Factor Model

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Factor Models in Practice

- In investment management, a factor (or factor loading) is simply any variable that can be used to predict returns.
  - Every number in the financial statement of a company can be a (cross-sectional) factor.
    - E.g. Earnings, Book/Market ratio, Dividend Yield.
  - Every macroeconomic variable can be a (time-series) factor for a stock.
    - E.g. HML return, SML return, Gold return*

What are Factors

- In academic finance, we reserve the name "factors" for those indicators that last a long time, and come with well-defined risks.
  - E.g. what are the risks of market returns, or HML?
- Because many investors are unwilling to bear those risks, the factor returns are not quickly arbitraged away.

Computing Time-Series Factors

- For each stock, just take as long a returns series as we like, and regress it against the factor(s) such as HML returns.
  - Of course, we need to lag the HML return by one period in order to be predictive, as in Assignment 9.

Computing Cross-Sectional Factors

- Take one snapshot in time (e.g. yesterday's close), and regress the 1-day return of all the stocks.
- Sparse data/estimation problem: factor loadings that can vary greatly and unrealistically from day to day.
- Can aggregate many days of data for all stocks, thus "tie" regression coefficients of those days together.

Some Example Factors for Stocks

- “Variance Risk Premium”: Difference Between Implied Volatility and Historical Volatility.
  - High VRP predicts positive returns.
- “Implied Skew”: Skew of returns implied by difference between OTM call and put option prices.
  - High Implied Skew predicts positive returns.

Some Examples Factors

- “Implied Kurtosis”: Kurtosis of returns implied by difference between OTM call + put option prices and ATM call + put option prices.
  - High Implied Kurtosis also predicts positive returns.
- In summary: Expected risks bring expected positive returns!
- Short interest (SI vs DTC)
- Liquidity
  - Low liquidity (volume) predicts positive returns.

Statistical Factors

- Principal component analysis

⇒eigenvectors of covariance matrix of returns

⇒cross-sectional statistical factors loadings.

- Regress future returns against statistical factors loadings

⇒use the regression coefficients (factors) for predictive model.

⇒An adaptive, long-short portfolio trading model, suitable at many frequencies!

Thank you for your hard work!

- Please feel free to email me after the course is over.