Bond Supply and Excess Bond Returns

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Bank of Canada Conference, September 12, 2008

Summary

- Representative agent models: bond supply is irrelevant for asset pricing.
- However... treasury buyback program, Operation Twist, Greenspan's conundrum.

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Contribution:

- Testable implications from a no-arbitrage "preferred habitat" model (Vayanos and Vila, 2007).
- Empirical evidence supporting the model's predictions.

Summary: Testable Implications

1. Relative supply of long-term bonds $\uparrow$
   - Bond yields and premia for all maturities $\uparrow$.
   - The effect is more significant for long maturities.

2. Arbitrageur's risk aversion $\uparrow$
   - Bond yields are more sensitive to the relative supply of long term bonds.
   - Stronger covariance between spreads and expected returns.

Theoretical Approach

Short-term rate:

$$dr_t = \kappa_r(\bar{r} - r_t)dt + \sigma_r dB_t.$$

Bond returns:

$$\frac{dP_t^{(\tau)}}{P_t^{(\tau)}} = \mu_t^{(\tau)}dt - A_t^{(\tau)}\sigma_r dB_t.$$

From the risk-averse arbitrageur's portfolio choice problem:

$$\mu_t^{(\tau)} - r_t = aA_r(\tau)\sigma_r^2 \int_0^T x_t^{(\tau)} A_r(\tau)d\tau.$$

Equilibrium condition:

$$x_t^{(\tau)} = s_t^{(\tau)} \equiv \beta(\tau) + \alpha(\tau)\log P_t^{(\tau)}.$$

Time-varying expected excess returns if $\alpha(\tau) \neq 0$.

Theoretical Approach

Risk-averse arbitrageurs require a compensation for holding long-term bonds

$\Downarrow$

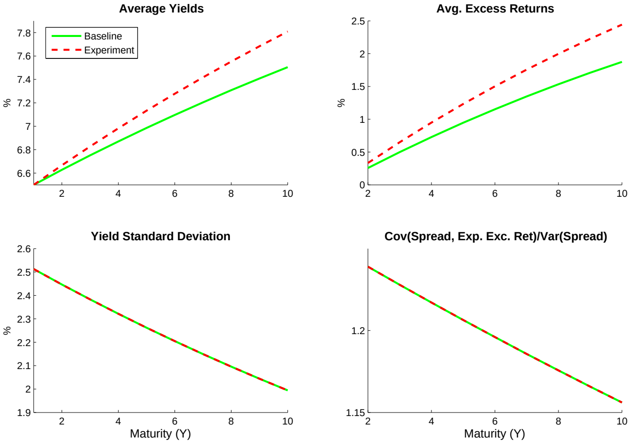
the compensation is determined by the exposure to short-term rate risk

$\Downarrow$

the exposure increases as the average maturity of bond supply increases.

One Factor Model: $\tau y_t^{(\tau)} = C(\tau) + A_r(\tau) r_t$.

$$s_t^{(\tau)} = \beta(\tau) - \alpha(\tau)\tau y_t^{(\tau)}$$



Baseline: $\beta(\tau) \equiv 1$, $\alpha(\tau) \equiv 1$. Experiment: $\Delta\beta(2) = -1$, $\Delta\beta(10) = 1$.

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- What determines $\alpha(\tau)$?
  "Bonds in the utility function" (Krishnamurthy and Vissing - Jorgensen, 2007).

$$\max_{\{c_t, c_{t+1}, \theta_t\}} \quad u(c_t) + \beta u(c_{t+1}) + v(\theta_t)$$

s.t.

$$c_t + \theta_t \leq w_t,$$

$$c_{t+1} \leq w_{t+1} + \theta_t(1 + y_t).$$

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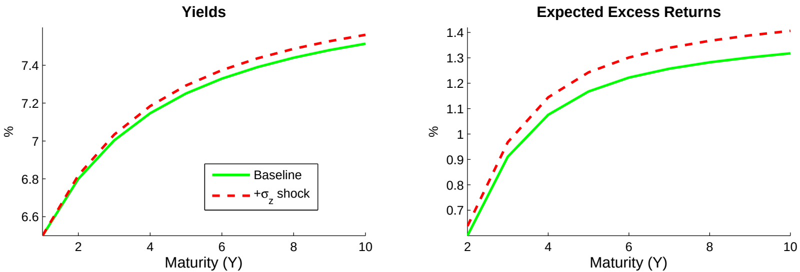
$$v'(\theta_t) = u'(c_t) - (1 + y_t)\beta u'(c_{t+1}).$$

If $v''(\theta_t) < 0 \Rightarrow$ downward sloping demand for bonds.

Two factor model: $\tau y_t^{(\tau)} = C(\tau) + A_r(\tau) r_t + A_z(\tau) z_t$.

$z_t \sim$ fiscal policy shock.

$$s_t^{(\tau)} = \beta(\tau) + \gamma(\tau) z_t, \quad dz_t = -\kappa_z z_t dt + \sigma_z dB_t^z.$$



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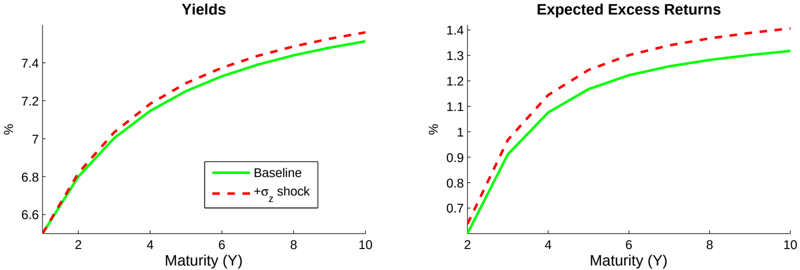

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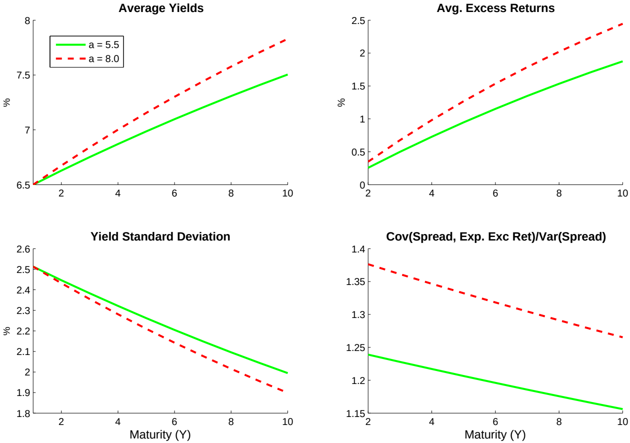
Persistent policy shocks increase the volatility of long-term yields.

Time-Varying Risk Aversion

- Comparative statics: low a vs. high a.



- What are the implications from a model with endogenous time-variation in risk aversion, $a = a(W)$?

Final Comments

- Short-term rate.
  - Endogenous.
  - Coordination of fiscal and monetary policies.
- Optimal debt structure: what are the welfare implications of changes in debt maturity?
- Lesson: Bond supply can be a significant determinant of bond yield dynamics.