Discussion of "Yield Curve Premia"
by Brooks and Moskowitz

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summary

- "carry" and "value" predict excess returns on government bonds
- "momentum" is not important/significant
- subsume information in other predictors used in literature
- builds on evidence on gov bonds in Toby’s previous work on value & momentum everywhere, carry

comments

- what are the predictors? how do they relate to what we know?
- factor structure in expected returns?
- do they subsume information in other predictors?
- lessons for economics?
- discussion focuses on US evidence, paper has international data
what are the predictors?

- "carry" = slope = long rate − short rate = $y_t^{(n)} - y_t^{(1)}$

- each bond $n$ has its own slope

- classic predictor, Campbell and Shiller (1991)

  $$r x_{t+1}^{(n)} = \alpha_n + \beta_n \left( y_t^{(n)} - y_t^{(1)} \right)$$

- monthly data 1964-2013

<table>
<thead>
<tr>
<th>$n$</th>
<th>$\beta_n$</th>
<th>t-stat</th>
<th>$R^2$</th>
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<tr>
<td>5</td>
<td>2.5</td>
<td>3.9</td>
<td>0.15</td>
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</table>
slope for 5 year bond
slope forecast of excess returns on 5 year bond
what are the predictors?

- "value" = real rate
  
  = nominal rate – exp. inflation over life of the bond
  
  = $y_t^{(n)} - E [\pi_{t\rightarrow t+n}]$

- each bond $n$ has its own real rate

- recent debate about expected inflation as predictor

  one observation: Great Inflation
  
  54% $R^2$ in Cieslak and Povala (2015), Bauer and Hamilton (2016), Cochrane (2016) gets 62% with a time-trend

  monthly data 1985-2013

<table>
<thead>
<tr>
<th>$n$</th>
<th>$R^2$ with all interest rates</th>
<th>include time trend</th>
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- here: exp. inflation over life of the bond, what happens here?
nominal rate and expected inflation

exp. inflation over 5 years

nominal rate on 5 year bond
real rate

real rate on 5 yr bond
real rate prediction of excess returns

$R^2 = 14\%$, smaller after 1985
what are the predictors?

- "momentum" = return of the bond over the last year
- momentum is not important/significant for bonds

summary of predictors in Brooks & Moskowitz

- 2 predictors for excess returns: for each bond $n$, find
  1. its slope $y_t^{(n)} - y_t^{(1)}$
  2. its real rate $y_t^{(n)} - E[\pi_{t \rightarrow t+n}]$

- predictors are nominal rates and exp. inflation over various horizons
factor structure in expected returns?

- single factor structure in expected returns, Cochrane & Piazzesi 2005
- intuitively: fitted values are linear functions of nominal rates, which have strong factor structure
- does expected inflation over various horizons destroy it?
factor structure in expected excess returns?

BM forecasts with own slope + real rate
factor structure in expected returns across bonds?

- procedure as in Cochrane & Piazzesi 2005
- collect $f_t = \text{all slopes and real rates for all bonds } n$
- restricted regression:
  1. run regression for cross-sectional average
     \[
     \bar{r}x_{t+1} = \gamma^\top f_t + \epsilon_{t+1}
     \]
     get fitted value $\hat{\gamma}^\top f_t$
  2. run individual bond regressions on fitted value
     \[
     r_{x(t)} = \beta_n \left( \hat{\gamma}^\top f_t \right) + \epsilon_{t+1}^{(n)}
     \]

<table>
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- compare restricted $\beta_n \hat{\gamma}^\top$ and unrestricted coefficients
factor structure in expected returns across bonds?

unrestricted coefficients

restricted coefficients

slope

real rate

unrestricted coefficients

restricted coefficients
do slope and real rate subsume other factors?

- depends on data and sample
- for example, not in monthly Fama-Bliss data, 1964-2013

<table>
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<th>real rate</th>
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- yes in quarterly GSW data for 10-year bond, 1972-2016
lessons for economics?

- evidence for a single factor in expected bond returns
- then bond markets are not segmented much
- standard models that generate time-varying risk premium are fine beliefs (e.g., learning), risk aversion (e.g., habits), risk (e.g., stochastic vol, ambiguity), liquidity risk, etc.
- here, each bond has its own factors: its slope and its real rate
- do we need a model with segmented bond markets? QE-style models as Vayanos & Vila?
- how are bond factors related to those in other asset markets, e.g. stocks and foreign exchange?
- hard to interpret the numbers in Table XII, needs more work!