Discussion of "Real Credit Cycles" by Bordalo, Pedro, Nicola Gennaioli, Andrei Shleifer, and Stephen J. Terry

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Awesome paper !

- Theory of rational expectation (RE)
  (or its twin in finance: efficient market (EM) hypothesis)
  - 'Correct' expectation
  - Unpredictable forecast errors (FE)
- Data
  - Systematic FE (extrapolation $\rightarrow$ reversal)
  - Over- optimistic (pessimistic) in good (bad) times
- BGST (2021): Theory of diagnostic expectation (DE)
  - Incorporated into a workhorse RBC framework
  - Disciplined by micro data
  - Parsimonious way to produce boom-bust credit cycles

DE as Crucial Ingredient

- Diagnostic expectation (indexed by θ) of state X_t

$$\underbrace{E_t^{\theta}(X_{t+1})}_{DE} = \underbrace{E_t(X_{t+1})}_{RE} + \theta \underbrace{\left[E_t(X_{t+1}) - E_{t-1}(X_{t+1})\right]}_{News} \quad (1)$$

- Example: $AR(1)$

$$X_{t+1} = \rho X_t + \varepsilon_{t+1}, \quad \varepsilon_{t+1} \sim i.i.d.N(0, \sigma^2) \quad (2)$$

- DE: $\theta > 0$

$$E_t^{\theta}(X_{t+1}) = \rho X_t + \theta\rho\left[X_t - \rho X_{t-1}\right] = \rho X_t + \theta\rho\varepsilon_t \quad (3)$$

- DE $\sim$ RE + autocorrelated shock: $corr(\varepsilon_{t+1}, \varepsilon_t) > 0$
  - Key mechanism of overreaction

Test for DE

- Predictable FE

$$E_t(FE_{t+1}) \equiv E_t(X_{t+1}) - E_t^{\theta}(X_{t+1}) = -\theta\rho\varepsilon_t \qquad (4)$$

- Micro-level evidence
  - $E_t(FE_{t+1})$: firm-level forecast errors (I/B/E/S)
  - ε_t: investment or debt issuance
- Result: $corr(E_t(FE_{t+1}), \varepsilon_t) < 0$

	(1)	(2)	(3)	(4)
	Forecast Error$_{t+1}$			
Estimation Method:	OLS	GMM	OLS	GMM
Investment$_t$	-0.618^{***}	-1.459^{***}		
	(0.119)	(0.061)		
Debt$_t$			-0.562^{***}	-0.887^{***}
			(0.187)	(0.056)
Firm Effects		X		X

- In support of DE ($\theta > 0$) rather than RE ($\theta = 0$)

Credit Cycles

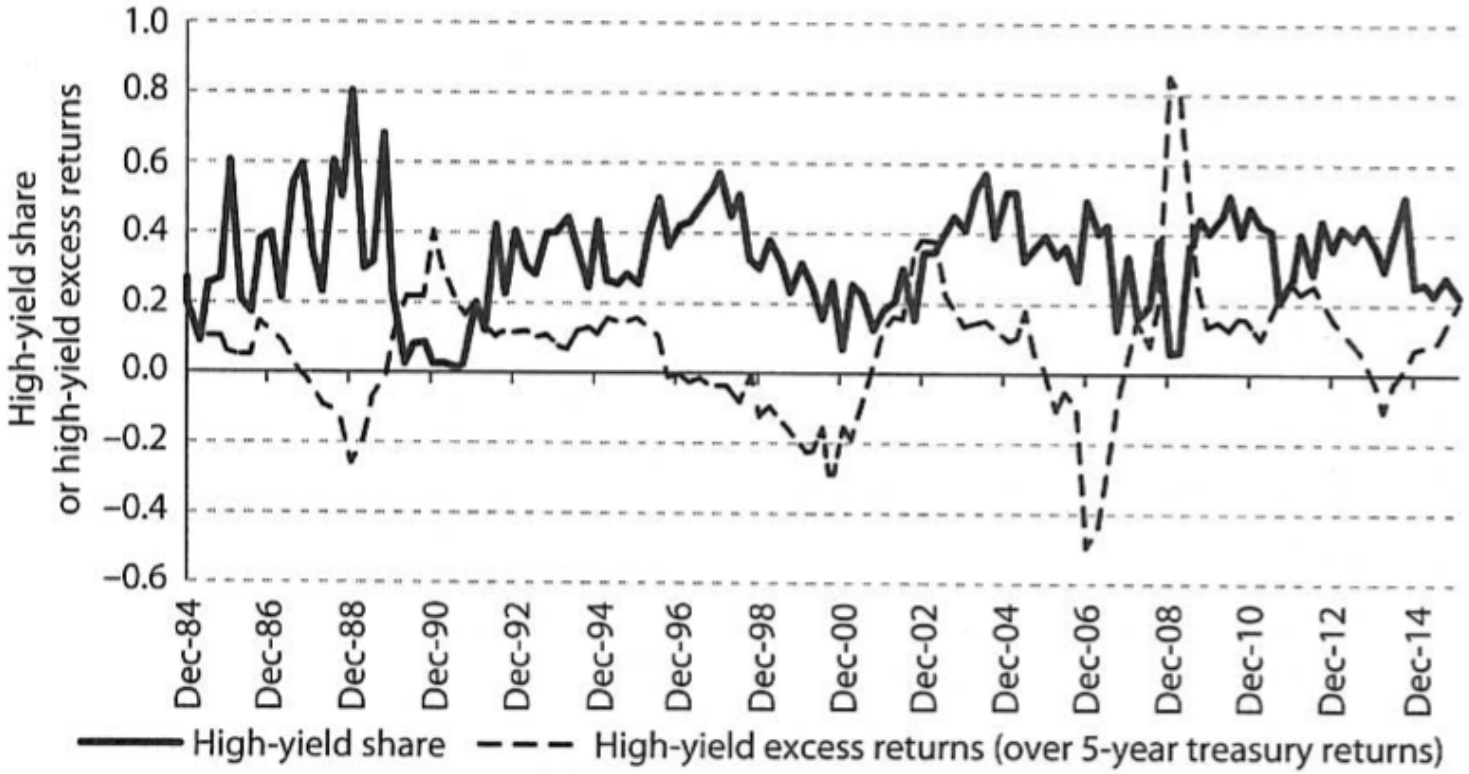

Figure: Debt Quality and Subsequent High-Yield Excess Returns[1]

[1]Data source: Greenwood and Hanson (2013), reprinted in *A Crisis of Beliefs* by Gennaioli and Shleifer (2018). Debt quality is measured by share of risky corporate debt.

A DE Theory of Credit Cycles

- Stylized facts (Schularick & Taylor, 2012; Greenwood & Hanson, 2013; López-Salido et al., 2017; Bordalo et al., 2018; BGST, 2021; etc.)
  1. (Overreaction) news $\uparrow \rightarrow$ spread $\downarrow\downarrow$ & investment $\uparrow\uparrow$
  2. (Reversal) sentiment $\uparrow \rightarrow$ excess returns $\downarrow$ & real activity $\downarrow$
- BGST (2021): DE theory of boom-bust cycles
  - Credit spread under DE

$$s_t^{\theta} \approx (1-\rho)s_{\infty} + \rho s_{t-1} - s[\rho(1+\theta)\varepsilon_t - \rho^2\theta\varepsilon_{t-1}] \tag{5}$$

  - Credit Spread under RE

$$s_t^{*} \approx (1-\rho)s_{\infty} + \rho s_{t-1} - s\rho\varepsilon_t \tag{6}$$

  - DE vs RE

$$s_t^{\theta} - s_t^{*} = \underbrace{-s\rho\theta\varepsilon_t}_{over-reaction} + \underbrace{s\rho^2\theta\varepsilon_{t-1}}_{reversal} \tag{7}$$

Important Contribution

- RE credit cycle *à la* Kiyotaki and Moore (1997)

$$b_t \leq \xi_t E_t q_{t+1} k_t \quad \rightarrow \quad LTV_t \equiv \frac{b_t}{E_t q_{t+1} k_t} = \xi_t \tag{8}$$

  - One-way amplification + persistence, no boom-bust cycles
  - Constant LTV absent of financial shock (ξ_t)

- Hetero-belief credit cycle *à la* Geanakoplos (2010)

$$LTV_t = \frac{\text{worst-case rate of return}}{\text{risk-free rate}} \tag{9}$$

  - LTV too high (low) in boom (recession), no boom-bust cycles
  - Bad news + increases volatility $\rightarrow$ crashes

- DE credit cycle *à la* BGST (2021)

  - Extrapolation -reversal (boom-bust) cycle

Comments

- DE in the model is representative w. a single parameter θ
  - Identical across micro & macro TFP, borrowers & lenders
  - Minimal but powerful departure from RE benchmark, I like it !
- Comment 1: Macro-level evidence
  - Linking forecast error or its revision to aggregate news and information shock (i.e. Jarociński & Karadi, 2020)
- Comment 2: Representative or heterogeneous
  - Psychological forces: stable, universal (θ)
  - Context-specific: time-varying or heterogeneous (θ_t^i)

Comments

- Comment 3: Endogenous or exogenous
  - Information friction (i.e. Angeletos, Huo, & Sastry, 2021)
  - Belief dispersion + financial friction (i.e. Geanakoplos, 2010)
- Comment 4: Robustness of DE equilibrium
  - Conditional on heterogeneity in DE
  - Interaction between different types of agents
  - Will arbitragers 'correct' mis-pricing ?

Comments

- Comment 5: Decomposing real channels of DE
  - Overspending on fixed operation cost (entry decision)
  - Overspending on equity issuance cost (financing decision)
  - Overspending on adjustment costs (production decision)
  - etc.
- Comment 6: Implication on firm dynamics
  - Entry-exit dynamics
    - Cooley & Quadrini, 2001; Clementi, & Palazzo, 2016; etc.
  - Debt-equity dynamics
    - Covas & Den Haan, 2011; Begenau & Salomao, 2019; etc.

Summary

- Interesting, Inspiring and Important Paper!
  - Intriguing theory of expectation backed by micro data
  - Strong mechanism disciplined by solid quantification
  - Milestone in business (credit) cycle research
- Good luck with the paper!
  - Can't wait to see more follow-up works