

# Attribution of Fund Returns

MGMT 675: AI-Assisted Financial Analysis



- Mutual fund styles
- Fama-French factors
- Other factors
- Julius workflow

# Styles and Factors

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  - Is it reasonable to compare a small cap fund to a large cap fund?
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- How to determine the fund's style?
  - Holdings are reported quarterly, are just a snapshot at a point in time
  - Can we use returns to infer styles?

# Fama-French Regression and Alpha

$$r_i - r_f = \alpha_i + \beta_{\text{Mkt-RF}} \text{Mkt-RF} + \beta_{\text{SMB}} \text{SMB} + \beta_{\text{HML}} \text{HML} \\ + \beta_{\text{CMA}} \text{CMA} + \beta_{\text{RMW}} \text{RMW} + \varepsilon_i$$

- Coefficients are style exposures
- Seeking alpha:
  - Fama-French pricing model is:

$$\bar{r}_i - r_f = \beta_{\text{Mkt-RF}} \overline{\text{Mkt-RF}} + \beta_{\text{SMB}} \overline{\text{SMB}} + \beta_{\text{HML}} \overline{\text{HML}} + \beta_{\text{CMA}} \overline{\text{CMA}} + \beta_{\text{RMW}} \overline{\text{RMW}}$$

- Fama-French pricing model is equivalent to:  $\alpha_i = 0$
- $\alpha_i > 0$  means outperformance, given style exposures.

## Other style factors

- Past returns:
  - Momentum: return over past 12 months excluding most recent month (high minus low)
  - Long-term reversal: return over past 5 years excluding most recent year (low minus high)
  - Short-term reversal: return over previous month (low minus high)
- Volatility and idiosyncratic volatility
- Liquidity (volume, spreads)
- Betting against beta: return of levered portfolio of low beta stocks minus de-levered portfolio of high beta stocks
- Quality (profitability, growth, safety, payouts)



- French's data library
- AQR's data library

# Julius Workflow

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- Ask user to provide the ticker of a mutual fund
- Provide a list of available factors and ask the user to select from the list (more than one typically)

## Julius prompts

- Get monthly closing prices for the mutual fund using yfinance 0.2.54 and compute returns as percent changes.
- Get RF from French's data library. Convert to decimal.
- Get required factor data from French or AQR. Convert French data to decimals.
- Convert dates to compatible formats and merge the data.
- Compute the excess mutual fund return by subtracting RF.
- Regress the excess mutual fund return on the factors. Report a summary of the regression.

## Plotting the results

- Given the estimated betas, compute the factor contribution to the return each month as  $\text{beta} \times \text{factor return}$ .
- Compute the active return as the difference between the mutual fund excess return and the sum of the factor contributions.
- Compound each factor contribution over time and compound the active return over time.
- Plot the compounded active return and each of the compounded factor contributions in a single figure.