Mentorship Sharing Session

Introduction to Quantitative Finance

Practical Insights into Financial Markets

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Hi! I’m Caden

Derivatives Analyst (Equity) @ SGX Group

My Specialization:

Derivatives, Equities, Commodities, Market Microstructure

Previous experience:

- Commodity Quant Analyst
- Sales and Business Development

Education

- NTU BEng Aerospace Engineering
- SMU MSc Quantitative Finance

Three Objectives of today

✓ Introduce financial markets and the roles of a Quant in the industry

✓ Provide some tips to kick start your quant pursuit

✓ Share some advices on positioning yourself in this pursuit

Disclaimer

The views expressed here are solely my own, shaped by my personal experiences and mental models. They do not represent the views of my employer. These reflections are not presented as universal truths, but rather as one possible framework for thinking about and navigating quantitative finance in the industry.

Overview – Trading Ecosystem

Tradable Universe

Definition: A tradable product here is defined by

a) Marketability: There must be a platform or a market where the product can be traded (on exchange or over-the-counter)

b) Liquidity: There must be sufficient liquidity and no barrier for the product to be able to exchange hands without huge price impact

Asset Class

- Equities
- Fixed Income
- Currencies
- Digital Assets
- Credit
- Commodities
- Alternatives (Real estate, Private Equities)

Instrument

Securities

- Shares
- Bonds
- Funds (ETFs/ Mutual Funds)

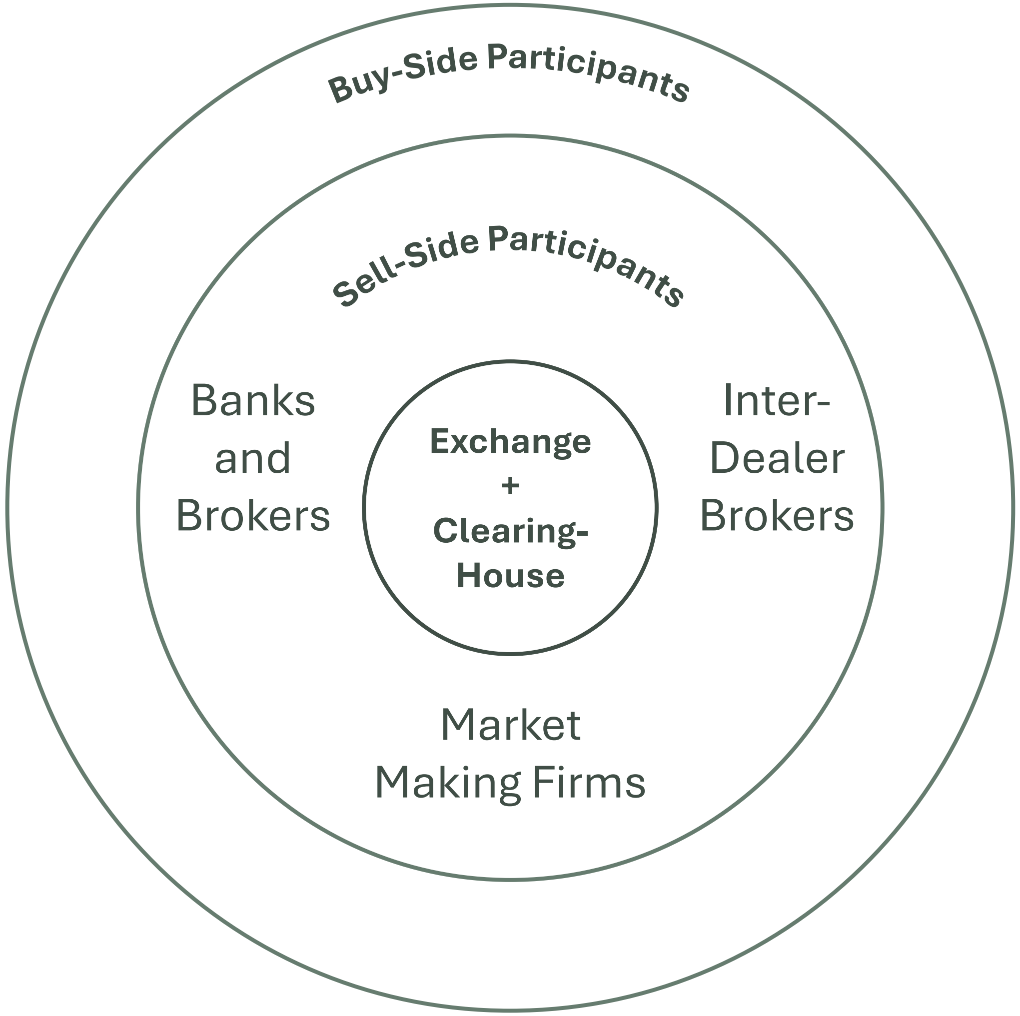
Derivatives

- Futures
- Options
- Swaps
- Structured Products

Exchange Trading Ecosystem

Sell-side Participants:
- Offers financial services to the end-clients
- Services include market making, access to trading venues

Examples:
- Banks: JPMorgan, Goldman Sachs
- Brokers: Marex, IBKR, Phillip Nova
- Market Makers: Optiver, Flow Traders, Jane Street, Citadel Securities



Buy-side Participants:
- End-users of financial services
- Own or manage assets

Examples:
- Asset Managers: BlackRock, Schroders
- Sovereign Wealth Funds: GIC
- Hedge Funds: Millennium Capital, Point72, Citadel
- Proprietary Trading Firms: Jane Street, XTX, Tower Research, Optiver, Flow Traders

What is Quantitative Finance?

Simple timeline of the development of Quant Finance

Advent of Modern Finance	The Rise and Rampage of Financial Engineering	Advancement of systematic trading post crisis

1900: Bachelier's Théorie de la Spéculation

1950 – Markowitz's Modern Portfolio Theory

1960s – CAPM and Efficient Market Hypothesis

1973 –
Black-Scholes-Merton Model
Chicago Board Option Exchange founded

1980s: Derivatives Boom

1990s: JPMorgan formalized Value-at-Risk (VaR) and introduced RiskMetrics Framework

1994: JPMorgan invented Credit Default Swap

2000: Gaussian Copula Model developed, empowered credit products

2008: Global Financial Crisis

2009: Bitcoin went live with the genesis block mined

2010s

- Enhanced regulatory oversight and limit on complex derivatives
- Improved computational capabilities empowered machine learning and data science
- Regulation drove most trades to exchange, improving liquidity
- Neobrokers provide better retail access into global markets, improving liquidity

Present and future

Direct Roles of Quants

Buy-Side

Trades and invests in securities and derivatives for themselves or on behalf of end-investors
E.g. Asset Managers (BlackRock), HFTs (Jane Street, Optiver), Hedge Funds (WorldQuant, Bridgewater Associates)

Quantitative Researcher/ Strategist	Execution Quants/ Quant Traders	Portfolio Quants
Alpha Generation	Best Execution using Algos	Optimize portfolio risk and return

Sell-Side

Provides financial services to the buyside, including over-the-counter products (structured products), access to listed exchanges, clearing and custody services
E.g. Banks (JPMorgan), Brokers (Marex, Interactive Brokers)

Desk Quants	Structurers	Validation Quants
Front Office Pricing Models	Product Development	Model Validation

Quantitative Risk Quants

Buy-side:
- Manage Firm level risks, across portfolios

Sell-side:
- Manage Firm level risks, across desks
- Ensures that firm comply with risk limits set by regulators

Quantitative Developers

Trading Architecture, In-house risk and trading systems and platform, data architecture etc

Key Skills and Knowledge of a Quant

Level 0: Foundational Knowledge

- Probability Theory
- Statistics
- Programming (Python)
- Basic Finance

Level 1: Functional Knowledge

- Stochastic Calculus
- Financial Econometrics
- Machine Learning and AI
- Numerical Methods
- Derivatives Pricing and Valuation

Level 2: Specialist Knowledge

Front Office	Risk	Technology
Trading Strategies	Market Risk	Low-level Programming (C++)
Risk + Portfolio Management	Credit Risk	Data Engineering
Quantitative Research	Stress-Testing	Software Engineering
Market Microstructure	Regulatory Framework	Trading Infrastructure
Asset-Specific Knowledge		

Thank you!