KaxaNuk

Sharing knowledge

Quant Scientist Program

About Us

We specialize in **quantitative research and development** focused on designing **scientific models** to make **better investment** decisions.

Quantitative Science in Finance

How it Works

Quantitative Science combines principles from **finance**, **economics**, **mathematics**, **machine learning**, **computer science** and **causal inference** to analyze and understand **financial markets phenomenons**.

Why it is Important

It allows **Quant Scientists to test hypotheses, make predictions, and derive insights** required to make informed financial decisions.

Some Examples and Evolution

Asset Pricing Models

Capital Asset Pricing Model: A widely used model that relates the expected return on an asset to its systematic risk.

Fama-French Three-Factor Model: Extends the CAPM by adding two additional factors: size (SMB - Small Minus Big) and value (HML - High Minus Low).

Carhart Four-Factor Model: An extension of the Fama-French model by adding a momentum factor.

Factor Models

Factor Models, Machine Learning, and Asset Pricing

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There are 2 versions of this paper

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Abstract

We survey recent methodological contributions in asset pricing using factor models and machine learning. We organize these results based on their primary objectives: estimating expected returns, factors, risk exposures, risk premia, and the stochastic discount factor, as well as model comparison and alpha testing. We also discuss a variety of asymptotic schemes for inference. Our survey is a guide for financial economists interested in harnessing modern tools with rigor, robustness, and power to make new asset pricing discoveries, and it highlights directions for future research and methodological advances.

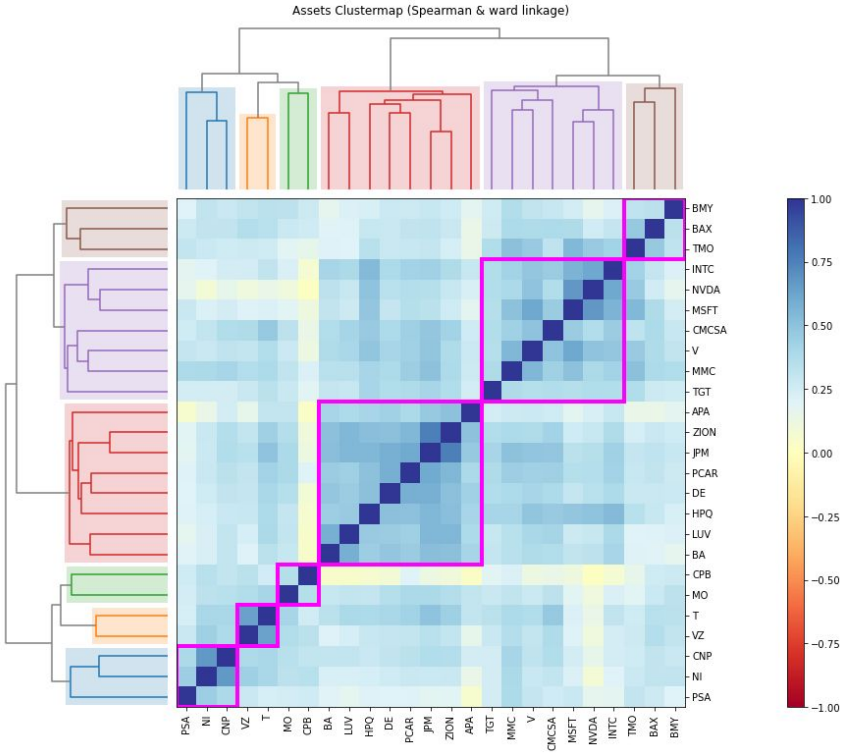
Portfolio Theory

Markowitz Portfolio Theory: this theory focuses on constructing portfolios that offer the maximum possible expected return for a given level of risk.

Black-Litterman Model: is an analytical tool used by portfolio managers to optimize asset allocation within an investor's risk tolerance and market views.

Hierarchical Clustering Portfolio Optimization: aims to capture the benefits of diversification by grouping similar assets together and constructing portfolios that span different clusters.

Hierarchical Clustering Portfolio Optimization



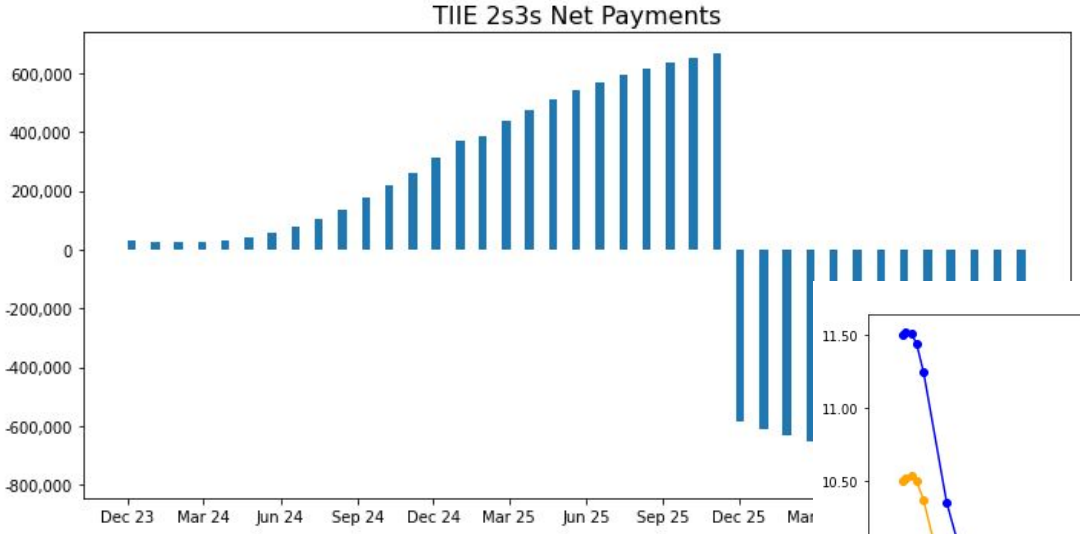
Derivatives Pricing Models

Black-Scholes Model: is a mathematical equation used for pricing options contracts and other derivatives, using time and other variables.

Heston Model: extends the Black-Scholes model incorporating stochastic volatility, meaning the volatility itself is considered a random variable that evolves over time.

Cox-Ingersoll-Ross Model: models the interest rate as a stochastic process.

QuantLib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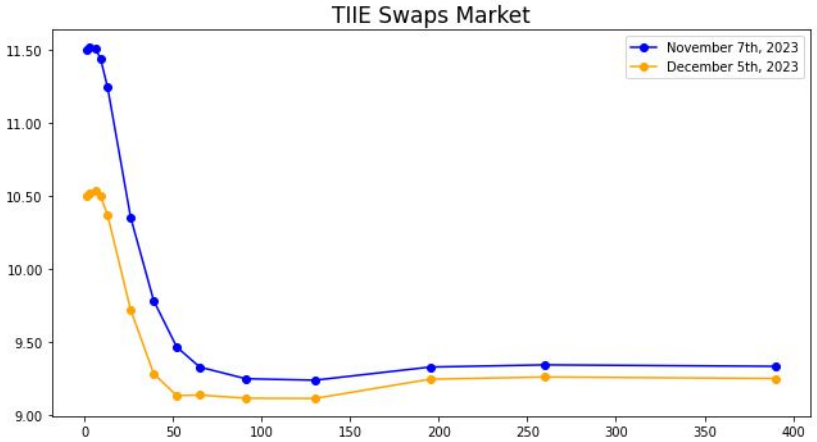
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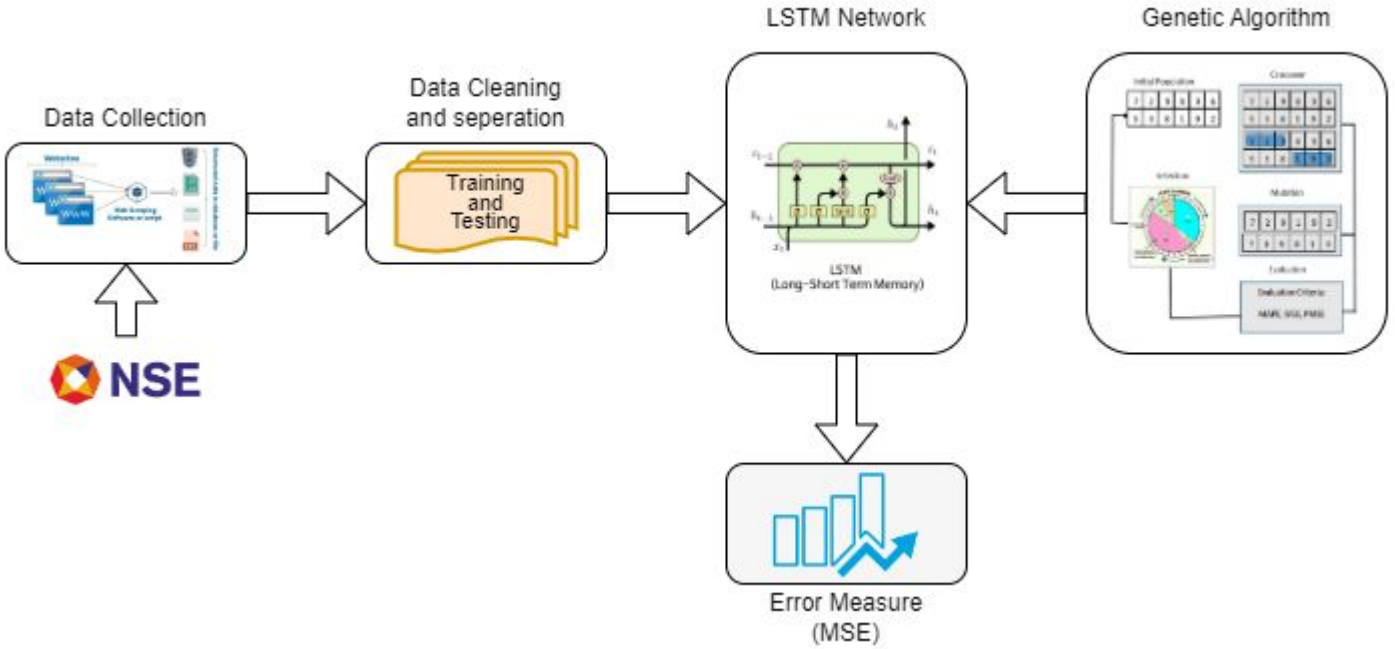
Time Series Analysis

Autoregressive Integrated Moving Average: it utilizes the combination of autoregressive and moving averages to predict future values.

Exponential Smoothing: it works by reducing the lag effect shown by moving averages by putting on more weight on values that occurred more recently.

Long Short-Term Memory: is a type of recurrent neural network that can learn the order dependence between items in a sequence.

Long Short-Term Memory



Market Microstructure

Order Book Models: studying the dynamics of bid and ask prices in financial markets.

Market Impact Models: analyzing the impact of large trades on market prices.

Algorithmic Trading: implementing trading strategies based on quantitative models and algorithms.

Visual High Frequency Trading

VisualHFT

VisualHFT is a cutting-edge GUI platform for market analysis, focusing on real-time visualization of market microstructure. Built with WPF & C#, it displays key metrics like Limit Order Book dynamics and execution quality. Its modular design ensures adaptability for developers and traders, enabling tailored analytical solutions.

Machine Learning in Finance

Scoring Models: classification algorithms, such as logistic regression, decision trees, random forest, and ensemble methods, are used to score securities.

Clustering: allows to group similar financial instruments, such as stocks, bonds, or derivatives, based on various attributes like volatility, liquidity, correlation, and historical performance.

Natural Language Processing: is a vital tool for uncovering insights from financial articles, news, and social media, shaping our understanding of market movements.

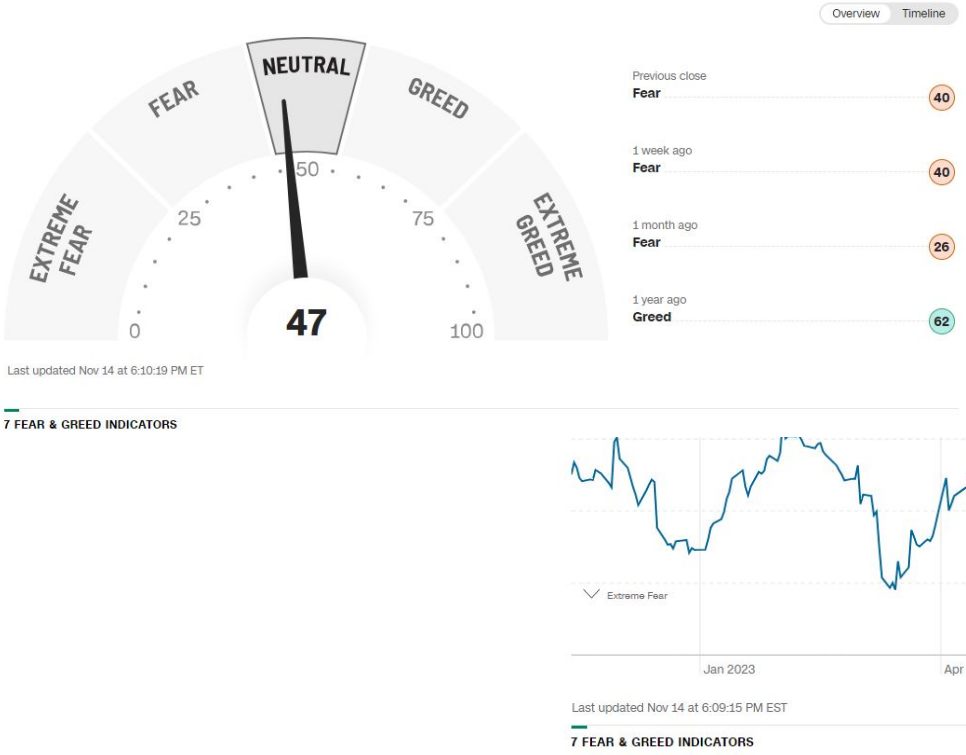
Bloomberg GTP

Behavioral Finance

Behavioral finance helps us understand how financial decisions around things like investments, payments, risk, and personal debt, are greatly influenced by **human emotion, biases, and cognitive limitations** of the mind in processing and responding to information.

Investors are found to systematically **hold on to losing investments far too long** than rational expectations would predict, and they also **sell winners too early**.

CNN Fear & Greed Index



Causality in Finance

Causality in finance refers to the **relationship between cause and effect** in financial markets or economic phenomena.

It involves understanding how changes in one variable may lead to changes in another, identifying the direction of influence, and assessing the strength of the relationship. **Causality is a crucial concept in financial research and decision-making**.

Causality

On the Three Demons in Causality in Finance: Time Resolution, Nonstationarity, and Latent Factors

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Abstract

Financial data is generally time series in essence and thus suffers from three fundamental issues: the mismatch in time resolution, the time-varying property of the distribution - nonstationarity, and causal factors that are important but unknown/unobserved. In this paper, we follow a causal perspective to systematically look into these three demons in finance. Specifically, we reexamine these issues in the context of causality, which gives rise to a novel and inspiring understanding of how the issues can be addressed. Following this perspective, we provide systematic solutions to these problems, which hopefully would serve as a foundation for future research in the area.

Our Program

Goal

The objective of this program is to **develop your financial and coding skills** through examples and the development of a project “**Meents'ul**” that seeks to apply the knowledge gain during each workshop.

Who Is It For

- CIOs, CFOs and CTOs
- Portfolio Managers
- Quant Strategists
- Quant Researchers
- Quant Developers
- Financial Advisors
- Traders
- Students
- Treasurers
- Economists
- Actuaries
- Programmers
- Investor Relations
- Financial Analysts

Workshop 1

Python and Equity Markets: A Beginner's Workshop

Calendar

Session	Type	Date	Modules
Opening	On-Site	1/23/2024	Kick-off
1		1/30/2024	Financial Markets Foundations
2		2/6/2024	
3		2/13/2024	
1		1/30/2024	Basic Coding Concepts in Python
2		2/6/2024	
3		2/13/2024	
4		2/20/2024	Python in Finance
5		2/27/2024	
6		3/5/2024	
7		3/12/2024	
Meents'ul	Online	**3/19/2024**	**Meents'ul Project Definition**
8		3/26/2024	Machine Learning in Finance I
9		4/2/2024	
10		4/9/2024	
11		4/16/2024	
12		4/23/2024	
13		4/30/2024	End-to-end Equity Strategy
14		5/7/2024	
15		5/14/2024	
Meents'ul		**5/21/2024**	**Meents'ul Final Project**
Closure		5/28/2024	Closing Ceremony

Basic Coding Concepts in Python

- Intro to Python and programming / Basic data structures
- Basic coding structures If, Try, For, While / Main libraries
- Functions, Module & Classes / Code analysis

Financial Markets Foundations

- Financial markets / Asset classes / Financial economics / Market cycles / Top-down analysis
- Equity Market / Stocks / ETFs / Financial Ecosystem / Bottom-up analysis
- Fixed Income / Commodities / FX / Derivatives

Python in Finance

- Data management, cleaning and visualization
- Data sources (APIs) / Main financial libraries / Python + PowerPoint
- Web scraping / Google Trends / Python + Excel
- Feature extraction / Time series

Machine Learning in Finance I

- Intro to ML, Statistics, Probability, Calculus and Algebra
- Regression
- Classification
- Dimensionality Reduction
- Clustering

End-to-end Equity Strategy

- Systematic strategies framework
- Factor investing and Feature selection
- Strategy building and Backtesting with reality modeling

Workshop 2

Fixed Income and Derivatives: From Beginner to Intermediate Workshop

Calendar

Session	Type	Date	Modules
Opening		8/6/2024	
1		8/13/2024	Fixed Income
2		8/20/2024	
3		8/27/2024	
4		9/3/2024	
5		9/10/2024	Derivatives
6		9/17/2024	
7		9/24/2024	
Meents'ul	Online	**10/1/2024**	**Meents'ul Project Definition**
8		10/8/2024	
9		10/15/2024	Machine Learning in Finance II
10		10/22/2024	
11		10/29/2024	
12		11/5/2024	
13		11/12/2024	Portfolio Management
14		11/19/2024	
15		11/26/2024	
Meents'ul		**12/3/2024**	**Meents'ul Final Project**
Closure	On-Site	12/10/2024	Closing Ceremony

Pre-requisites

- Basic Coding Concepts in Python
- Financial Markets Foundations
- Python in Finance
- Machine Learning in Finance I
- End-to-end Equity Strategy

Fixed Income

- Bond valuation I
- Bond valuation II
- Quantlib fundamentals

Derivatives

- Futures and Forwards
- Options
- Swaps
- Derivatives strategies

Machine Learning in Finance II

- Neural Networks
- Recurrent Neural Networks
- Natural Language Processing
- Reinforcement Learning

Portfolio Management

- Asset allocation with reality constraints
- Portfolio optimization: Mean-variance and Black-Litterman
- Stress testing and Simulation
- Attribution analysis

Specifications

Format

- Each level will last 4.5 months and will be 1 session per week **in Spanish** and English material.
- We will have online sessions of 1.5 hours, every week you will have tasks to complement your learning.
- In each session we will cover some slides and then we will run codes with examples, that could be later used to develop your own repository.
- If you have any questions, we can schedule **1 on 1 time** to solve them (up to 3 meetings per level).

Platforms

We are going to use the following platforms:

- ➔ **Google Meet** - for the online sessions
- ➔ **GitHub** - to download slides and codes
- ➔ **YouTube** - to upload recorded sessions
- ➔ **Anaconda** - to download Spyder
- ➔ **Spyder** - will be the IDE to run the codes

Meents'ul

This is the name for the final project that seeks to **apply what has been learned** during the workshop and should be submitted and presented in a video of maximum 10 minutes to earn the workshop's certificate.

We will have a session between modules to discuss your project and share ideas.

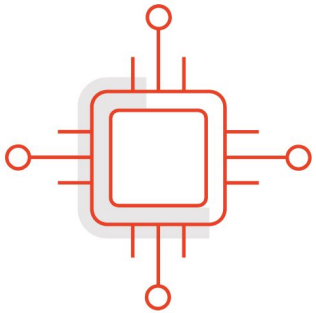
In **Mayan** the word Meents'ul means: **to search for fruits after the harvest**.

Pricing

- ➔ Each workshop will have a cost of **MXN$25,000** + VAT.
- ➔ If you pay 1 month before each workshop start date, you will have a **20% discount**.
- ➔ If you take a workshop, you will have an **additional 10% discount** for the second or third workshop respectively.

Develop your financial and coding skills!

Thank you!



Send us an email for more details or questions to:
training@kaxanuk.mx

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KaxaNuk

Sharing knowledge

Kaxan means Seek and Find, Nuuk Answer in Mayan