Financial Feature Engineering- How to Research Alpha Factors

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What Can feature engineering do?

- Algorithmic trading strategies are driven by signals.
- The signals that aim to produce such uncorrelated returns are also called alpha factors.
- Feature engineering is a key ingredient for successful predictions.

What to learn in this chapter:

- This chapter provides an overview as a starting point for your own search for alpha factors.It also presents key tools that facilitate computing and testing alpha factors.
- It involves:
  - How the NumPy, pandas, and TA-Lib libraries facilitate the manipulation of data
  - Present popular smoothing techniques like the wavelets and the Kalman filter, which help reduce noise in data.
  - Preview how you can use the trading simulator Zipline to evaluate the prediction.
  - Discuss key alpha factor metrics like the information coefficient and factor turnover.

Alpha factors in practice – from data to signals Alpha factors

- Transformations of raw data that aim to predict asset price movements.
- A factor may combine one or several inputs,but outputs a single value for each asset when the strategy evaluates the factor to obtain a signal.
- Focus on how to leverage ML to learn new factors from data and effectively aggregate the signals from multiple alpha factors.

Alpha factor

- Alpha factors result from transforming raw market, fundamental, or alternative data using simple arithmetic
- Absolute or relative changes of a variable over time,ratios between data series, or aggregations over a time window.
- Metrics that have emerged from the technical analysis of price and volume patterns.

Alpha factor

- ML has proven quite effective in learning to extract signals directly from a more diverse and much larger set of input data without using prescribed formulas.
- Alpha factors remain useful inputs for an ML model that combines their information content in a more optimal way than manually set rules.
- Algorithmic trading strategies today leverage a large number of signals.

Building on decades of factor

- In this section, we will review a few key factor categories prominent in financial research and trading applications and explain their economic rationale
- Present metrics typically used to capture these drivers of returns

Momentum and sentiment – the trend is your friend

- Momentum investing is among the most well-established factor strategies.
- Momentum factors are designed to go long on assets that have performed well, while going short on assets with poor performance over a certain period.
- Optimizing the predictive power requires creative feature engineering in the form of effective data transformations.

Designing and executing an ML-driven strategy

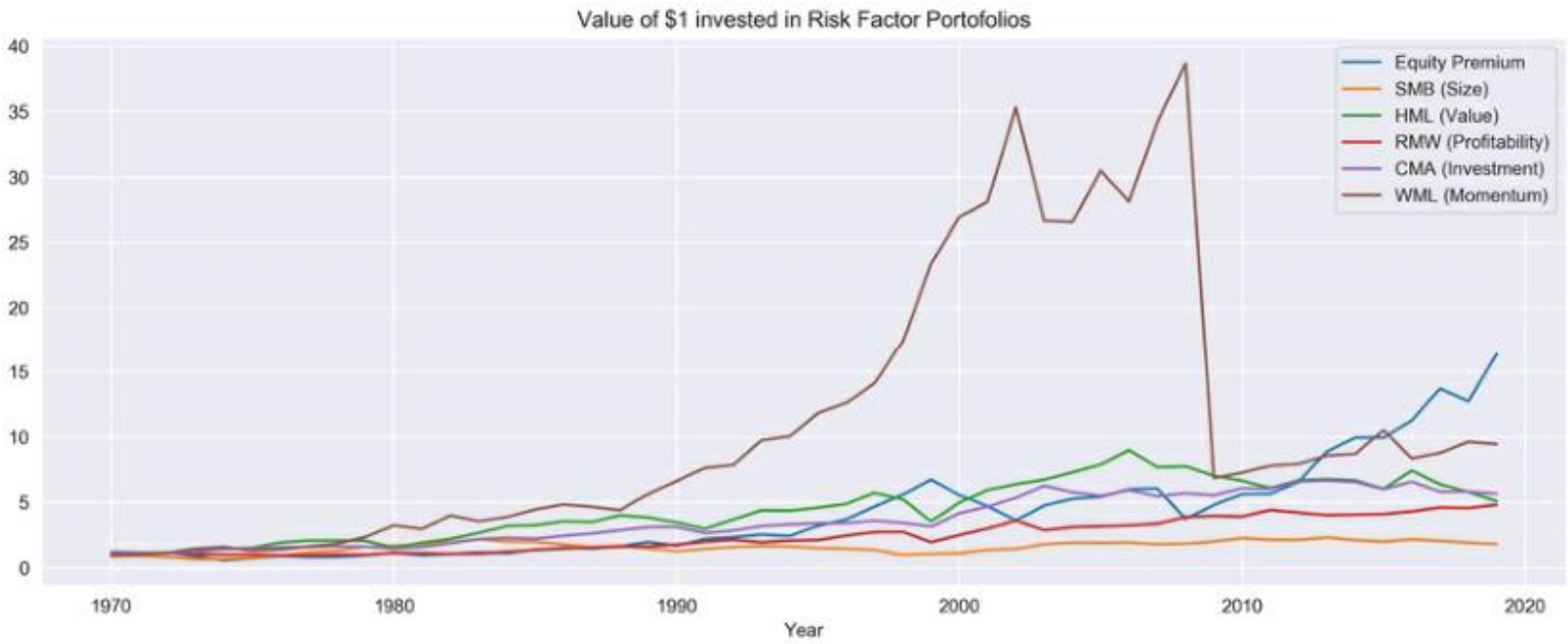

Figure 4.2: Returns on various risk factors

Why might momentum and sentiment drive excess returns?

- investor behavior, persistent supply and demand imbalances, a positive feedback loop between risk assets and the economy, or the market microstructure.
  - The biases of underreaction and over-reaction to market news
  - Economic growth boosts equities, and the resulting wealth effect feeds back into the economy through higher spending, again fueling growth.
  - Persistent demand-supply imbalances due to market frictions
  - Investors implement strategies that mimic their biases

How to measure momentum and sentiment

- Momentum factors are typically derived from changes in price time series by identifying trends and patterns.
  - RSI, Price momentum, Price acceleration, Percent off 52-week high, Earnings estimates count, 6-month change in target price……