Discussion on

“How useful are no-arbitrage restrictions for forecasting the term structure of interest rates?

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Summary of the paper

- Propose a way to test the importance (for out-of-sample forecasting purposes) of imposing restrictions to an econometric model.

- The importance of restrictions is tested by the optimal weight on a convex combination of two forecasts (restricted and unrestricted).

- The optimal weight is obtained by minimizing a loss function that depends on forecasts of out-of-sample data.

- Two types of loss functions (statistical and economic) are adopted to test if no-arbitrage conditions are important on the Ang and Piazzesi (JME 2003) model.

Do No-arbitrage restrictions really matter?

- Ang & Piazzesi (JME, 2003), Favero, Niu & Sala (WP, 2007), Christensen, Diebold & Rudebusch (WP, 2007), and Almeida & Vicente (JBF, 2008) all find that no-arbitrage restrictions improve forecasting ability
  - The first three papers in the context of Gaussian affine DTSMs while the last paper considers Gaussian and Stochastic Volatility affine models.

- Based on a family of Gaussian affine models, Duffee (2008) suggests that imposing no-arbitrage is irrelevant for forecasting.

- All results are model and sample specific (with some robust. tests).

- This paper provides a time-varying measure of the importance of each forecasting candidate:
  - Equivalent to performing multiple robustness tests on studies that adopt RMSE as loss function in the traditional style.

Still on no-arbitrage and forecasting

- It has been shown that no-arbitrage improves forecasting ability on longer forecasting horizons (6m, 12m): Here the test is performed for a one-period (1m) forecasting horizon.

- Also, it appears to be the case that no-arbitrage restrictions are most useful (for forecasting purposes), under more sophisticated models, like those including stochastic volatility.
  - The restrictions improve econometric identification of volatility and market prices of risk.

- Under model misspecification no-arbitrage helps (Duffee (2008)).

- So, maybe no-arbitrage could matter more if those cases are taken into account.

Economic Interpretation: Bond Risk Premia

- The lambdas define the optimal convex combination of forecasts but don't give any explicit information on the risk premium structure of interest rates.

- One idea is to plot the implied market prices of risk of the restricted no-arbitrage version. Are those plausible?

- Market prices might explain why no-arbitrage version is more useful under the portfolio loss function
  - The combination of no-arbitrage with time-varying risk premium probably allows the model to better capture the correlation structure of yields
  - Constant risk premium makes the restricted model too restrictive!

- How to extract bond risk premia from the unrestricted or RW models? Use some exponential spline function. BHR

Statistical x Economic Loss Functions

- The no-arbitrage restrictions appear to be more relevant when the economic loss function is adopted instead of the statistical one.

- Can't it be due to the fact that the particular portfolio loss function is exploring two characteristics that could also appear in a statistical loss function?

  – The correlation structure of the yields on the optimal linear combination ? Here all yields appear together.

  – The covariance matrix is re-estimated with a rolling window.

  – What is important: Time variation on the metric (coming from time-varying optimal portfolio weights and covariance matrix) or simply the fact that we consider all yields simultaneously.

Market Practitioners

- So far, the optimal combinations of forecasts (lambdas) are obtained based on out-of-sample data.

- An implementation of a version that attempts to forecast data out-of the sample used to estimate the lambdas would be useful for practitioners.

- These results might depart from the ones that generated lambdas, specially for longer horizon forecasts.

Comparison of Multiple Forecasts?

- In the context of this paper the forecaster faces the decision of choosing between imposing restrictions or not on one forecasting model.

- Now, suppose he also wants to test different econometric techniques to estimate the model (like kalman filtering x inverting the states, QML x Simulated Maximum Likelihood).

- How to proceed?