Machine Learning for Trading
Financial Investing

Technical Analysis

- Value (Simple): Price movements, volume (patterns/charts)
- Data: Chart analysis – looks for pattern.
- Shorter term: Day, minutes, even seconds.
- Trend line, price patterns.

Fundamental Analysis

- Value calculated using various economic factors:
  - looks into aspects in company to estimate its value
- Data: Economic reports, news, industry statistics
- Situations:
  - Looks for situation were price is below it value.
  - Long term trader
- Time: Longer term, Days, weeks, months
- Expectations, currents.

Technical Analysis

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Fundamental vs. Technical
### Characteristics Technical Analysis

**What it is**
- Forecasting direction of prices by looking at primarily
  - **historical price** and **volume**.
- Computer statistics called **indicators**.
- Indicators are heuristics
- Signals

**Why it may work**
- There is information in price
- Heuristics work.

### Technical Analysis Indicators

**Indicators:**
- Lets you see if it is a buy and sell.

**Example:** price going outside or inside Bollinger bands can be an indicator of buy or sell.

### Criticism of Technical Analysis

**Not for investment** (recall investment is longer term)

**Based on Heuristics**
- Artificial Intelligent, heuristics and work, and they work frequently.

**Does not consider the value of the company**
- Only trends or movement in price (volume)

### Fundamental or Technical?

(T) For Technical, (F) for Fundamental
- Moving Average of price
- % Change in volume
- Price/Earnings Ratio
- Intrinsic Value
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When is Technical Analysis Effective (in practice).

- Individual indicators weak
- **Combination** is stronger
- Look for contrast
  - One stock vs. another.
  - Stock vs. Market)
- Shorter time periods.

When does Technical Analysis Have Value?

- **Fundamental** – Humans
- **Technical** – Computers – Fast.

Indicator: Momentum

- **Momentum** \[t\] = \[price[t]/price[t-n]-1\].
- \(n\) is the window n-day 5, 10.
- **Bull** – trend is up.
  - Bull thrusts horns up into the air
- **Bear** – trend is down
  - Bear swipes it paws downward.
Indicator: Simple Moving Average

- **Length parameter**
- **Crossover** for buy and sell
- Red arrow Sell,
- Green arrow Buy

SMA: Proxy of Underlying Value

- \( \text{SMA}[t] = \frac{\text{price}[t]}{\text{price}[t-n:t].\text{mean()}} \)
- Idea:
  - IF above, Price will come back down to average. **Sell**
  - IF below, price come up to average **Buy**.

Revisit Bollinger Bands.

- **Bollinger Bands**
  - **Bollinger Bands BB**
  - **A few good indicators**
  - **How to use look for cross from outside to inside**
All right suppose you like that whole idea that I told you about Bollinger bands. Let's see now how well you might use it. So I've identified four different times here where the actual price crosses an upper or lower Bollinger band.

I want you to look at each one of those, and identify here whether it's a buy signal, a sell signal or no signal at all.

Let's take a look at this first one. So we went from outside the upper band and crossed down inside it. That is a sell signal because we've gone very far from the moving average, and we've validated now that we're moving back towards the moving average so that's a sell.

Here, we've gone from inside to outside, and that is never a signal. It does indicate, of course, a significant excursion from the moving average, but we're looking for the validation that it comes back inside, so this is not a signal at all.

Here however we've come back through that bottom band, and that is a buy signal.

Finally for this last one, number four, we've gone outside the lower band and we've transitioned up inside it, that is a buy signal. So that's Bollinger bands and how you might use them.

Normalization

- Normed = (values - mean) / values.std()
- Z-score