial markets, including concepts such as emergence, self-organization, and feedback loops.
- Agent-Based Modeling (ABM): Exploring ABM as a tool for simulating the behavior of individual agents in financial markets and studying the dynamics of market phenomena such as bubbles, crashes, and herding behavior

Week 8 Final Project

- Mentees will work on a final project that integrates concepts from behavioral finance, game theory, risk management, and algorithmic trading. The project may involve designing and backtesting a trading strategy, analyzing market data to identify behavioral patterns, or developing a risk management framework incorporating behavioral insights.

Let's discuss...

- 999 vs 1000
- Decoy effect
- Meaningful vs sisyphus lego building (11 vs 7, 8 vs 7)
- motivation, acknowledgement, praise worthiness
- or praise worthiness...

**“However beautiful the strategy, you should occasionally
look at the results.”**

–Sir Winston Churchill

So why some strategies don't work?

Are we taking some assumptions that can't be always true in the real world?

or something else...?

The potential problem with this standard economic model is that it is **based on some strong assumptions.**

For example, it assumes people can be approximated by a homo-economicus who is rational, calculating and selfish, has unlimited computational capacity, and never makes systematic mistakes. It also assumes market institutions work and so, for instance, prices should converge, as if by magic, to equilibrium.

But we know we can't assume all that :)

More formally the assumptions made in economics are...

Micro

- Consumers maximize utility subject to budget.
- Firms maximize profits subject to demand.
- Markets converge to supply=demand equilibrium.

Macro

- Agents in economy have rational expectations.
- Economy in rational expectations equilibrium.

Finance

- Investors maximize expected returns subject to investment opportunities.
- Asset market prices reflect correctly anticipated discounted future cash flows.

‘Behavioural Finance’

A subfield of **‘Behavioural Economics’**.

Then what is...

'Behavioural Economics'

Behavioral economics is about understanding economic behavior and its consequences. It's about understanding why someone buys a hotdog, goes to work, saves for retirement, gives to charity, gets a qualification, sells an old car, gambles on a horse race, cannot quit smoking, etc. It's also about understanding whether people make good or bad choices, and could be helped to make better choices.

'Behavioural Finance'

A subfield of '**Behavioural Economics**' that deals with financial decision-making and financial behaviour

A subfield of '**Behavioural Economics**'.

Behavioral economics is about testing the standard economic model on humans, seeing when it works and when it does not, and asking whether it can be tweaked, or given an overhaul, to better fit what we observe.

Behavioral economics is about applying insights from laboratory experiments, psychology, and other social sciences in economics

Then what is...

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Now what is

Game Theory

Something related to a 'Game' !!!

So...lets just play a game

The Grade Game

Consider you have 2 choices to make α (alpha) and β (beta). I randomly pair 2 responses and the following happens –

1. if u choose α and pair chooses α , both get B
2. if u choose α and pair chooses β , you get A, they get C.
3. if u choose β and pair chooses β , both get B+
4. if u choose β and pair chooses α , you get C, they get A.

So what were your choices and why?

After seeing the 'Nash Equilibrium', what should be your choice?

		Pair	
		α	β
Me	α	(8,8)	(10, 6)
	β	(6, 10)	(9,9)

Btw what is 'Nash Equilibrium'?

A game which reaches an optimal outcome.

That was just the intro...we'll see it in much detail later!

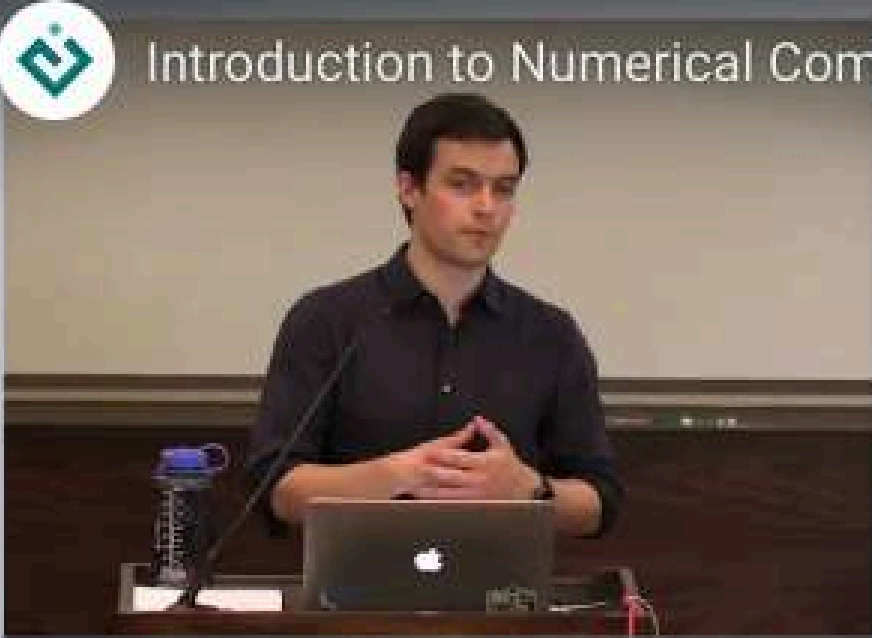
Python

Most of our codes will be in python. A good grasp is necessary!



Numpy – A python library

For algorithmic strategies, numpy will be intensively used for data storage and manipulation. Have a good grasp on it too!



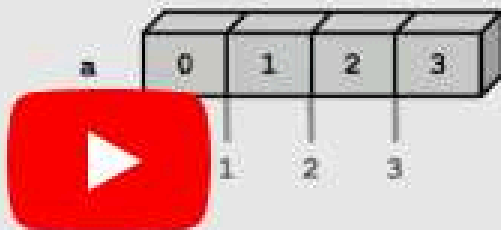
Introduction to Numerical Computing with NumPy | SciPy 2019 Tutorial | Alex Chabot-Le...

Setting Array Elements

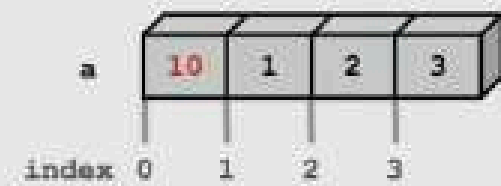
Share

ARRAY INDEXING

```
>>> a[0]
0
```



```
>>> a[0] = 10
>>> a
array([10, 1, 2, 3])
```



BEWARE OF TYPE COERCION


```
>>> a.dtype
dtype('int32')
```

assigning a float into
an int32 array truncates
the decimal part


```
>>> a[0] = 10.6
>>> a
array([10, 1, 2, 3])
```


fill has the same behavior

```
>>> a.fill(-4.8)
>>> a
array([-4, -4, -4, -4])
```



SciPy 2019

Watch on  YouTube

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That's all !!

THANK YOU

