PROJECT DISCUSSION

Keith Law

IMPORTANT PERFORMANCE MEASURES

- Cumulative return (CR): $\frac{P_T}{P_0} - 1$

- Annualized (geometric) return (AR): $\left(\frac{P_T}{P_0}\right)^{\frac{365}{T\,in\,days}} - 1$

- Annualized Volatility (Vol): $\sigma_{freq} \times ann.\,factor$ where $ann.\,factor = 16$ (daily), $\sqrt{52}$ for weekly

- Annualized Sharpe ratio (ASR): $\frac{AR - r_f}{Vol}$

- Sortino ratio: $\frac{AR - r_f}{Vol^-}$ where Vol^- is the standard deviation of negative returns

- Drawdown: $\frac{P_t}{max(P_{t,t-1,...})} - 1$

- Max drawdown (MD): $\min(Drawdown)$

- Calmar ratio: $\frac{AR}{MD}$

- Value-at-Risk (VaR) at $(1 - \alpha)$: the α percentile of returns

- Conditional VaR (CVaR) or Expected Shortfall (ES): $E[r_t | r_t < VaR]$

PRODUCT/STRATEGY DESIGN

- Strategy: "Quantitative" and "Algorithmic" (rule-based, non-discretionary)

- Category: Trend-following / Factor model / Asset allocation (smart beta) / Statistical arbitrage

- Absolute return or relative return?

- Long-only / Long-short?

- Methodology / theme: The motivation and hypothesis behind

- Innovation / originality: Identify what is available in the market and how you fill the gap. Design a cool product name

- Construction: How to test / justify the hypothesis, what are the parameters and how you estimate it (Bayesian or rolling window)

- Techniques: Efficient frontier, factor models, smart beta scheme, multivariate volatility modeling, Bayesian techniques etc. and any other knowledge (machine learning models…)

- Rebalance: Regular rebalancing (at what frequency) or irregular rebalancing (trigger)

- Risk off trigger: Target volatility or other signal, drawdown control, how to convert into cash (sequential or full mechanism). Max cash % allowed?

- Use of derivatives for hedging?

- Other considerations: Liquidity filter (20d daily turnover at least USD 5million), transaction cost (broker fee + stamp duty + exchange fee), % of active trading days before rebalancing etc.

PRODUCT/STRATEGY DESIGN

- Backtest:
  - Start with initial NAV of USD 10 million
  - Purchasing and selling needs to account for transaction costs (and liquidity filters etc.)
  - Monitor the change of NAV in daily basis, and any risk-off trigger
  - Make sure NO use of forward information
  - Performance and drawdown
  - Performance analytics: Cumulative return, annualized geometric return, annualized standard deviation, annualized Sharpe ratio, Maximum drawdown, Calmar ratio etc.

- Simple Example:
  - Market: SPX
  - Methodology: Some value factors XXX..
  - Long-only, stock selection, relative return
  - Weighting scheme: A smart beta scheme XXX…
  - Rebalancing: Monthly
  - Aim at 0% cash, no derivatives used
  - Liquidity filter: At least USD 10 million daily turnover
  - Transaction cost: Assume 10bps in & out

SPX – example backtest

SPX Value MV Performance
- Cumulative return: 2.9
- Annualized geometric return: 8.4%
- Annualized std. : 21.5%
- Annualized Sharpe ratio: 0.39
- Max drawdown: 66.7%
- Calmar ratio: 0.13

SPX Value EW Performance
- Cumulative return: 3.8
- Annualized geometric return: 9.7%
- Annualized std. : 21.9%
- Annualized Sharpe ratio: 0.44
- Max drawdown: 71.2%
- Calmar ratio: 0.14

SPX Stylish Beta
- Cumulative return: 5.8
- Annualized geometric return: 12.0%
- Annualized std. : 19.1%
- Annualized Sharpe ratio: 0.63
- Max drawdown: 62.7%
- Calmar ratio: 0.19
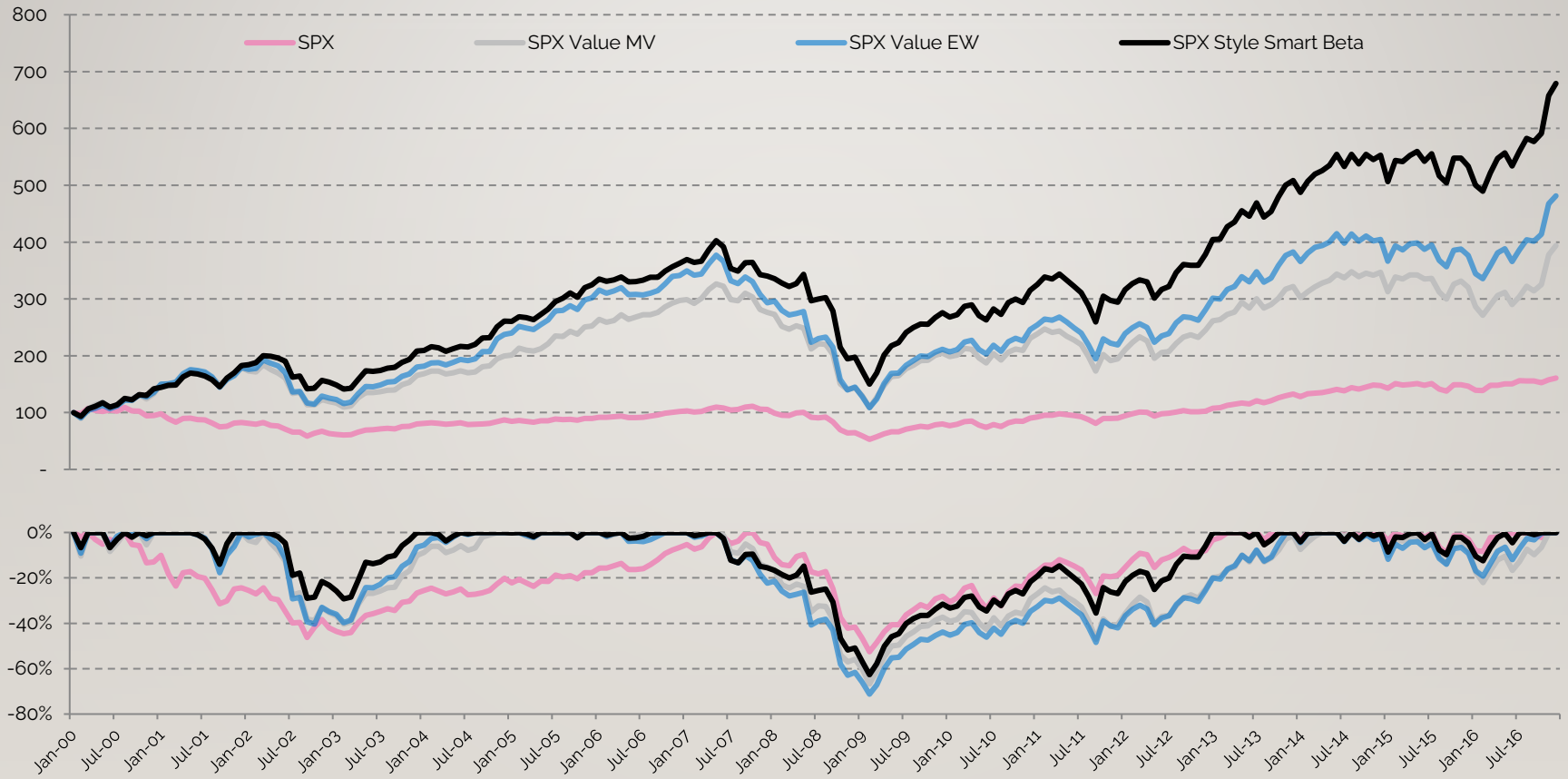
PROJECT REQUIREMENT

➢ You are required to use the techniques learnt from the course to design an algorithmic strategy with proper backtesting

➢ Each group is required to write a report on the methodology and results in less than 1000 words (which exclude all graphs / tables / codes), together with the python codes, Powerpoint (optional)

➢ Codes, written report and presentation need to be 'clear' and 'concise'

➢ Grading will be based on a holistic approach: The effort of the whole team, how much you applied (the techniques you learnt from the course), the accuracy and proficiency of codes, the professional standard of the report and presentation

➢ How much effort you spend on the project will be reflected in your grade

PROJECT REQUIREMENT

➤ Teamwork:

  ➤ Ideally, coding can be designed by modules (or 'Class' and each member can contribute)

  ➤ For example, within the main backtesting which takes general inputs such as prices and constituents, there should be a module on the main strategy which consists of many other functions (classes)

  ➤ The team should have good division of labor. Suggestion: coding (at least 2 persons), writing and presenting the results in a professional report and presentation (1-2 persons)

  ➤ Ensure good and concise English (make sure you proof-read)

  ➤ There will be a **real** peer evaluation in the last class

PROJECT REQUIREMENT

➢ Presentation:

  ➢ Will be held during the last two classes, each group has around 20mins, but no more than 30 mins (including Q&A)

  ➢ Powerpoint is optional, i.e. you may present slides or your project report directly

  ➢ You need to describe the methodology, i.e. how you come up with the idea, and the techniques (as well as the corresponding codes) to tackle the problem

  ➢ Ensure the key results are presented in a clear way through tables / graphs etc.

  ➢ You may also highlight the special effort (you believe that should deserve extra points)

  ➢ **Learn from others: Each team is required to <u>'challenge'</u> the other team by asking a meaningful and challenging question, i.e. STAY FOCUS on other teams' presentation. This will be counted as part of your participation score**