Discussion of “The Bond Premium in a DSGE Model with Long-Run Real and Nominal Risks” by Glenn Rudebusch & Eric Swanson

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Summary

- Nice and important paper

- Literature on DSGE models not worried about implications for asset prices

  Why worry?

  - monetary policy analysis at central banks:

    short rate movements don't have much impact on long rates in the model

    transmission mechanism?

  - asset prices are measured precisely

  - need to understand risk premia to extract inflation expectations from TIPS versus Treasuries, or extract policy forecasts from Fed funds futures

- This paper: DSGE model with Epstein-Zin utility

Implications of standard models

- asset prices are not volatile enough (stocks, long bonds)

- difference between average returns and riskfree rate is

  stocks: small

  long bonds: small and *wrong sign*!

- illustrate with one and two period nominal bonds:

  Euler equation for one period nominal bond

$$P_t^{(1)} = E_t \left[\beta \frac{u'(c_{t+1})}{u'(c_t)} \exp(-\pi_{t+1}) \right]$$

  with log utility

$$m_{t+1} = \log \ \beta \frac{u'(c_{t+1})}{u'(c_t)} = \log \beta - \Delta c_{t+1}, \qquad m_{t+1}^{\$} = m_{t+1} - \pi_{t+1}$$

  with homoskedastic normal shocks, get

$$\log P_t^{(1)} = -E_t [\Delta c_{t+1} + \pi_{t+1}] + \text{constant}$$

Implications of standard models ctd.

- one-period nominal bond price

$$\log P_t^{(1)} = -E_t\left[\Delta c_{t+1} + \pi_{t+1}\right] + \text{constant}$$

- slope of the yield curve reflects risk premium on longer bonds

- (log) risk premium on two period bond held for one period

$$\begin{aligned} &= -cov_t\left(m_{t+1}^{\$}, \log P_{t+1}^{(1)}\right) \\ &= -cov_t\left(\Delta c_{t+1} + \pi_{t+1}, E_{t+1}\left[\Delta c_{t+2} + \pi_{t+2}\right]\right) \end{aligned}$$

- sign? persistence in consumption growth or inflation leads to negative risk premium

Intuition for mechanism

- premia high if assets pay off in good states

  premia low if assets pay off in bad states (insurance)

- what is a bad state?

  log utility: low realized consumption growth

- in bad state

  consumption growth is low

  expected future consumption growth is low (with persistence)

  short bond price is high (short rate is low)

  payoff of a long bond is high

- long bonds provide insurance against bad states

  $\Rightarrow$ risk premium is negative (= insurance premium)

Implications of standard models ctd.

- risk premium

$$= -cov_t\left(\Delta c_{t+1} + \pi_{t+1}, E_{t+1}\left[\Delta c_{t+2} + \pi_{t+2}\right]\right)$$

important distinction

  - log consumption difference-stationary:

$$\left.\begin{array}{l}\Delta c_{t+1} \text{ iid or positively autocorrelated} \\ \pi_{t+1} \text{ positively autocorrelated}\end{array}\right\} \textit{negative} \text{ premium}$$

    nominal and real yield curves *slope down*

  - log consumption trend-stationary, e.g. $c_{t+1} =$ linear trend + AR(1)

    $cov_t\left(\Delta c_{t+1}, E_{t+1}\left[\Delta c_{t+2}\right]\right) < 0$ helps with positive premium

    common in DSGE models, makes puzzle less severe

How can we get the sign right?

- Epstein-Zin utility (Piazzesi & Schneider, 2006 NBER macroannual), EIS $= 1$

- what is a bad state?

  $$m_{t+1} = \text{const.} - \Delta c_{t+1} - (\gamma - 1)\,(E_{t+1} - E_t) \sum_i \beta^i \Delta c_{t+i}$$

  (a) low realized consumption growth, as before

  (b) bad news about future consumption growth

- NIPA postwar data on consumption:

  high inflation predicts low consumption growth

- inflation surprise: payoffs of long bonds are low

  $\Rightarrow$ long bonds are undesirable, so investors command a *positive* premium

Comments

- contribution to monetary DSGE literature

  $\Rightarrow$ Epstein Zin utility with high risk aversion (improves asset pricing)

  can still match volatility of macro aggregates

  same spirit as Tallarini (2000, JME) result for RBC model

  Result is very different from Rudebusch & Swanson 2008

  study of DSGE model with external habit utility

Comments

- methodology:

  in any model with frictionless financial markets,

  asset prices completely described by Euler equations

  as long as model matches consumption, hours & inflation,

  production side, price setting & policy rule irrelevant for asset prices

  $\Rightarrow$ most papers in asset pricing test Euler equation directly

  here: indirect analysis using endogenous consumption and hours

  (possibly misspecified)

Comments

- contributions to asset pricing literature:

  yield curve with Epstein Zin utility and multiple goods

  [for stocks: Uhlig 2006 (consumption, leisure), Fillat 2007 (consumption, housing)]

  results:

  1. yield curve slopes up because inflation is bad news for consumption (and leisure?)

  2. volatility of long rates due to endogenous time variation in risk premia

Utility

- utility process for consumption stream C_t solves

$$V_t = \frac{C_t^{1-1/\sigma}}{1-1/\sigma} - \frac{L_t^{1+\chi}}{1+\chi} + \beta E_t \left[V_{t+1}^{1-\alpha} \right]^{1/(1-\alpha)}$$

- if $\alpha = 0$, utility is separable across time and goods

- how to deal with trending consumption?

  Uhlig 2006 provides conditions for balanced growth
  and for risk aversion wrt relative gambles in consumption to remain stationary

  not satisfied here

- should be clarified for Euler equation testing

Why does the yield curve slope up?

- one way to get direct evidence

  assume log consumption is difference stationary

  felicity $\log C + \eta \log \widetilde{L}$

- pricing kernel with leisure

$$m_{t+1} = \text{constant} - \Delta c_{t+1} - (\gamma - 1)\left(E_{t+1} - E_t\right) \sum_i \beta^i \left(\Delta c_{t+i} + \eta \widetilde{l}_{t+i}\right)$$

- what is a bad state — now also bad news about leisure

- question: what generates news about leisure in the model?

  disentangle different effects

Mechanism for volatility in long rates in the model

- pricing kernel with nonhomothetic utility, complicated

  consider two period case

$$\begin{aligned} m_{t+1} \;=\; & \text{pricing kernel for Epstein Zin over consumption} \\ & + \left(\frac{1/\sigma - \gamma}{1 - 1/\sigma}\right) \log \left(1 - \left(\frac{1 - 1/\sigma}{1 + \chi}\right) \frac{w_{t+1} L_{t+1}}{C_{t+1}}\right) \end{aligned}$$

- paper generates some volatility in long rates through heteroskedasticity of m_{t+1}

- it should not come from first term (little heteroskedasticity in consumption data)

  document conditional 2nd moments from model!

- for leisure term

  – provide direct evidence by computing pricing kernel using VAR that includes hours and consumption (with more periods, expectations of ratio will matter)

  – does it work with utility that satisfies Uhlig conditions?