Disussion of Asset Pricing in a Production Economy with Chew-Dekel Preferences

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This Paper

- Stochastic growth model with Chew-Dekel preferences can match key features of asset returns.
  1. EZ preferences generate constant risk premia.
  2. GDA preferences can generate countercyclical risk premia.
- Paper is at the frontier:
  1. Nests preference specification that explain the equity premium in when consumption is exogenous
  2. Examines how these preferences perform in G.E.
  3. Uses finite-elements rather than log-linearization techniques.

This Paper (cont)

- Basic Ingredients
  - transitory shocks
  - adjustment costs to capital
  - recursive preferences in the Chew-Dekel class
    1. EZ: Risk aversion 18 and EIS 1/39.
    2. GDA: comparable results with lower RA.
- Calibration
  - Model matches
    1. level of equity premium and risk-free rate
    2. volatility of consumption and equity returns
  - Model does not match
    1. volatility of the risk-free rate
    2. time-variation in the equity premium

some comments

- Authors target an equity premium of 7.5% for unlevered equity.
  1. No leverage; target moments of firm rather than equity returns.
  2. $E(R_A^e) = D/(D+E)\,R_D^e + E/(D+E)R_E^e$
  3. In US, $D/(D+E)$ is close to 50%.
  4. A premium of 3-4% on total assets would be enough.
- Is risk-aversion of 18 unreasonable?
  1. in most experimental evidence, distribution of payoffs is known.
  2. Robust control isomorphic to EZ with $EIS^{-1} < RA$ (Skiadas 2003).
  3. Can interpret high RA as aversion to uncertainty.

How do we match the Sharpe Ratio?

- let γ be risk aversion coefficient and ψ be EIS. We can write

$$\begin{aligned}
\log M_{t+1} \quad - \quad & E_t \log M_{t+1} = -\psi^{-1}(\log C_{t+1} - E_t \log C_{t+1}) \\
& +(\psi^{-1} - \gamma)(\log V_{t+1} - E_t \log V_{t+1}) \\
= \quad & -\gamma(\log C_{t+1} - E_t \log C_{t+1}) \\
& +(\psi^{-1} - \gamma)(1 - \psi^{-1})(\log wc_{t+1} - E_t \log wc_{t+1})
\end{aligned}$$

  where wc_t is the wealth-consumption ratio.
- HJ bounds: $var(logM_t) \geq SR^2$.
- If shocks are transitory and $\psi < 1$:

$$\begin{aligned}
cov_t(\log C_{t+1} - E_t \log C_{t+1}, \varepsilon_{t+1}) &> 0 \\
cov_t(\log wc_{t+1} - E_t \log wc_{t+1}, \varepsilon_{t+1}) &> 0
\end{aligned}$$

  If $\gamma < \psi^{-1}$, the two components of the SDF reinforce each other.
- Is wc helpful in pricing assets? LVV 2007 construct proxy for wc and estimate linearized version of $E(RM) = 1$:

LVV 2007

	Factor Prices		Tests		Fit			Returns and Wealth-Consumption			
	λ_c	λ_{wc}	F-test	χ^2	R^2	$RMSE$	MAE	$RP^{\Delta c}$	$RP^M - RP^{\Delta c}$	R^W	A_0^{Ann}
Panel A: Size and book-to-market											
Uncond.	0.61	0.01	0.61		0.67	0.56	0.42	2.45	5.66	3.40	76.25
	(0.17)	(0.35)	(5.68)	(0.00)							
	[0.27]	[0.53]	[18.23]	[8.38]							
Cond.	0.44	0.27	0.71		0.69	0.50	0.38	2.85	2.41	3.80	58.50
	(0.15)	(0.33)	(2.21)	(0.00)							
	[0.20]	[0.42]	[6.50]	[0.00]							
Panel B: Size and long-term reversal											
Uncond.	0.03	0.97	1.01		0.82	0.41	0.31	4.02	5.54	4.97	34.82
	(0.16)	(0.30)	(0.17)	(0.00)							
	[0.17]	[0.31]	[0.25]	[0.00]							
Cond.	−0.06	1.10	1.04		0.86	0.33	0.25	4.17	3.14	5.12	33.10
	(0.15)	(0.30)	(0.07)	(0.00)							
	[0.16]	[0.32]	[0.14]	[0.00]							

Risk-free rate

- Campbell(1999). Let $\eta = \frac{1-\gamma}{1-\psi^{-1}}$.

$$
\begin{aligned}
r_t &= -E_t \Delta \log M_{t+1} \\
&\approx -\ln\beta + \underbrace{\psi^{-1}(E_t \Delta \log c_{t+1})}_{\text{intertemporal smoothing}} - \underbrace{\frac{1}{2}\left(\frac{\eta}{\psi^2}\sigma_{c,t}^2 + (1-\eta)\sigma_{w,t}^2\right)\sigma_z^2}_{\text{precautionary savings}}
\end{aligned}
$$

- $\beta > 1$ and high precautionary savings keep risk-free rate low.
- Low EIS means the riskless rate is sensitive to changes in the expected growth rate of consumption $\rightarrow$ similar to habit models
- adjustment costs make expected consumption growth volatile.

Why doesn't the equity premium vary over time?

- Let $\zeta_t \sim N(0, \sigma_z)$ be innovation to technology:

$$\begin{aligned} \Delta \log C_{t+1} &= E_t \Delta \log C_{t+1} + \sigma_{c,t} \zeta_{t+1} \\ \Delta \log wc_{t+1} &= E_t \Delta \log wc_{t+1} + \sigma_{w,t} \zeta_{t+1} \end{aligned}$$

- The market price of risk/ Sharpe ratio /vol of SDF is

$$\sigma_t \left(\log M_{t+1} - E_t \log M_{t+1} \right) = \gamma \sigma_{c,t} \sigma_z + (\psi^{-1} - \gamma)(1 - \psi^{-1}) \sigma_{w,t} \sigma_z$$

which does not vary a lot because $\sigma_{c,t}$ and $\sigma_{w,t}$ don't vary a lot.

Countercyclical risk premia.

- quick fix: make $\sigma_{z,t}$ countercyclical: $cov(\varepsilon_t, \sigma_{z,t}) < 0$
- Then risk premia are countercyclical

$$\sigma_t (\log m - E \log m) = \gamma \sigma_{c,t} \sigma_{z,t} + (\theta^{-1} - \gamma)(1 - \theta^{-1}) \sigma_{w,t} \sigma_{z,t}.$$

- But, as long as as long as $cov(\varepsilon_t, E_t \Delta \log c_{t+1}) > 0$ riskfree rate is more volatile:

$$r_t \approx -\ln \beta + \psi^{-1}(E_t \Delta \log c_{t+1}) - \frac{1}{2} \left(\frac{\eta}{\psi^2} \sigma_{c,t}^2 + (1-\eta) \sigma_{w,t}^2 \right) \sigma_{z,t}^2$$

Generalized Disappointment Aversion

- A more sophisticated approach based on Routledge and Zin (2004).
- Consider the power utility case: $\psi^{-1} = \gamma$

$$\begin{aligned} \log M_{t+1} - E_t \log M_{t+1} &= -\gamma(\log C_{t+1} - E_t \log C_{t+1}) \\ &\quad + \log(1+\theta I_{t+1}) - E_t \log(1+\theta I_{t+1}) \\ &\approx -\gamma(\log C_{t+1} - E_t \log C_{t+1}) \\ &\quad + \theta(I_{t+1} - E_t I_{t+1}) \end{aligned}$$

where $I_{t+1} = 1$ if $v_{t+1} \leq \xi \left(E_t v_{t+1}^{1-\gamma}\right)^{1/(1-\gamma)}$, $\pi_t = E_t[I_{t+1}]$.

- Now assume $\gamma \to 0$ (In general, there is also a covariance term):

$$\begin{aligned} \log M_{t+1} - E_t \log M_{t+1} &= \theta(I_{t+1} - E_t I_{t+1}) \\ \sigma_t (\log M_{t+1} - E_t \log M_{t+1}) &= \theta \sqrt{\pi_t (1-\pi_t)} \end{aligned}$$

- MPR depends on $\pi_t = Pr_t(v_{t+1} \leq \xi E v_{t+1}$.
- Model can generate countercyclical price of risk.

Bond Risk Premia

- Can model match equity *and* long-term bond premia?
- Equity premium = uncertainty premium + term premium
- Volatile R_f increases volatility of equity *and* bond returns.
- Data: Term premium $\approx 2\%$, Equity Premium $\approx 4-7\%$.
- Persistence of shocks is key. AJ 2004 show that if M has no permanent shocks

$$\lim_{k\to\infty} E_t \log\left\{\frac{R_{t+1,k}}{R_{t+1,1}}\right\} \geq E_t\left[\log\frac{R_{t+1}}{R_{t+1,1}}\right]$$

LT bonds have the highest risk-premium in the economy.

How to avoid large bond premia

- How to make the risk-free rate less volatile?
  1. External habit (Campbell-Cochrane).
  2. Leisure enters utility non-separably.
  3. Write models with storage.
  4. Non-Ricardian fiscal regimes.

How to avoid large bond premia

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- but part of the equity premium comes from the term premium.
    1. Campbell-Shiller:
       var(returns) = var(cashflows) + var(discount rates) - covariance term
    2. If we make the risk-free rate *less* volatile we need to make risk premia *more* volatile.
    3. This will help with the predictability regressions.

How to make risk premia more volatile?

- External habit (Campbell-Cochrane).
- Generalized Generalized Disappointment Aversion (make threshold ξ history dependent ?)
- Rep Agent has DRRA: (agents heterogenous in γ, basic vs luxury goods).
- Heteroscedastic output shocks.
- Asymmetric adjustment costs: $\sigma_{c,t}$ can be made countercyclical.

Summary

1. Habit models are not necessary, EZ with low EIS + transitory shocks does just as well.
2. Volatile risk-free rate is the price we pay to have volatile stock returns.
3. Volatile risk-free rate also implies large term premium.
4. Increasing volatility of risk premia will allow us to lower volatility of risk-free rate.
5. GDA preferences help. Can we combine them with heteroscedastic output / asymmetric adjustment costs?