Chapter 9: Quantitative Equity Investing

Reading Notes by Tinghao Li for the book: Efficiently Inefficient

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1 Intro

Quantitative equity investing: model-driven equity investing. Quants codify their trading rules in computer systems and execute orders with algorithmic trading overseen by humans.

Disadvantages:

- Trading rule cannot be as tailored to each specific situation and it cannot be based on "soft" information.

Advantages:

- it can be applied to a broad set of stocks, yielding significant diversification
- the quant's modeling rigor may largely overcome the behavioral biases
- the quant's trading principles can be backtested using historical data

	Fundamental Quantitative Investing	Statistical Arbitrage	High-Frequency Trading
Based on	Economics, finance, statistics	Arbitrage relations, statistics	Statistics, engineering, information processing
Turnover	Days to months	Hours to days	Instances to hours
Capacity	Higher	In between	Lower
Who determines trade	Strategy	Strategy, but some orders may not be filled	Market
Backtest	Reliable	Transaction-cost estimate essential	Heisenberg uncertainty principle of finance

Figure 1: Three types of quant investing

The three types of investing differs in the way trades are determined. Fundamental quants usually determine the trades ex ante, stat arb quants decide the trades gradually while HFTs let the market determine the trades, which definitely the hardest one to backtesting.

2 Fundamental Quantitative Investing

2.1 Value Investing

Value investing focuses on: fundamental value vs current market value, e.g., a stock's book to market (BM), earnings to price, dividends to price, cash flows to price, etc. Value investing buys value stocks and sells those with the opposite characteristics.

2.2 Stock Momentum

Momentum investing: buying recent winners and short-selling recent losers. The intuitions are 1) good news today leads to a price increase today, but if underreacts, then the price must continue to go up. 2) If the prices have been going up for a while and investors start to jump on the bandwagon, this further adds to the momentum.
Momentum as a quant measure of equity catalysts: equity investors are often looking for stocks that have value plus a catalyst, meaning cheap stocks where the market is about to recognize their potential. Such a catalyst can make the value bet pay off quickly as the stock price rises.

2.3 Quality Investing

High-quality stocks can be defined as stocks that are profitable, growing, stable and well managed. Quality investing is to buy high-quality stocks. In addition, quant value and quality factors tend to be negatively correlated. Therefore,

- Combining value and quality factors: quality at a reasonable price. Better than each component alone
- Combining quality, value and momentum: buys upward-trending stocks that are cheap relative to their quality and shorts falling stocks that are expensive.

2.4 Betting against Beta and Low-Risk Investing

We found that safer stocks have higher returns compared to what the capital asset pricing model (CAPM) says they should. In other words, the safer stocks have positive alpha. This factor is called a "betting against beta" (BAB). One reason this works is because of the leverage constraints or for the fear of taking leverage. Thus, investors simply pick risky stocks and pushes up the prices resulting diminished returns.

Low risk investing

- Betting against beta
- Buying safe stocks without shorting risky ones Buying stocks with low total volatility
- Buying stocks with low idiosyncratic volatility Buying stocks with low earnings volatility Buying high-quality stocks
- Constructing the minimum-variance portfolio
- Low-risk investing has historically worked both for investing across and within industries.

2.5 Quant Portfolio Construction

How to manage the risk in a quant portfolio?

- Diversification eliminates most of the idiosyncratic risk
- Market neutral quant portfolio eliminates the overall stock market risk
- Industry-neutral portfolio eliminates the industry risk (e.g., BAB within an industry) and can pick better stocks.

Then no risk left? NO. The risks that are left are the risks associated with the factors that the quant wants to bet on. Things to consider when constructing a quant portfolio are **expected return**, **volatility**, **exposure**, **rebalancing**, **transaction costs**, etc.

3 Statistical Arbitrage

Statistical arbitrage (stat arb) are more based on arbitrage relations and statistical relations, less based on an analysis of economic fundamentals. It could happen in **Twin Stocks** or **Multiple Share Classes** and other scenarios.

The trading strategies are:

- **Pairs trading**: stat arb look for pairs of highly correlated stocks, identify situations when their prices move apart, and bet on a convergence by buying the stock that lags behind and shorting the one rising more. It can be applied to a larger universe of stocks. How to measure the **lag** resulted to different statistical models.
- **Residual reversal strategy**: bet that the residual between the stock's actual return and its expected return will revert.
- **Index arbitrage and closed-end fund arbitrage**: arbitrage the difference between stock index futures and the prices of the underlying stocks, the discrepancies between futures and an ETF, the difference between the ETF and its constituents, and the difference between a closed-end mutual fund and its underlying stock holdings.

4 High Frequency Trading

HFTs some time provide liquidity while demand liquidity as well. The former we call market makers and is the dominate parts of HFTs.

- Market Making.
  - Market makers charge a price for the liquidity service. More sellers than buyers $\rightarrow$ market makers buy the excess supply $\rightarrow$ market makers hold the securities in inventory $\rightarrow$ natural buyers arrive $\rightarrow$ market makers unload the inventory. Thus the profits come from the bid-ask spread of the market impact (buying low and selling high as the price bounces around).
  - Market makers face the risk of losing money as well. When the fundamental value declines (they are trading against informed traders, as well), market makers may buy low and sell even lower.
- HF Stat arb strategies
- Some HFTs seek to hit "stale" limit orders, including the limit orders submitted by other HFTs. Being "faster" is very important.
- Some HFTs seek to exploit large orders that are broken up into smaller trades and traded over hours or days