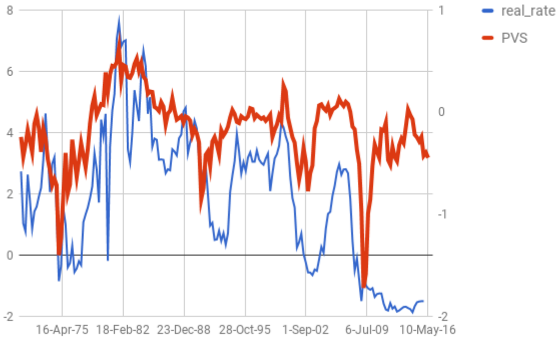
Idiosyncratic Risk and the Real Rate

- incomplete markets: idiosyncratic risk matters for the real rate of interest
  - agents over-accumulate assets and drive down risk-free rate below rep. agent risk-free rate
  - see seminal work by *Bewley, Aiyagari, Huggett.*
  - in general, idiosyncratic risk affects all asset prices in the same way; no effect on risk premia (*Krueger and Lustig*).

- **measurement**: agents' willingness to take on idiosyncratic risk is revealed by valuation of high-vol stocks (PVS).
  - *PSS* interpretation: when high vol stocks are valued richly, then agents' willingness to take on idiosyncratic risk is high (precautionary motive is low.)

PVS and the Real Rate



Outline

1. **Aggregate Risk**
2. Idiosyncratic Risk
3. Leverage Constraint

Aggregate Risk in DAPM

Definition

Entropy is defined as: $L_t(M_{t+1}) = \log E_t\left[\exp(m_{t+1})\right] - E_t[m_{t+1}]$.

- using the cumulant-generating function: $L_t(M_{t+1}) = \sum_{j=2}^{\infty} \kappa_{j,t}(m_{t+1})/j!$
  1. variance (κ_2)
  2. skewness $(\kappa_3/\kappa_2^{3/2})$
  3. kurtosis (κ_4/κ_2^2)
- Conditional entropy puts an upper bound on expected log returns: $L_t(M_{t+1}) \geq E_t(\log R_{t+1})$

Example

Log-normal consumption growth and power utility (*Hansen and Singleton*): $L_t(M_{t+1}) = .5\gamma^2\sigma_{ct}^2$

The Short Rate and Aggregate Risk in DAPM

Definition

The log risk-free rate is the sum of an expected MU and an aggregate risk component: $r_t^f = -E_t[m_{t+1}] - L_t(M_{t+1})$

Example

Log-normal consumption growth and power utility (*Hansen and Singleton*): $r_t^f = -\log \beta + \gamma E_t\left[\Delta c_{t+1}\right] - .5\gamma^2 \sigma_{ct}^2$

- in any no-arbitrage model, increases in aggregate risk $L_t(M_{t+1})$ will lower the risk-free rate, unless expected MU growth decreases.
  - example: increase in disaster risk in *Rietz-Barro* model.
- in *CC* model (with constant risk-free rates), expected MU growth is chosen such that: $E_t[m_{t+1}] = -r^f - L_t(M_{t+1})$

Risk and Cash Flow Accounting

Example

Log-normal consumption growth and power utility (*Hansen and Singleton*): $r_t^f = -\log \beta + \gamma E_t [\Delta c_{t+1}] - .5\gamma^2 \sigma_{ct}^2$

- decomposition in risk and cash flow component:
  - in long U.S. sample, *Hartzman (2015)* quantifies contribution of risk and cash flow component; finds significant role for aggregate risk
  - in shorter U.S. sample, *PPS* do not ; needs to be explained better (could we use same sample?)
- *PPS* objective should be to explain residual, after accounting for aggregate risk: $r_t^f - \left[-\log \beta + \gamma E_t [\Delta c_{t+1}] - .5\gamma^2 \sigma_{ct}^2\right]$

Secular decline in long rates

Definition

The long rate is the sum of an expected MU and a risk component:
$y_t^{\infty} = -\lim_{k\to\infty}(1/k)E_t[m_{t\to t+k}] - \lim_{k\to\infty}(1/k)L_t(M_{t\to t+k})$

- persistent increases in aggregate risk will lower the long yields.
- secular decline in long rates
  - aggregate **risk-based explanations**: secular $\nearrow$ in $(1/k)\lim_{k\to\infty} L_t(M_{t\to t+k})$ (*Barro et al. (2015), Hall (2016)*)
    - aggregate risk increase should affect *all asset valuations*:
    1. why are equity risk premia so low right now?
    2. why is implied vol and actual vol in equity markets so low?
  - aggregate **cash-flow based explanations**: secular $\nearrow$ in $\lim_{k\to\infty}(1/k)E_t[m_{t\to t+k}]$; secular stagnation, demographics (*Summers (2015)*)

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Short Rate and Idiosyncratic (CS) Risk

- the CS average IMRS is the pricing kernel:
  $M_{t+1} = \mathbb{E}_{cross}\left[M^i_{t+1}\right]$

Example

power utility: $m_{t+1} = -\gamma \kappa^c_{1,t+1} + \sum_{j=2}^{\infty} (-\gamma)^j \kappa^c_{j,t+1}/j!$

$$\begin{aligned} \textit{variance of } \Delta c^i_{t+1} &: \kappa^c_2 (Mankiw, CD, STY, HKLVN), \\ \textit{skewness of } \Delta c^i_{t+1} &: \kappa^c_3 / \kappa^{3/2}_2 (CG, Schmidt), \\ \textit{kurtosis of } \Delta c^i_{t+1} &: \kappa^c_4 / \kappa^{c2}_2 (CG, Schmidt). \end{aligned}$$

$r^f_t << -\log \beta + \gamma E_t\left[\Delta c^a_{t+1}\right] - .5\gamma^2 \sigma^2_{c^a}$
Increase in κ^c_2, decrease in κ^c_3, and increase in κ^c_4 increase $E_t[m_{t+1}]$ and lower $r^f_t = -E_t[m_{t+1}] - L_t(M_{t+1})$.

Secular decline in long rates

Definition

The long rate is the sum of an expected MU and a risk component:
$y_t^\infty = -\lim_{k\to\infty}(1/k)E_t[m_{t\to t+k}] - (1/k)\lim_{k\to\infty} L_t(M_{t\to t+k})$

- **aggregate (TS) risk-based** explanations: secular $\nearrow$ in $(1/k)\lim_{k\to\infty} L_t(M_{t\to t+k})$ (*Barro et al. (2015), Hall (2016)*)
- **cash-flow-based** explanations: secular $\nearrow$ in $\lim_{k\to\infty}(1/k)E_t[m_{t\to t+k}]$; secular stagnation, demographics (*Summers (2015)*)
- **idiosyncratic (CS) risk-based** explanations: secular $\nearrow$ in $\lim_{k\to\infty}(1/k)E_t[m_{t\to t+k}]$ (*Pflueger, Siriwardane and Sunderam (2017)*)
    - investors are subject to more idiosyncratic risk
    - investors bid up prices of all assets; no effect on risk premia.

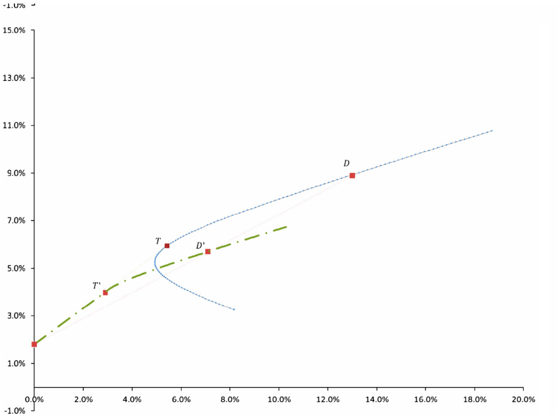
Outline

1. Aggregate Risk
2. Idiosyncratic Risk
3. **Leverage Constraint**

Leverage Constraints and the Real Rate

- **market segmentation**: agents' willingness to take on idiosyncratic risk is revealed by valuation of high-vol stocks (PVS).
  - PSS' interpretation: when high vol stocks are valued richly, then agents' willingness to take on idiosyncratic risk is high (precautionary motive is low.)
- is this really about idiosyncratic risk per se? (need direct evidence)
- **alternative interpretation**: leverage-constrained investors buy high vol stocks (*Frazzini and Pedersen (2014), Asness, Frazzini and Pedersen (2012), Miller*).
  - high vol stocks are substitute for leverage for the leverage-constrained (e.g. retail investors, mutual funds, pension funds)
  - when leverage-constrained investors have more appetite for high risk and high returns, then PSV increases.

Leverage Constraints



Leverage Constraints and the Real Rate

- risk anomaly, betting against beta: high-risk, high beta assets do not earn returns that are high enough
  - risk anomaly pervasive across and within asset classes

- do we see similar correlation with real rates when we compare valuation of high and low beta stocks?
- what about comparing valuation of high vol vs low vol Treasuries, corporate bonds etc.?

- perhaps PVS more about risk appetite of leverage-constrained households

Conclusion

- novel and intriguing finding, connecting stock markets to bond markets.
- other plausible interpretations
- more work needed.