Quant Funds

What Are They?

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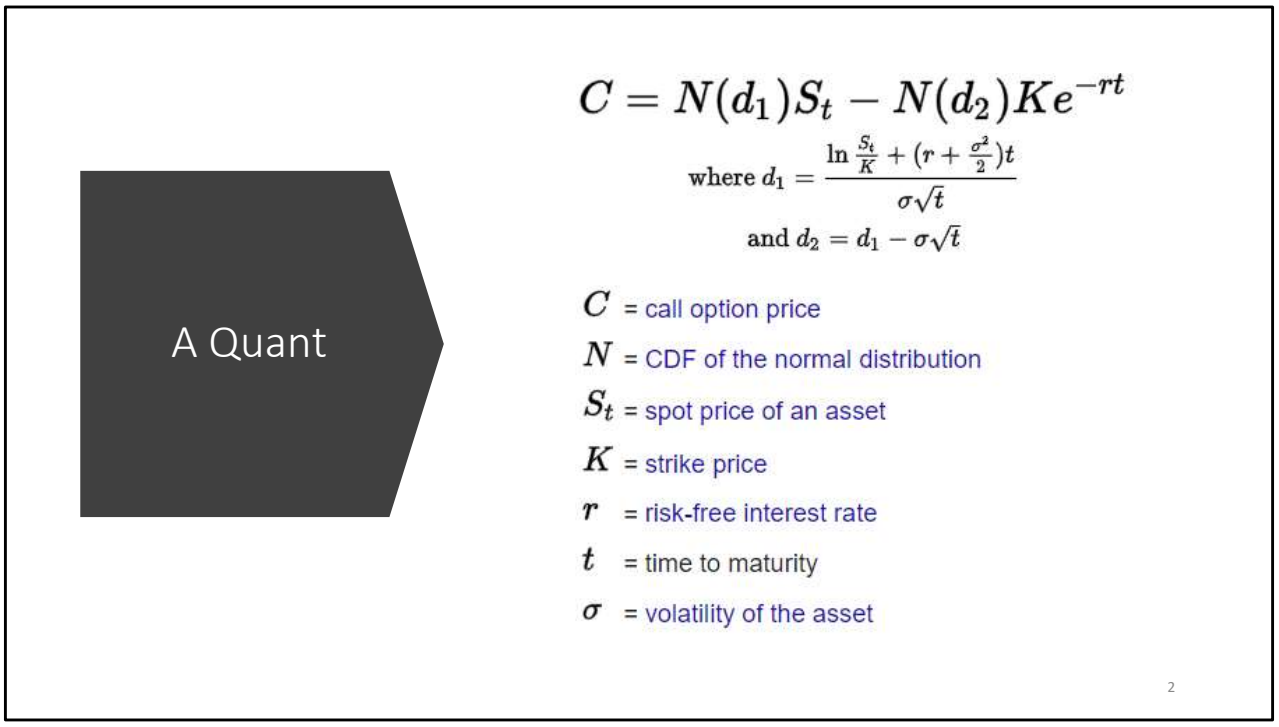
In Al's Investment Club agenda, he titled my presentation as "Fast Money Quants". And that they are investors and funds that use complex algorithms to generate trades. That is, a quantitative approach to investing and portfolio management. Forum members or any investor or their financial advisors have considered financial and other economic data in making buy and sell decisions. So this type of data use is not new; it just can differ based on the selection and amount of data itself along with the relationship between the various select data. Here is one of the financial data relationships we can discuss.
Let's take a look.



Here is my attempt to draw a quick picture of Quant

Quant Funds

- Quant Funds Defined
- How Funds Invest
- Practical For the Individual Investor?
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Quant Funds are a sort of quasi-active, quasi-passive investment where the fund manager is in charge of the eventual investment decisions, but their actions are guided. Particularly, quant funds support the creation of portfolios based on precise risk and return. Quant funds have improved the trading, risk management, and portfolio management processes by enhancing efficiency, accuracy, and compliance.

Quant funds, in general, dominate the developed market today. The top five hedge funds in the world are quant funds.

In 2022 while the S&P 500 is down 15.5% year to date through Nov. 25, hedge funds as a whole have outperformed. Year to date through Nov. 25, the Barclay Hedge Fund Index, which tracks the net returns of 3,040 funds, is only down 9.6%.

This outperformance during a bear market explains why some millionaires and high-net-worth investors choose to put their money in hedge funds despite the exorbitant fees: an ability to deliver uncorrelated, positive expected returns with lower volatility, regardless of how the market is moving.

Here's my outline:

Quant Funds Defined

- Basic Definition
  - An investment fund whose securities are chosen based on numerical data compiled through quantitative analysis. These funds are considered non-traditional and passive.
  - Built with customized models using software programs to determine investments
- Range of Investing Covered
  - Used to price and trade securities
  - Employed primarily by investment banks and hedge funds, but sometimes also by commercial banks, insurance companies, and management consultancies
- Who or What Use Quant Funds
  - Individual and institutional investors
  - Hedge fund managers

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Slide 4: Basic Definition:

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Slide 4: Range of Investing: Complex models are used that allow financial firms to price and trade securities. The models that consist of mathematical algorithms are employed primarily by investment banks and hedge funds, but sometimes also by commercial banks, insurance companies, and management consultancies.

“Quants”, who develop the complex algorithms, work directly with traders, providing them with pricing or trading tools, and are often referred to as "front-office" quants. In the "back office," quants validate the models, conduct research, and create new trading strategies. For banks and insurance companies, the work is focused more on risk management rather than trading strategies.

The high demand for quant expertise is driven by multiple trends:

- The rapid growth of hedge funds and automated trading systems
- The increasing complexity of both liquid and illiquid securities
- The need to give traders, accountants and sales reps access to pricing and risk models
- The ongoing search for market-neutral investment strategies. Attachment 6

Slide 4: Who or What Use Quant Funds?

Quant trading is widely used at individual and institutional levels for high frequency, algorithmic, arbitrage, and automated trading.

Just like in "The Wizard of Oz," someone is behind the curtain driving the process. As with any model, it's only as good as the human who develops the program. Most firms running quant models combine the skills of investment analysts, statisticians, and the programmers who code the process into the computers. Due to the complex nature of the mathematical and statistical models, it's common to see credentials like graduate degrees and doctorates in finance, economics, math, and engineering. [Attachment 2]

Hedge fund managers embrace the methodology. Advances in computing technology advanced the field, such that complex algorithms could be calculated in the blink of an eye, thus creating automated trading strategies. The field flourished during the dotcom boom and bust.

Quant strategies stumbled in the Great Recession as they failed to account for the impact mortgage-backed securities had on the market and economy as a whole. However, quant strategies remain in use today and have gained notable attention for their role in high-frequency trading (HFT) that relies on math to make trading decisions.

How Quant Funds Invest

- Tools
  - Quantitative Strategies
  - Off-The-Shelf Plug-and-Play
  - Black-Scholes option pricing formula
- Strategies
  - Advantages
  - Disadvantages/Risks

$$C = N(d_1)S_t - N(d_2)Ke^{-rt}$$

$$\text{where } d_1 = \frac{\ln\frac{S_t}{K} + (r + \frac{\sigma^2}{2})t}{\sigma\sqrt{t}}$$

$$\text{and } d_2 = d_1 - \sigma\sqrt{t}$$

C = call option price
N = CDF of the normal distribution
S_t = spot price of an asset
K = strike price
r = risk-free interest rate
t = time to maturity
σ = volatility of the asset

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Tools

a. **Tools:** The information generated by these computer models helps investors analyze investment opportunities and develop what they believe will be a successful trading strategy. Typically, this trading strategy will include very specific information about entry and exit points, the expected risk of the trade, and the expected return. [Attachment 3]

Quantitative investment strategies have evolved into complex tools with the advent of modern computers but the strategies' roots go back over 80 years. They are typically run by highly educated teams and use proprietary models to increase their ability to beat the market. There are even off-the-shelf programs that are plug-and-play for those seeking simplicity. Quant models always work well when backtested, but their actual applications and success rate are debatable. While they seem to work well in bull markets, when markets go haywire, quant strategies are subjected to the same risks as any other strategy.

The use of both quantitative finance and calculus led to many other common tools, including one of the most famous, the Black-Scholes option pricing formula, which not only helps investors price options and develop strategies but helps keep the markets in check with liquidity.

Here's the formula:(Click Enter)

The Black–Scholes or Black–Scholes–Merton model is a mathematical model for the dynamics of a financial market containing derivative investment instruments.

There are as many models out there as those who develop them, and all claim to be the best. One of the best-selling points of a quant investment strategy is that the model, and ultimately the computer, makes the actual buy/sell decision, not a human. This tends to remove any emotional response that a person may experience when buying or selling investments. [Attachment 2]

Quant funds typically run on a lower-cost basis because they don't need as many traditional analysts and portfolio managers to run them. However, their trading costs tend to be higher than traditional funds, due to a higher turnover of securities. Their offerings are also generally more complex than standard funds and it is common for some of them to target high-net-worth investors or have high fund entrance requirements.

Successful quant funds keep a close eye on risk control due to the nature of their models. Most strategies start with a universe or benchmark and use sector and industry weightings in their models. This allows the funds to control the diversification to a certain extent without compromising the model itself. [Attachment 1]

Strategies

Advantages of Quant Strategies
While the overall success rate is debatable, the reason some quant strategies work is that they are based on discipline. If the model is right, the discipline keeps the strategy working with lightning-speed computers to exploit inefficiencies in the markets based on quantitative data. The models themselves can be based on as little as a few ratios like P/E, debt-to-equity, and earnings growth, or use thousands of inputs working together at the same time.
Successful strategies can pick up on trends in their early stages as the computers constantly run scenarios to locate inefficiencies before others do. The models are capable of analyzing a large group of investments simultaneously, where the traditional analyst may be looking at only a few at a time. The screening process can rate the universe by grade levels like 1-5 or A-F. This makes the actual trading process very straightforward by investing in the highly-rated investments and selling the low-rated ones.

Disadvantages/Risks of Quant Strategies
There are reasons why so many investors do not fully embrace the concept of letting a black box run their investments. For all the successful quant funds out there, just as many seem to be unsuccessful. Unfortunately, for the quants' reputation, when they fail, they fail big time.
Long-Term Capital Management (LTCM) was one of the most famous quant hedge funds, as it was run by some of the most respected academic leaders and two Nobel Memorial Prize-winning economists, Myron S. Scholes and Robert C. Merton. During the 1990s, their team generated above-average returns and attracted capital from all types of investors. They were famous for not only exploiting inefficiencies but using easy access to capital to create enormous leveraged bets on market directions.

The disciplined nature of their strategy actually created the weakness that led to their collapse. Long-Term Capital Management was liquidated and dissolved in early 2000. Its models did not include the possibility that the Russian government could default on some of its own debt. This one event triggered events, and a chain reaction magnified by leverage created havoc. LTCM was so heavily involved with other investment operations that its collapse affected the world markets, triggering dramatic events.
In the long run, the Federal Reserve stepped in to help, and other banks and investment funds supported LTCM to prevent any further damage. This is one of the reasons quant funds can fail, as they are based on historical events that may not include future events.

Quant funds can also become overwhelmed when the economy and markets are experiencing greater-than-average volatility. The buy and sell signals can come so quickly that high turnover can create high commissions and taxable events.

Practical for the Individual Investor?

- Access: Limited, But Improving
  - Systems for accessing market data, like the Bloomberg data terminal, having the necessary technical and quantitative analysis tools available that fit into their stream of trading (like Bollinger bands, charts)
  - Computer systems with programming language compatibility: Perl, C++, Java, Python
  - Historical and/or real-time data availability, to backtest their identified strategies
  - Automated access to brokerage/trading accounts usually through Direct Market Access
  - Information Access through Morningstar

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Practical For the Individual Investor?

a. **Access is Limited, But Improving: [**Quant strategy developers implement their own algorithms on real-time data containing prices and quotes. They need to be familiar with any associated systems that provide data feeds and content. Quant traders typically have access to these tools:

- Systems for accessing market data, like the Bloomberg data terminal, having the necessary technical and quantitative analysis tools available that fit into their stream of trading (like Bollinger bands, charts, etc.)
- Computer systems with programming language compatibility: Perl, C++, Java, Python are the common ones among the trader community
- Historical and/or real-time data availability, to backtest their identified strategies

- Automated access to brokerage/trading accounts usually through Direct Market Access.

Practical For the Individual Investor?

Below is a list of six quantitative strategies from Morningstar:

Quantitative Funds with Morningstar Analyst Ratings

Fund	Oldest Share Class Ticker	Category	Analyst Rating
BlackRock Advantage Small Cap Growth	PSGIX	Small Growth	Bronze
BlackRock Advantage Large Cap Growth	BMCAX	Large Growth	Bronze
BlackRock Advantage Large Cap Value	MALVX	Large Value	Bronze
LSV Small Cap Value Investor	LSVQX	Small Value	Silver
LSV Value Equity Investor	LSVEX	Large Value	Silver
T. Rowe Price QM US Small-Cap Gr Eq	PRDSX	Small Growth	Gold

Source: Morningstar, Ratings as of Sept. 26, 2019

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Information Access through Morningstar: [Quant funds are available in virtually any investing style (large-cap growth, small-cap value, and so on).

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[Artificial intelligence (AI), machine learning and big data are hardly new to the world of stock picking. But, traditionally, they've been available only to institutional investors with deep pockets.

In addition for the Individual, Danelfin is trying to change all that. The financial technology firm's AI-driven analytics platform aims to level the playing field, giving regular folks access to institutional-level technology. The platform, which offers both free and premium plans, uses artificial intelligence to analyze more than 900 fundamental, technical and sentiment data points per day for 1,000 U.S.-listed shares and 600 stocks listed in Europe.

After churning through 10,000 daily indicators, Danelfin's algos produce a series of scores. The AI Score, which ranges from 1 to 10, indicates a stock's probability of beating the market over the next 30 to 90 trading sessions. Danelfin also assesses stocks' volatility and their potential for nasty drawdowns. Stocks with superior Low Risk Scores should help tactical investors and traders sleep better at night.

Practical for the Individual Investor?

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If nothing else, Danelfin's system has certainly earned its keep in 2022. The fintech's top 10 stock picks generated a price return of 10.8% from Oct. 4 through Dec. 13. That handily beat the S&P 500, which gained 6% over the same span.

Practical for the Individual Investor?

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  - Information Access through Morningstar
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- Performance: "Iffy"

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Quant Performance

Quant funds have attracted a considerable amount of interest and investment because of the returns they have generated over the years. However, according to a report by Institutional Investor, they've been underperforming since 2016. In the five years leading up to 2021, the report said the MSCI World index and the equity quant index generated annualized returns of 11.6% and 0.88%, respectively.

[Dec 30 (Reuters) - Global hedge funds are set to register their worst returns in 14 years in 2022 after aggressive U.S. interest rate rises hit asset prices hard, however, their declines are overall smaller than the slump seen in equity and bond markets this year. Attachment 18]

Here's a look at five of the top hedge funds in 2022:

Top Five Hedge Funds

In terms of assets under management and historical performance

- **Scion Asset Management LLC:** Scion's Between November 2000 and June 2008. After fees and expenses, Scion's investors pocketed a 489% return.
- **Citadel LLC**: Through the end of October 2022, Citadel's flagship fund Citadel Wellington had risen a remarkable 30.7% year to date
- **Bridgewater Associates:** In the first half of 2022, its flagship fund Pure Alpha II rose 32% as the wider stock market was crashing.
- **Renaissance Technologies LLC**: Founded in 1982 by James Simons with a highly quantitative focus. Consistent with Simons' background as an MIT- and University of California—Berkeley-educated mathematician and his stint with the National Security Agency as a codebreaker, Renaissance relies heavily on quantitative trading, sifting through large amounts of market data to capitalize on trends and exploit inefficiencies. Unfortunately, Medallion has long been closed to outsiders, and it is currently limited to current and former Renaissance partners.
- **Elliott Investment Management**: The firm recently notified its investor that currently its primary goal considering global conditions was to "preserve capital" by safeguarding the gains they made in the prior years.

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Scion Asset Management LLC: Scion's website is extremely bare-bones – there's a home page with no information and a contact page with just their email address. Between November 2000 and June 2008, after fees and expenses, Scion's investors pocketed a 489% return.

Citadel LLC: Through the end of October 2022, Citadel's flagship fund Citadel Wellington had risen a remarkable 30.7% year to date

Bridgewater Associates: With about $150 billion in AUM, Bridgewater is one of the largest hedge funds in the world and still manages to put up incredible returns: In the first half of 2022, its flagship fund Pure Alpha II rose 32% as the wider stock market was crashing.

Renaissance Technologies LLC: Founded in 1982 by James Simons with a highly quantitative focus. Consistent with Simons' background as an MIT- and University of California—Berkeley-educated mathematician and his stint with the National Security Agency as a codebreaker, Renaissance relies heavily on quantitative trading, sifting through large amounts of market data to capitalize on trends and exploit inefficiencies. Unfortunately, Medallion has long been closed to outsiders, and it is currently limited to current and former Renaissance partners.

Elliott Investment Management: founded by Paul Singer in 1977 and has since grown to around $55.7 billion in assets under management. The firm recently notified its investor that currently its primary goal considering global conditions was to "preserve capital" by safeguarding the gains they made in the prior years.

Key Take Aways

- A quant fund makes investment decisions based on the use of advanced mathematical models and quantitative analysis.
- Managers utilize algorithms and custom-built computer models to pick their investments.
- Investors are turning to and sticking with quantitative analysis within funds because of the rising availability of market data.
- Although quant funds utilize state-of-the-art technology, the use of quantitative analysis isn't new.

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Quantitative investment strategies have evolved from back-office black boxes to mainstream investment tools. They are designed to utilize the best minds in the business and the fastest computers to both exploit inefficiencies and use leverage to make market bets. They can be very successful if the models have included all the right inputs and are nimble enough to predict abnormal market events.

On the flip side, while quant funds are rigorously backtested until they work, their weakness is that they rely on historical data for their success. While quant-style investing has its place in the market, it's important to be aware of its shortcomings and risks. To be consistent with diversification strategies, it's a good idea to treat quant strategies as an investing style and combine it with traditional strategies to achieve proper diversification.

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