Discussion paper “Much ado about nothing: A study of differential pricing and liquidity of short and long term bonds”

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International Pension Workshop
Leiden, The Netherlands
18 January, 2017
Summary (1/4)

Topic: Are long term yields and liquidity driven by different explanatory variables than short term yields and liquidity?

Setup:
- Fit NS to 20 year bonds
- Extrapolate NS beyond 20 year
- Average root mean squared pricing error between market prices and NS prices for maturities < 20 year = short noise measure, > 20 year = long noise measure.
- Short noise captures (Sec 4.5)
  - Age of bond
  - Market and funding liquidity
- Long noise captures
  - Bond issue level illiquidity
  - US noise measure
- These explanatory conventional liquidity proxies is low, so the noise measures capture something else as well.
Summary (2/4)

- Why is NS above long maturity data?
  - Roll implied bid-ask spread
  - Time to maturity of bonds
  - Liquidity risk and TED spread
  - Flight-to-safety flows
  - Credit risk of Germany

- Short yield are driven by
  - Short noise
  - Large scale asset purchases
  - German credit quality
  - Flight-to-safety flows

- Long yield are driven by
  - German credit quality
  - Flight-to-safety flows

- These effects are significant but small. Thus negligible?
Differential pricing

- Different pricing of long term versus short term bonds. By a different theoretical model?

Segmentation

- One segment/part of term structure has different demand and supply, and/or different pricing?

Try to find out whether there is segmentation in yields and in liquidity.

- For yields: use bias of bonds (AAA, so trying to explain risk premiums or interest rates itself?)
- For liquidity: use noise measure
**Conclusion:**

- Although significant differences in pricing and drivers of short and long maturity bonds, economic effect small
- Thus long term bonds not distorted by *demand pressure, default or liquidity premiums*. Therefore little evidence for *segmentation*.
- Implying; long term bonds not illiquid? But volume of trades is lower! Or therefore 3 factor model should fit perfectly. But also not true. So what does this insignificance inform us?
- In paper; “if long maturity bond yields are not distorted, we could extrapolate long term discount rates from these yields observed in bonds markets.”
- How?! And how do you explain the enormous difference between model implied rates and the data available? Long term is beyond 20 years, but only 1 data point in market, namely 30 year.
Number of data points for noise long estimation, is only 1 point, the 30 year maturity bond?
Bonds between 6 months and 30 years, or only 2, 5, 10 and 30 years?
Average maturity of bonds is 8.34 years, whereas average age is 8.71 years.
Fit NS, minimise weighted sum of squared deviations weighted by inverse of duration. Thus long term yields less important?
Long noise is complete out-of-sample!
Difference between bias and noise?

\[
Bias_t = \frac{1}{N_{long,t}} \sum_{i=1}^{N_{long,t}} \left( y_{t}^{long,i} - y_{long,i}(b_t) \right)
\]  
(1)

\[
Noise_{long,t} = \sqrt{\frac{1}{N_{long,t}} \sum_{i=1}^{N_{long,t}} \left( y_{t}^{long,i} - y_{long,i}(b_t) \right)^2}
\]  
(2)
Data (2/2)

- Sum of noise and bias closely related to objective of NS to be minimised.
- Can base NS on prices or yields, here weighted by duration. Thus would expect noise or bias to be close to zero?
Output Table 2

Regress short noise:
- Time to maturity: the older the bond, the lower the liquidity (locked up in buy and hold)
- Selective default and breakup risk by the KfW spread\(=?\) : Ted spread, our proxy for funding liquidity\(=?\)
  If market liquidity or funding conditions worsen, noise increases

Regress long noise:
- Zero returns\(=\) asset level illiquidity.
- US noise: crisis-related aspect of funding liquidity
- \(R^2\) low
Output Table 3

- Regress bias
  - Bias negative, NS above data.
  - Roll implied bid-ask spread increases, bond liquidity decreases, bias increases.
  - Time to maturity decreases/gets older, bias increases.
  - Liquidity risk, surprise component of ILLIQ measure
  - Flight-to-safety flows, PCA of CDS spreads of Eurozone third world countries, if credit or default of poor countries increases, bias goes down up
  - German credit risk
  - Volatility or investor sentiment measured by VIX index

- Univariate and multivariate analysis
Output Table 4

How would you do cross-sectional pricing tests?
Regress long and short yields (residual yields, minus average swap rates)
Use here data and not NS?
Short yields decomposition:

- ECB asset growth: ECD asset growth decreases short yields, because increase in bond prices, which is in line with decreased supply
- Flight-to-safety: decrease in credit quality of poor countries leads to increase of both long and short term yields.
- CDS: As German credit quality deteriorates, yields will go up while bonds prices will decline.
- KfW: yield spread on German agency and maturity-matched Treasury bonds, if widens, then yields decrease. People will not buy the German agency bonds and will buy in other countries? Inconsistent with breakup risk?
Output Table 4

- Long yields decomposition:
  - Long noise: the larger the pricing error, noise, the larger the yields will be. Would expect that data yield is lower or NS yield is higher? Which one is 'the yield'?  
  - Flight-to-safety
  - CDS
  - KfW

- Figure with correlation between long and short yields is based on data not on NS extrapolation? Not constant so NS not appropriate model.
Output Table 5

- Short yield differences regression.
  - Short noise up, average short yield decreases
  - Ted spread
  - Changes over time, before and after crisis different noise effect though puzzling change.

- What is difference with previous regression?
- Long yield difference regression:
  - Short and long noise.
  - Crisis no effect.
Output Table 6
- Regress short noise
  - Flight-to-safety
  - Asset growth of ECB
- Long noise
  - Flight-to-safety
  - Changes in German credit quality or breakup risk
  - Volatility

What is difference with Table 4, yield composition or Table 2, noise measures?
Discussion

- Liability valuation
- Compare NS with UFR
- Policy
Liability valuation

- Effect of using NS or data or UFR is negligible for simplified pension fund. Thus whole debate about nothing.
- Not true, see three cases on next slide.
- Reasoning:
  - Regress the 'noise (difference data and NS)' on explanatory variables.
  - Size of significant variables small.
  - Thus cannot explain difference, and according to example does not matter anyways.
- Lots of text, what is main regression and explain the explanatory variables in a structured way.
Age of funds effect

Old fund

Raw data: 94.07%
3 Months average: 95.25%
UFR: 94.17%

Discussion by A. Balter of paper by Z. Simon

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Age of funds effect

Middle fund

Raw data
85.86%

3 Months average
88.54%

UFR
89.56%
Age of funds effect

Young fund

Raw data
90.77%

3 Months average
94.47%

UFR
97.41%

Discussion by A. Balter of paper by Z. Simon
“Differential pricing and liquidity of short and long term bonds”
Compare NS with UFR

Show also data points available in Figure. UFR method is identical to data below 20 years, and NS should be extremely close! So why difference?
Discussion

Policy

"We suggest a viable alternative to the UFR method"

Three issues with UFR

- How to fit and extrapolate?
- LLP?
- Based on which info should long term rates be determined?

"We propose a simple method"

- Which one? NS?
- Is "better" in terms of what?
- Use also LLP 20 years
- No segmentation thus use bond prices, but not long enough!
Circle derivation
- Measure liquidity by noise, e.g. mispricing. Depends heavily on 'correct/theoretical' price. But that turns out to be difficult. Thus due to illiquidity the pricing is difficult, but you measure illiquidity by the mispricing itself. Circle reasoning?

Method
- Use < 20 year bonds to estimate NS
- Extrapolate NS
- Use > 20 year bonds to calculate difference with extrapolated NS

Completely relying on NS! Major assumption! This is whole debate about.
- Not an arbitrage free model.
- The difference is noise.
- Noise can be due to illiquidity.
- Is liquidity driven by explanatory variables?
- Are these variables segmented? Implying that the variables are different for short noise than for long noise?
If yes

Then it is important not to use the bad data beyond 20 years. Or use a different model to fit?

If no

Then can just use the market data that is available. Or do normal extrapolation. But how? And what is available? Number of maturities beyond 20 is only the 30 year bond. Pension funds need yields up to 100 year maturity.

Why not use NS for long yields as well, since liquidity is not a problem?

Then the objective of NS is the noise itself.

Thus the error of NS is the noise measure.

Back to circle.

Baseline, NS calibration/extrapolation, contains both parameter uncertainty and model uncertainty.
Minor comments (3/3)

- Explain terms such as segmentation, ...
- Mention earlier what you define to be short term (< 20 year) and long term (> 20 year) (page 12)
- Check typos
- Explanation of tables in words is done by different numbers than the shown results, mention how you get these from the tables (or mistakes?)!
- Lots of text, help reader to get main points without using too much key words. Maybe bit more 'easy explanations/intuition', or add more examples or reasoning to be followed by the reader. Possibly structure or graph of what you investigate and what your hypothesis is. Might add formula(s).
- Still not clear HOW to extrapolate.
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