The Cross-Section of Risk and Return

Kent Daniel  Lira Mota  Simon Rottke  Tano Santos

Discussant: Ralph S.J. Koijen,  Chicago Booth, CEPR, NBER

New Methods for the Cross Section of Returns
Main insights

- Characteristics-sorted portfolios can be inefficient:
  1. Ignore information about the covariance matrix.
  2. Often constructed using information from one or two characteristics.

- If characteristics associated with expected returns correlate with loadings on unpriced factors, factors are contaminated.

- This paper
  - Methodology: Provide a simple way to clean factors using industry adjustments and better hedge portfolios.
  - Empirical application: “Purify” the 5 Fama and French factors.
The idea of contaminated factors already explored in, among others, Daniel and Titman (1997) and Gerakos and Linnainmaa (2018).

Focus in the current paper on improving Sharpe ratios, but contaminated factors may have an impact on testing theories.

A decomposition of valuation ratios

- Use the decomposition of Rhodes-Kropf, Robinson, and Viswanathan (2005) of market-to-book ratios:
  \[ mb_{ijt} = \text{firm deviation} + \text{sector deviation} + \text{value-to-book}. \]

- Most return predictability related to “market-to-value.”
- Use decompositions to re-assess theories that explain the value premium.
Contaminated factors and testing theories

<table>
<thead>
<tr>
<th>Reference</th>
<th>Economics</th>
<th>Spread exposures (Low-high MB)</th>
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<tbody>
<tr>
<td>Da-Warachenka (09)</td>
<td>CF risk</td>
<td>0.24*</td>
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<td>Bansal-Dittmar-Lundblad (05)</td>
<td>Cons. risk</td>
<td>1.44</td>
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<td>Kogan-Papanikolau (14)</td>
<td>IST shocks</td>
<td>-0.27*</td>
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<td></td>
<td>Firm age</td>
<td>6.22*</td>
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<td>Ai-Kiku (16)</td>
<td>Idio. risk</td>
<td>-0.014*</td>
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<td>Dechow-Sloan-Soliman (04)</td>
<td>Duration</td>
<td>-1.56*</td>
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<tr>
<td>Da (09)</td>
<td>Duration</td>
<td>-0.37*</td>
</tr>
<tr>
<td>Chen (17)</td>
<td>Duration</td>
<td>-2.38*</td>
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Campbell-Vuolteenaho (04) and Parker-Julliard (05)
How to clean factors?

- **Notation** (all $N$ dim vectors)
  - $R_t^e$: excess returns.
  - $c_{k,t-1}$: $k$–th vector of characteristics.
  - $\tilde{x}$: corresponds to the cross-sectionally de-meaned vector.

- **Procedure**:
  1. Take a set candidate factors, $f_{kt}^{(1)} = \tilde{c}'_{k,t-1} R_t^e$.
  2. Compute the betas
     
     $$R_t^e = a_t + \sum_k \beta_{k,t-1} f_{kt}^{(1)} + \epsilon_{kt}.$$  

  3. Find a hedge portfolio (using conditional sorts) such that
     - $w'_{k,t-1} c_{k,t-1} \simeq 0$.
     - $w'_{k,t-1} \beta_{k,t-1}$ is large.

  4. Construct the hedged factor, $f_{kt}^{(2)}$, by regressing $f_{kt}^{(1)}$ on all hedge portfolios, $h_t$,
     
     $$f_{kt}^{(2)} = f_{kt}^{(1)} - \gamma'_{k,t-1} h_t.$$
The impact of purifying factors

**Combo strategy:** $SR^2$ increases from 1.30 to 2.25.
Improving low-dimensional factor models

- The current paper criticizes the construction of low-dimensional factor models.
- The ultimate factor weights are a function of characteristics and factor loadings, $w_{kt}^{(2)} = g(c_{kt}, \beta_{kt}, \gamma_{kt})$. 
Improving low-dimensional factor models

- The current paper criticizes the construction of low-dimensional factor models.
- The ultimate factor weights are a function of characteristics and factor loadings, $w_{kt}^{(2)} = g(c_{kt}, \beta_{kt}, \gamma_{kt})$.
- Would it not be more efficient to estimate the portfolio rule directly as a function of all characteristics

$$w_t(n) = w_{t}^{bm}(n) + \theta' z_t(n),$$

where $\theta$ is estimated to maximize expected utility,

$$\hat{\theta} = \arg \max_{\theta} \frac{1}{T} \sum_t [u(w_{t-1}' R_t)],$$

see Brandt, Santa-Clara, and Valkanov (2009).
- One can impose a penalty to deal with the long list of characteristics, see DeMiguel, Martin-Utrera, Nogales, and Uppal (2018).
More broadly... 

- The potential appeal of factors is that they are interpretable and connect more closely to economic theories.
- **Challenge:** Recent literature using alternative statistical methods imply that low-dimensional factor models leave substantial alphas.
- The current paper seems in between by using more advanced statistical techniques but applied to existing factors.
- Less obvious (to me) at this point: How do we get back to testing economic theories?
- Moreover, most results so far are for the cross-section of U.S. stocks. Are these results stable if we look at
  - Global equities.
  - Factors that span global asset classes (and much more capital): Low beta, carry, momentum, value.