Comments on

Estimating the Term Structure with Macro Dynamics in an Small Open Economy

by Fousseni Chabi-Yo and Jun Yang

Sen Dong

Columbia University

May 2006

The Research Question

- What macro shocks drive the Canadian yield curve?

The Literature

- Reduced-form VAR models + no-arbitrage pricing:

  Ang and Piazzesi (2004); Ang, Piazzesi and Wei (2004); Ang, Dong, and Piazzesi (2004); Chernov and Bikbov (2005) and Dai and Philphon (2005)

- Structural macro models + no-arbitrage pricing:

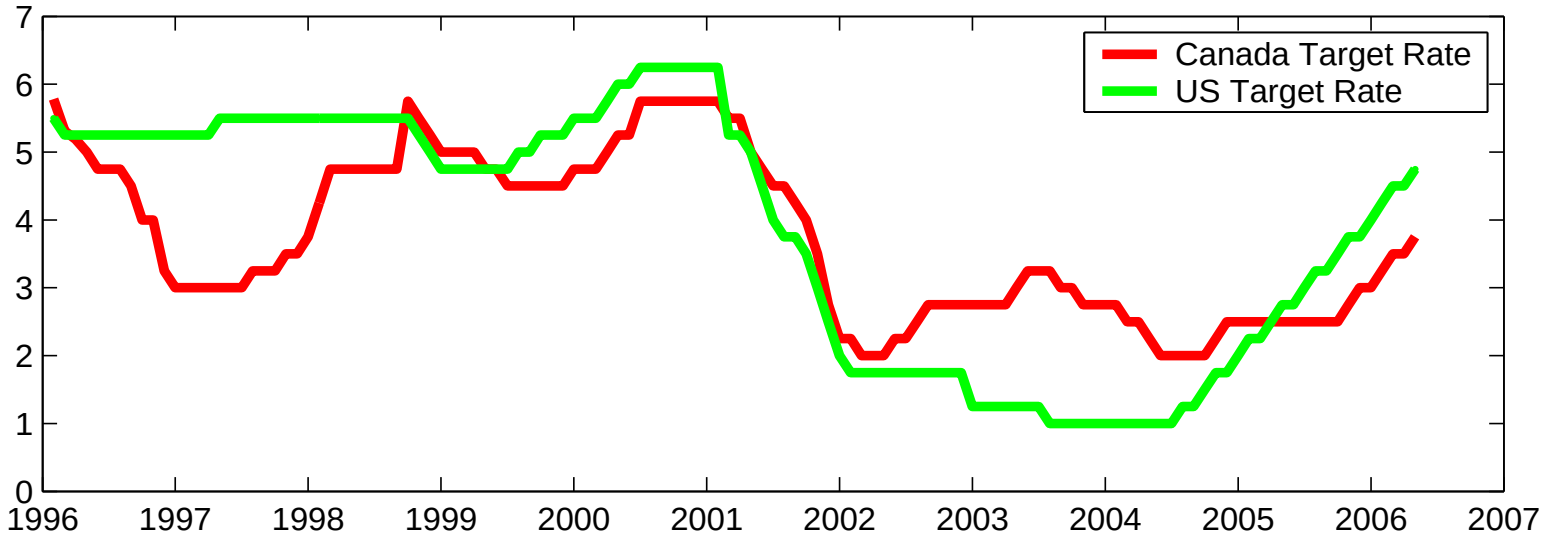
  Rudebusche and Wu (2004), Hördahl, Tistani, Vestin (2005), and Bekaert, Cho and Moreno (2004)

- Multiple regimes: Bikbov (2005)

- Two-country models: Dong (2005)

The Research Question

- What macro shocks drive the Canadian yield curve?



The Model in this Paper

- A New-Keynesian open economy model:

  $X_t = A + B\mathrm{E}_t X_{t+1} + CX_{t-1} + \varepsilon_t$

  Rational Expectations $\Rightarrow X_t = \mu + \Phi X_{t-1} + \Sigma\varepsilon_t$

  where $X = [g, \pi, r, q, g^*, \pi^*, r^*]$

- Combined with an exogenously specified SDF

$$\begin{aligned} m_{t+1} &= \exp(-r_t - .5\lambda_t'\lambda_t - \lambda_t'\varepsilon_{t+1}) \\ \lambda_t &= \lambda_0 + \lambda_1 X_t \end{aligned}$$

- No-arbitrage pricing of Canadian bonds $y_t^n = a_n + b_n X_t$

The Findings

- Canada responds strongly to the US short rate movements

  1% increase in US short rate $\Rightarrow$ 1.17% increase in Canadian short rate

- US macro shocks responsible for most of the yield curve variations

  $>$ 75% variations of yield levels and bond risk premia

  For long term bonds, 95% of variations are due to US aggregate supply shocks

Comments

- A New Keynesian small open economy model + no-arbitrage pricing for the yield curve
  - Elegant and with micro-foundations
  - A great modeling setup for the question asked by the paper
- Potential inconsistency
- Suggestions for improvements

Potential inconsistency

$r_t - \mathrm{E}_t \pi_{t+1}$ is real interest rate + inflation risk premium

- Aggregate Demand:
  $g_t = \beta_0 + \beta_g g_{t-1} + (1-\beta_g)\mathrm{E}_t g_{t+1} - \beta_r(\boxed{r_t - \mathrm{E}_t \pi_{t+1}}) + \beta_q \Delta q_t + \beta_{g^*} g_t^* + \varepsilon_t^g$

- However, inflation risk demands a risk premium in the model:
  $\lambda_t = \lambda_0 + \lambda_1 X_t$

Potential inconsistency

The exogenously specified SDF is not consistent with the IS curve

$$m_{t+1} \quad = \quad \exp(-r_t - .5\lambda_t'\lambda_t - \lambda_t'\varepsilon_{t+1})$$

- Bekaert, Cho, and Moreno (2004) derive the SDF consistent with the IS curve
- The estimated model is not very successful in matching the moments of bond excess returns in the data

Suggestions

Using yields information in the estimation of macro dynamics

- This paper uses a two-step estimation: First estimate the macro dynamics, then estimate the risk premium parameters
- A couple of key parameters are of wrong sign or not significant
- Using yields information may help estimate the parameters of macro dynamics: Ang, Dong, and Piazzesi (2004), Bekeart, Cho, Moreno (2004), Bikbov (2005)

Suggestions

Foreign exchange rate dynamics can be much richer

$$q_t - q_{t-1} = \delta_r[(r_t - \mathrm{E}_t\pi_{t+1}) - (r_t^* - \mathrm{E}_t\pi_{t+1}^*)] + \varepsilon_t^q$$

- This exogenously specified forex process is not consistent with the SDF
- Instead, return in forex markets can be endogeneouly determined. Bansal (1997), Backus et al (2000) and Dong (2005).
- Similar to Dong (2005),

$$\begin{aligned} q_t - q_{t-1} \quad &= \quad r_t - \pi_t - r_t^* + \pi_t^* \\ &\qquad + \text{forex risk premium} + \text{macro shocks} \end{aligned}$$

Which channel is important?

Finding: US macro shocks are important to Canadian yield curves

- Direct impact?

$$g_t = \beta_0 + \beta_g g_{t-1} + (1-\beta_g)\mathrm{E}_t g_{t+1} - \beta_r(r_t - \mathrm{E}_t\pi_{t+1}) + \beta_q \Delta q_t + \boxed{\beta_{g^*} g_t^*} + \varepsilon_t^g$$

- Through foreign exchange market?

$$\pi_t = \alpha_0 + \alpha_\pi \pi_{t-1} + (1-\alpha_\pi)\mathrm{E}_t\pi_{t+1} + \alpha_g g_t + \boxed{\alpha_q \Delta q_t} + \varepsilon_t^\pi$$

- Through systematic response of Bank of Canada to the US short rate?

$$r_t = \gamma_0 + (1-\rho)(\gamma\pi_t + \gamma_g g_t + \gamma_q \Delta q_t + \boxed{\gamma_{r^*} r_t^*}) + \rho r_{t-1} + \varepsilon_t^r$$

Conclusion

- This paper applies a New Keynesian model coupled with no-arbitrage pricing to the Canadian yield curve
- US macro shocks are more important than Canadian macro shocks
- The paper has the potential to help us understand which channel is more important.

The Model in this Paper

- Macro dynamics modeled as an open economy New-Keynesian model
- Canada: a small open economy, affected by the US
- $\pi_t = \alpha_0 + \alpha_\pi \pi_{t-1} + (1-\alpha_\pi)\mathrm{E}_t\pi_{t+1} + \alpha_g g_t + \boxed{\alpha_q \Delta q_t} + \varepsilon_t^\pi$
- $g_t = \beta_0 + \beta_g g_{t-1} + (1-\beta_g)\mathrm{E}_t g_{t+1} - \beta_r(r_t - \mathrm{E}_t\pi_{t+1}) + \boxed{\beta_q \Delta q_t + \beta_{g^*} g_t^*} + \varepsilon_t^g$
- $r_t = \gamma_0 + (1-\rho)(\gamma\pi_t + \gamma_g g_t + \boxed{\gamma_q \Delta q_t + \gamma_{r^*} r_t^*}) + \rho r_{t-1} + \varepsilon_t^r$
- Real exchange rate: $q_t - q_{t-1} = \delta_r[(r_t - \mathrm{E}_t\pi_{t+1}) - (r_t^* - \mathrm{E}_t\pi_{t+1}^*)] + \varepsilon_t^q$
- US: a large closed economy (without boxed terms)