

# Factor Timing with Portfolio Characteristics

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*The Review of Asset Pricing Studies, 2023*

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2024-11-06

# What is portfolio characteristics?

## Example:

- Assuming a L-S portfolio based on **BM factor** is constructed;
- Average MoM: Calculating average stocks momentum;
- High Avg MoM: in the past period, value stocks have performed well and shown an upward trend;

# Research Question

- 1. Can portfolio characteristics of factor portfolios predict stock returns?**
- 2. Will portfolio characteristics improve the predictive performance of portfolio returns?**

# Why doing Factor Timing

## 1. Factor investment being mainstream in portfolio managing:

- Performance of factor portfolios fluctuates over time(Akbas 2016)
- Existing static strategies ignore temporal variability of returns;

## 2. How to capture temporal variability of returns?

- Expanding firm characteristics to **portfolio characteristics**;
- The existing approach has limitations:

Single to single, single to many, many to single.

# Contribution

## 1. Literature exploring factor portfolio predictability

**Prior:** Factor momentum adapts to factor timing by comparing the relative performance of time and cross-sectional dimensions.(Gupta 2019)

- Using several indicators to predict MoM factor returns.(Daniel 2016)

**Extension:** Predict multi-factor rets using multi-portfolio characteristics;

- Characteristics-based forecasts result in higher returns.

# Contribution

## 2. Literature on Dimension Reduction in Asset Pricing

**Prior:** Using Lasso to filter characteristics (sparse model);  
(Gu et al. 2020, DeMiguel et al. 2020, and Feng et al. 2020)

- For diverse characteristic space, forcing the use of sparse model may affect prediction performance. (Kozak et al. 2020)

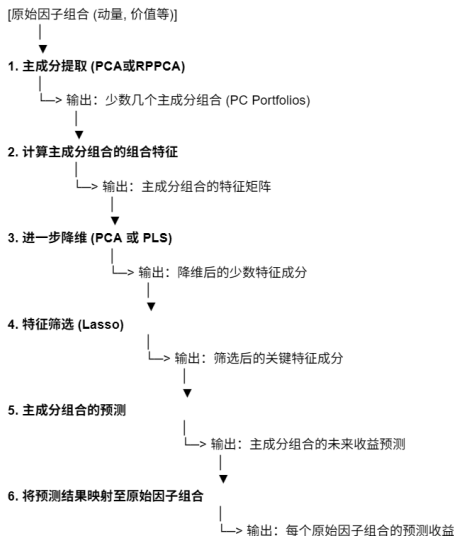
**Extension:** Extract characteristic PCs using PCA;

- Several dimensionality reduction steps in prediction process;
- Using lasso on characteristic PCs, balancing simplicity/accuracy.

# Hypotheses

- 1. Portfolio characteristics effectively predict factor returns.**
  - Different characteristics offer signals for different factor portfolios.
  - Portfolio characteristics reflect the temporal variability of factors.
- 2. Dimensionality reduction effectively extract return information.**
  - PCA, PLS, Lasso: Focusing on a few important characteristics.

# Modeling procedure





## Charateristics model outperforms others

|  | Average return (%) |             |             | Standard deviation (%) |             |             | Sharpe ratio |             |             |
|--|--------------------|-------------|-------------|------------------------|-------------|-------------|--------------|-------------|-------------|
|  | LSS                | TSFM        | CSFM        | LSS                    | TSFM        | CSFM        | LSS          | TSFM        | CSFM        |
| <i>A. Single factor</i>                              |                    |             |             |                        |             |             |              |             |             |
| PCA  | -0.10              | -0.03       | -0.01       | 7.23                   | 4.14        | 4.09        | -0.01        | -0.01       | -0.00       |
| PCA-PLS  | 1.16               | 0.74        | 0.76        | 8.57                   | 5.27        | 5.25        | 0.13         | 0.14        | 0.14        |
| RPPCA  | 0.20               | 0.20        | 0.21        | 5.64                   | 3.11        | 3.15        | 0.03         | 0.06        | 0.07        |
| RPPCA-PLS  | 1.12               | 0.73        | 0.74        | 8.28                   | 4.81        | 4.81        | 0.13         | 0.15        | 0.15        |
| <i>B. Time-varying number of factors using lasso</i> |                    |             |             |                        |             |             |              |             |             |
| PCA  | <b>1.47</b>        | <b>0.97</b> | 0.95        | 8.16                   | 5.01        | 4.96        | <b>0.18</b>  | 0.19        | 0.19        |
| PCA-PLS  | 1.38               | 0.96        | <b>0.97</b> | 8.22                   | 4.99        | 4.98        | 0.17         | 0.19        | 0.19        |
| RPPCA  | 1.21               | 0.84        | 0.83        | 7.06                   | 4.01        | 4.00        | 0.17         | <b>0.21</b> | 0.21        |
| RPPCA-PLS  | 1.23               | 0.84        | 0.86        | 6.89                   | 4.04        | 4.09        | 0.18         | 0.21        | <b>0.21</b> |
| <i>C. Benchmark models</i>                           |                    |             |             |                        |             |             |              |             |             |
| 1mMOM  | 1.06               | 0.56        | 0.58        | 8.81                   | 4.95        | 4.96        | 0.12         | 0.11        | 0.12        |
| 12mMOM   | 0.84               | 0.67        | 0.67        | 8.69                   | 5.08        | 5.12        | 0.10         | 0.13        | 0.13        |
| PCA-BM   | 0.79               | 0.59        | 0.61        | 6.16                   | 3.79        | 3.79        | 0.13         | 0.16        | 0.16        |
| IR spread  | 0.87               | 0.54        | 0.54        | 6.49                   | 3.92        | 3.92        | 0.13         | 0.14        | 0.14        |
| Sentiment  | 0.74               | 0.47        | 0.46        | 5.29                   | 3.13        | 3.22        | 0.14         | 0.15        | 0.14        |
| Historical sample mean                               | 0.48               | 0.35        | 0.35        | <b>3.47</b>            | <b>2.59</b> | <b>2.61</b> | 0.14         | 0.14        | 0.13        |

# Conclusion

- 1. New framework for portfolio-characteristics-based prediction**
  - Explored impact of characteristic information on factor portfolios.
- 2. Reducing variables through dimensionality reduction**
  - Better in capturing key sources of changes in factor portfolio returns.
- 3. Dynamically adjusting portfolios is more effective than static investments**

# The Challenge of Factor Timing

## **Transaction costs:**

Frequent portfolio adjustments can result in transaction costs, which may erode the potential returns of factor timing strategies.

## **Potential issues with multiple dimensionality reductions:**

- 1). Information loss
- 2). Insufficient interpretability