Discussion of:

"Changes in the Risk-Free Rate: Evaluating Asset Pricing Risk Models"

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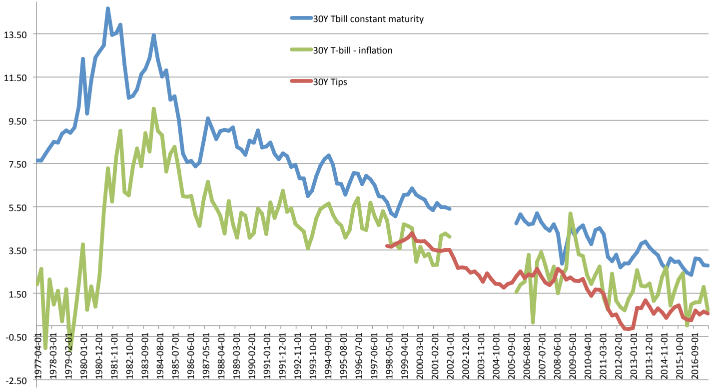
Key Idea: risk-free rate change as a model diagnostic

The paper is based on two observations

1. Dramatic reduction of $R_{f,t}$ since early 80s ($\approx 9\%$):



2. Given a SDF, M, we have that: $R_{f,t} = 1/\mathbb{E}_t\left[M_{t+1}\right]$

Q: which models can accommodate (and how) the change in $R_{f,t}$?

A Simple Benchmark: CRRA and log-normality

$$\log R_{f,t} = -\log\beta + \gamma\mu_t - \frac{\gamma^2}{2}\sigma_t^2$$

- Interest rate higher when:
  1. investor are more impatient (low $\beta \rightarrow$ want to consume now)

  Note: life expectancy $\uparrow \;\Rightarrow\; \beta\uparrow \;\Rightarrow\; \downarrow R_f$

  2. when consumption growth (μ) is high (consumption smoothing)

  $\Rightarrow$ rates more sensitive to μ when IES ($=1/\gamma$) low.

  3. risk is low ($\Downarrow$ precautionary savings)

  $\Rightarrow$ larger effect when RRA$=\gamma$ high.

  4. when "realistic" γ is high (for aggregate μ and σ)

Note: with $\gamma \approx 10$ and change in μ of about 0.8%, fits change in R_f

But: CRRA+log-N cannot explain the equity premium...

... so consider rare disasters (with CRRA), habits, and LRR.

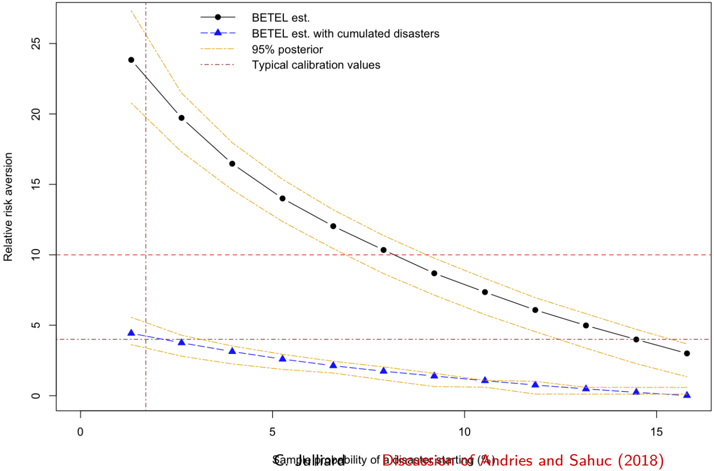
Rare Disasters à la Gabaix (2012)

$$\log R_{f,t} = -\log \beta + \gamma \mu_t - p_t \mathbb{E}_t^D \left[B_{t+1}^{-\gamma} - 1 \right]$$

- The CRRA bit can explain 1/2 of the change (γ calibrated at 4)

But: this model **cannot explain the equity premium!**

$\Rightarrow$ one-year disasters calibrated to match multi-year disasters



Habits à la Campbell and Cochrane (1999)

$$\log R_{f,t} = -\log \beta + \gamma\mu - \frac{1}{2}\gamma(1-\phi)$$

- since $\gamma = 2$, change in μ can explain no more than $1/5$ of the change.
- Changing ϕ (the AR(1) coefficient of the log surplus consumption ratio), would change the autocorrelation of P/D (how much?) but no evidence of this in the data...

But: CC99 needs $\gamma > 10$ to satisfy the HJ bound, and > 23 to satisfy entropy bounds (Ghosh, Julliard, Taylor (2016)).

$\Rightarrow$ A 0.80% reduction in μ implies a too large reduction in R_f.

- AS18 also consider an alternative process for the vol of the surplus consumption ratio that delivers a time varying R_f.

$\Rightarrow$ inconsistent with the smooth decline in the R_f (should have "jumped" like P/D in 2008-09)

Epstein-Zin à la Bansal and Yaron (2004)

If IES $= 1$

$$\log R_{f,t} = -\log \beta + \mu_t - \left(\gamma - \frac{1}{2}\right) \sigma_t^2$$

- hence change is μ is not enough... and even with $\gamma = 10$, the required increase in σ^2 is unrealistically high...

... besides, consumption vol clustering is hard to see in data

But if IES $\neq 1$

$$\log R_{f,t} = -\kappa + \frac{1}{\psi}\mu_t + \left(\frac{\gamma - \psi^{-1}}{1-\gamma}\right) \mathbb{E}_t r^e_{a,t+1} - \frac{1}{2} var_t \left(\log M_{t+1}\right)$$

- hence the change in μ is still not enough...
- ... and the needed increase in the risk premium is $\approx 1 : 1$.
- Consistent with the data?
  - Campbell and Thompson (2008): U-shaped risk premia 1980-2010
  - Martin (2016): highly volatile and with jump-like behaviour around 2000 and 2009.

A few more comments and suggestions

1. But is the 80-2010s R_f reduction the right quantity to target?
   - Maybe the 70-80s where the exception?
   - Post-WWII interest rate time series is tent shaped.
   - And the 70-80s where a the Burns/Miller/Volker years

   ⇒ maybe all these models need is a NK twist? (E.g. G.E. stability as a function of Taylor rule coefficients)
2. The LRR and habits formulation used were not designed for capturing interest rate dynamics. But there are alternatives:

   LRR: e.g. Bansal-Shaliastovich (2013)

   Habits: e.g. Wachter (2006)
3. Life expectancy of the affluent ones has dramatically increased ⇒ take formally into account its effect on β.
4. Aggregate consumption volatility underestimate the individual precautionary saving incentive (vol off by one order of magnitude and much small tail risk).

⇒ habits à la Constantinides and Ghosh (2016)?

Baseline

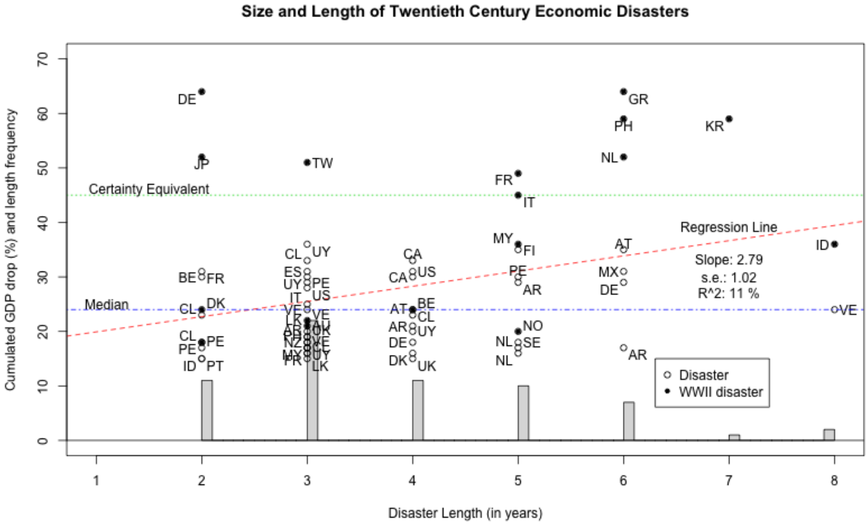
- Andries and Sahuc have picked up a hard (and surprisingly so) empirical fact for these models to explain.

⇒ a very interesting research project.

But:

- write-up is very preliminary (e.g. what's really your target R_f reduction changes during the paper)
- CRRA + disasters is a debunked framework – time to drop it.
- chosen formulations for habits and LRR might not be the best ones for the task at hand.
- but if the above does not do the trick, what does? Heterogeneous agents? Nominal frictions?
- I would target the up and down of R_f rather than only the latter.

Barro's Economic Disasters of the XX Century



Is consumption Vol autocorrelated?

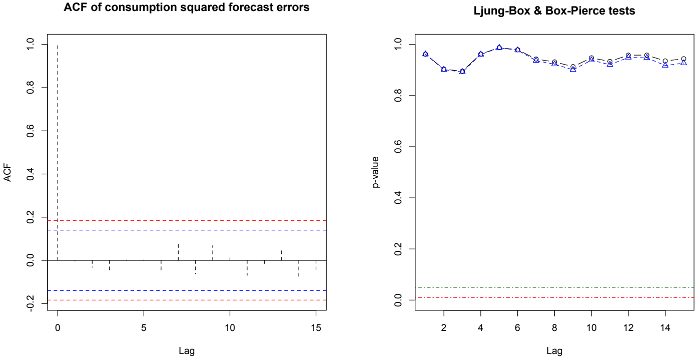


Figure: Autocorrelation structure of consumption growth squared forecast errors. Left panel: acf of $\left(\Delta c_{t,t+1} - \widehat{\mathbb{E}}_t\left[\Delta c_{t,t+1}\right]\right)^2$, where $\widehat{\mathbb{E}}_t$ denotes long memory *MA* based forecasts, with 95% and 99% confidence bands. Right panel: *p*-values of LB (triangles) and BP (circles) tests.

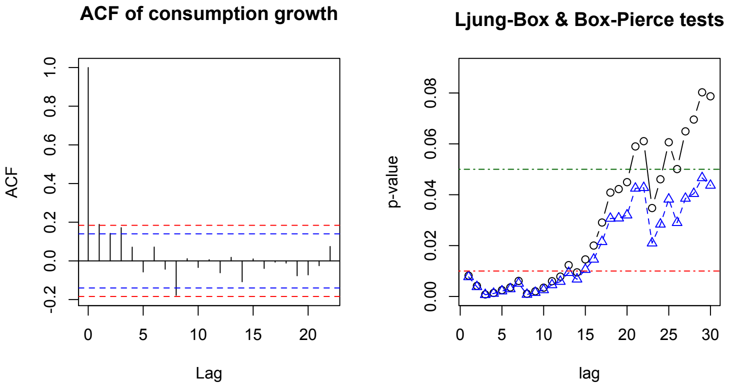


Figure: Autocorrelation structure of quarterly consumption growth. Left panel: autocorrelation function with 95% and 99% confidence bands. Right panel: $p-$values of LB (triangles) and BP (circles) tests.

A spurious link between Δc Vol and asset returns?

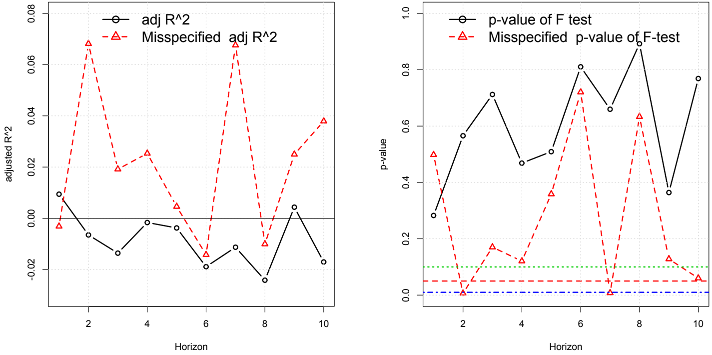


Figure: Predictability of consumption squared forecast errors on the first eight principal components of asset returns at several horizons. Assuming either a long memory *MA* for the consumption growth mean or, counterfactually, a constant mean.

- … not too unlikely …