Discussion of Binsbergen, Ma, and Schwert’s (BMS)

“The Factor Multiverse: The Role of Interest Rates in Factor Return Measurement and Discovery”

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Yale
A thought provoking paper!

Thanks to authors for sharing their duration-adjusted factors and bond returns

Let’s digest what the analysis tells us...
Premise of This Paper

- Long-term Treasuries have large interest rate risk. Because of this they carry a term premium. The term premium is large.

- Equity is a long-lived asset. Equity discount rates are likely influenced by bond-related premia.
  - How long-lived? Requires a notion of “equity duration”

- Equity “alpha” should be adjusted for term premium because it can be captured easily and cheaply in other markets.

On this premise, let’s revisit “anomaly” factors adjusted for term premia / equity duration.

This is an interesting idea.
Summary of Approach

- Start from long-short equity factor, $F_{t+1}$, which is an excess return (dollar neutral)

- Build **duration-matched fixed-income return spread** can be calculated as:

  $$ r_{t+1}^{Fl} = \sum_{n=1}^{\infty} w_{t,n}^{\text{long}} r_{t+1,n}^{\text{bond}} - \sum_{n=1}^{\infty} w_{t,n}^{\text{short}} r_{t+1,n}^{\text{bond}} $$

- Weights on bond of maturity $n$ are $w_{t,n}^{\text{long}}$ and $w_{t,n}^{\text{long}}$, and dictated by duration of each equity leg. Duration measured as price-dividend ratio (based on Gordon growth model)

- Adjusted factor is $F_{t}^{\text{adj}} = F_{t} - r_{t}^{Fl}$, another dollar neutral portfolio
1: Is Duration-Matching Effective in Neutralizing Interest Rate Risk?

- Motivation for adjustment: “Counterfactual” where only interest rates move, all else held fixed (growth rates, other components of discount rates)
  - Authors argue this is more economically interesting than usual long-short equity construction
  - I can appreciate rationale that we might not want to give equity factors “credit” for term premia

- BMS assert that the adjusted factor is $F_{t+1}^{adj} = F_{t+1} - r_{t+1}^{FI}$ neutral to duration/term premium effects. This is an empirical question. What could go wrong?

1. P/D may be poor measure of duration. Confounded by all drivers of discount rates, mispricing, etc. As a result, weights in $r_{t+1}^{FI}$ determined by non-duration attributes

2. Interest rate fluctuations correlate with equity returns in complicated way (all else is not fixed)
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- Does duration-matching capture interest rate risk exposure? This is easy to test
1: Is Duration-Matching Effective in Neutralizing Interest Rate Risk?

- If duration matching neutralizes term risk, then duration-adjusted factors should have lower betas on bond returns.

\[ F_t \text{ or } F_{t}^{\text{adj}} = \alpha + \beta_{\text{mat}} r_{t,\text{mat}} + \epsilon_t \]  
  for mat = 3m, 1y, ..., 30y and for all 153 factors

Adjusted factors appear more exposed to fixed income fluctuations, not less. Differences in adjusted vs. unadjusted factors evidently not from bond hedge. From bigger bond bets?
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2: How Many Factors are “Explained” By Duration Matching?

1. 66 duration-adjusted factors have average returns with $t \geq 2$
   - Authors refer to replication rate as $66/153 = 43\%$
   - Of the 153 studied by JKP, 34 were originally reported a NOT significant, must discard these from calculation
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2. JKP lay out argument for analyzing replication in terms of CAPM alpha. For $\sim20$ factors, the raw return is insignificant but the alpha is significant, meaning factor’s efficacy masked by its market exposure (e.g. BAB of Frazzini-Pedersen)
   - BMS do not control for the market
   - 90 duration-adjusted factors have CAPM alpha with $t \geq 2$, for $90/119 = 76\%$
   - Cf. 84% unadjusted factors have CAPM alpha with $t \geq 2$ in JKP
   - Duration-adjustment pushes $\sim10$ of the 153 factor from significant to insignificant
   - Average alpha rises from $0.28\%$ per month unadjusted to $0.41\%$ with BMS adjustment

   - After controlling for market, duration-matching has little impact on conclusions about factor significance
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- BMS only focus on comparison of $t$-statistics
  - $t$-stats drop for 102/153 factors after duration adjustment
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- $t$-stats drop for 102/153 factors after duration adjustment
- But mean returns rise for 110/153 factors after duration adjustment
- Average return across all factors rises from 0.21% per month unadjusted to 0.30% adjusted
- 16 factors have unadjusted $t$-stats $> 2$ but duration-adjusted $t$-stats $< 2$. Duration adjustment raises the mean return for 8 of these

Duration adjustment introduces variability in factor returns, does not reduce mean returns

This decreases test power and explains drop in replication rate
2: How Many Factors are “Explained” By Duration Matching?

2a. Why Does Duration Matching Appear to Make Factors Noisier and Decreases Test Power?

1. Inaccuracies from $\text{Duration} = P/D$ a likely culprit, skews weighting of bond controls

2. Bond returns themselves likely measured with substantial error
   - Constructed from smoothed yields of Gurkaynak et al. (2007). Reflect true yields plus error
   - Error is small vs. yield levels, but can be large noise in terms of returns

- Appears worse earlier in sample
It’s counterproductive to couch analysis in terms “replication rates” or “false positives” or “data mining” etc.

Literature has reported on anomalies/factors with significant CAPM alphas
  ▶ These are largely replicable
  ▶ Of the 153 studied by JKP, 85% appear to be “true positives”

If you show an alpha disappears when you control for additional risk exposures, it does not make the original CAPM alpha a “false discovery”

This paper asks a standard question: Do other risk factors explain CAPM alphas on factors?
  ▶ This can be addressed with common spanning tests: regressing portfolio returns on candidate risk factors (bonds in this case)
  ▶ The authors take a different approach for same question, this is fine, but not an investigation of “false discovery/data mining/replication”
3: Explaining Test Asset Returns Vs. Factor Discovery

\[ F_t = \alpha + \beta_{mkt}(r_{m,t} - r_{t,1m}) + \beta_{5y} r_{t,5y} + \beta_{10y} r_{t,10y} + \beta_{20y} r_{t,20y} + \beta_{30y} r_{t,30y} + \epsilon_t \text{ for all 153 factors} \]
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- Conclusions from alphas and \( t \)-stats more aligned
  - \( t \)-stats drop for 110/153 factors after duration adjustment, 22 significant become insignificant
  - Now, mean returns also drop for 95/153 factors after controlling for bond returns
- Basic BMS premise borne out—equity factor premia have a term/duration premium
- The effect is small. Average CAPM alpha drops from 0.28% per month to 0.24%
- Note that this zeroes-out interest rate risk by construction
- Spanning approach appears more impactful and less noisy than duration-matching
3: Explaining Test Asset Returns Vs. Factor Discovery

\[ F_t = \alpha + \beta_{mkt}(r_{m,t} - r_{t,1m}) + \beta_{dur}F_{t}^{\text{equity duration}} + \epsilon_t \text{ for all 152 factors (excl. duration factor)} \]
3: Explaining Test Asset Returns Vs. Factor Discovery

\[ F_t = \alpha + \beta_{mkt}(r^{m,t} - r^{bond}_{t,1m}) + \beta_{dur}F_t^{equity\ duration} + \epsilon_t \] for all 152 factors (excl. duration factor)

- Again, conclusions from alphas and \( t \)-stats more aligned, and BMS premise borne out
  - \( t \)-stats drop for 90/153 factors after duration adjustment, 23 significant become insignificant
  - Now, mean returns also drop for 89/153 factors after controlling for equity duration factor
- The effect is somewhat larger. Average CAPM alpha drops from 0.28% per month to 0.21%
- For comparison, controlling for profitability (OCF/Assets), average CAPM alpha drops 0.15%
- Note: Results are likely stronger with Gormsen-Lazarus or Goncalves duration factors
3: Explaining Test Asset Returns Vs. Factor Discovery

- In light of JKP, it’s not surprising that controlling for one additional anomaly factor explains some other factor alphas
- Related to large literature on “what is needed in SDF to explain test asset returns?” Not about true/false discoveries
3: Explaining Test Asset Returns Vs. Factor Discovery

- In light of JKP, it’s not surprising that controlling for one additional anomaly factor explains some other factor alphas.

- Related to large literature on “what is needed in SDF to explain test asset returns?” Not about true/false discoveries.

- JKP appendix raises doubt about importance of duration factor for SDF.
4. Equity Duration Is a Crowded Topic

  - “…construct a measure of duration for equity securities … book-to-market ratio provides a crude measure of equity duration and that our more refined measure of equity duration subsumes the Fama and French (1993) book-to-market factor in stock returns.”

- “Cash flow duration and the term structure of equity returns” Weber (2018) JFE
  - “…stocks with high cash flow duration earn 1.10% per month lower returns than short-duration stocks in the cross-section.”

- “The short duration premium” Goncalves (2021) JFE
  - “…short duration stocks earn a large premium (8.6% per year in value-weighted decile portfolios) relative to long duration stocks… subsumes the value and profitability premia”

- “Duration-Driven Returns” Gormsen, Lazarus (2023) JF
  - “…We propose a duration-based explanation for the premia on major equity factors, including value, profitability, investment, low-risk, and payout factors.”
4. Equity Duration Is a Crowded Topic

- “Firm life expectancy and the heterogeneity of the book-to-market effect” Chen (2011) JFE
  - “…the book-to-market effect is stronger in small stocks is because smaller stocks generally have shorter life expectancy and therefore shorter equity duration.”

- “A unified duration-based explanation of the value, profitability, and investment anomalies” Chen and Li (2018) WP
  - “…duration factors explain many related anomalies comparable to some leading factor models”

- “Why is long-horizon equity less risky? A duration-based explanation of the value premium” Lettau and Wachter (2007) JF
  - “…We propose a dynamic risk-based model that captures the value premium. Firms are modeled as long-lived assets distinguished by the timing of cash flows....”

- “Common risk factors in the returns on stocks and bonds” Fama and French (1993) JFE
  - “…Used alone, term-structure factors capture strong variation in stock returns. But when stock-market factors are also included, all stock portfolios load in about the same way on the two term-structure factors.”

- None of the papers listed are cited by BMS
- Most tie into question “what is needed in SDF to explain test asset returns?”
This is a paper about explaining returns on test assets, not about “false positives”

Important to control for market—find many more significant factors (including after controlling for bond risk)

Problematic to focus on marginal changes in significance
  - Obscures the fact that economic magnitudes—alphas themselves—in fact get larger
  - If using spanning approach, alphas indeed shrink, but magnitudes are small

Large literature shows that equity duration helps explain other factors
  - Literature focuses on most standard factors: value, profitability, investment,…
  - This paper broadens the analysis to a larger set of factors
  - Overall, effect of duration / interest rate risk appears economically small
  - Gormsen-Lazarus or Goncalves duration factors likely make bigger difference

Paper emphasize secular movements in interest rates, but evidence does not suggest this is a primary driver of term premium
This is a thought provoking paper! I learned a lot and I recommend you read it.

Thanks to organizers for opportunity to discuss it.