Discussion of

"Regime Shifts in a Dynamic Term Structure Model of U.S. Treasury Bond Yields"

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Main Questions:

- Are regime shifts important for our understanding of interest rates and the term structure?
- Is regime shift risk priced?
- Are the transition probabilities state dependent?

Approach:

- Arbitrage free model of the term structure. Standard multifactor model of the term structure. Affine structure.
- Regime shifts: in prices of risk of the standard factors, transition probabilities for the regimes.

Why this setup:

- *No Arbitrage Model:*
  - Tractable implications for prices.
  - Once fit to one set of bond prices can price other bonds with confidence: won't induce implied prices that exhibit arbitrage opportunities.
  - Could price derivatives.
  - Seems to recover some important factors in a robust manner.

- *Regime switching:*
  - There are regimes in interest rates: variation in fed policy, ...
  - Standard affine models of the term structure don't fit conditional volatility well. Conditional volatility clusters. This approach may give a parsimonious and tractable model of volatility.
  - Nonstationarity in the world? Shocks to operating procedure or financial structure.

Some of the details:

- **Affine Term Structure model**
  - Matches existing models
  - Restrictions imposed to induce identification.

- **Regime switching model:**
  - *State is known:*
    * Tractable.
    * But does this capture what we think of as regime shifts?
    * In models with hidden states, agents infer a conditional probability of the state. Exposure to regime risk varies with conditional view of the state.

– *Transition probabilities constant under risk-neutral probabilities*

* Makes pricing tractable.
* Given parameterization of true probabilities, this implies a model of the market price of regime-shift risk:

$$\Gamma_t^{jk} = \log\left(\frac{\pi_t^{jk}}{\pi^{*jk}}\right)$$

* This is somewhat unusual. What type of model would result in this especially *given* the model for the transition probabilities:

$$\pi_t^{jk} = \frac{1}{1 + \exp(\eta_0^{jk} + \eta_Y^{jk} \cdot Y_t)}$$

Some of the Results:

"Standard Part"

- Standard factors: curvature and two slope factors.

- Factor loadings are constant, but intercepts move with the state.

- Slopes of the yield curves vary with the state.

"Markov Switching"

- Regime H is associated with a recession. (Figure 4).
- Factors exhibit less mean reversion in state L.
- Regime shift risk is priced
- Yield curve gives information about transition probabilities.
  - Flatter curve implies higher probability of switching from L to H.
  - Probability of moving from H to L increases as short-term rates decline or butterfly spread declines.
- During recession the probability of moving from H to L is lower.

- Persistence in the state H during period 1983 to 1985. Credibility of the fed?

- Asymmetry in the transition probabilities. Unconditionally low probability of H to H. Under risk-neutral measure the probability of staying in HH is *much* larger.

- Humps in conditional volatility measures: figure 6. Is this a sign of macro effects on volatility? Is this in options?

- Factor Risk premia:
  - Market Price of Factor Risk depends on state: figure 7
  - Market Price of Regime Shift risk: bigger from H to L, than for L to H.
  - Time varying risk aversion? This feature appears in many models of equity markets. Is the variation implied here consistent with observations from the equity markets?

- Figure 8: MPRS risk H to L is affected by persistence of the underlying states by construction. Can this be interpreted through a utility function?

- No regime conditional volatility movement. Figure 10. Captures volatility during gulf war, but over stated later?

Other Comments:

- What about other securities like derivatives? If this model is capturing conditional volatility, does the model price derivatives well?

- How much depends on including 1980 to 1983? Is this a period of structural change or is it an event in a stationary Markov chain? Hard problem!