Discussion of

Learning about Risk and Return: A Simple Model of Bubbles and Crashes

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Summary and Praise

- Great paper hunting an old topic: improved AP models based on learning
- Simple asset pricing model with learning that can give rise to crash & bubble like behavior of asset prices
- New feature: agents estimate mean & risk of returns, previous literature focused mostly on learning of mean returns.
- Learning generates 'escape dynamics'
  - away from the fundamental REE (standard empirical deficiencies) towards the explosive bubble REE
  - prices become auto-correlated, so agents forecast price using lagged price
  - escapes not 'too far': still non-explosive price dynamics (unlike in the bubble RE)
- Model predictions much more plausible than under RE: model generated data passes formal 'bubbles tests'

Summary and Praise

- Main ingredients:

$$p_t = \beta E_t^*[p_{t+1} + y_{t+1}] - \sigma_t^2 \widetilde{z}_t$$

  where $\widetilde{z}_t > 0$ denotes random share supply.
- Forecasting equation

$$\begin{aligned} p_t &= k_t + c_t p_{t-1} + \varepsilon_t \\ \sigma_t &= Var_t(p_{t+1} + y_{t+1}) \end{aligned}$$

  Agents estimate k, c, σ_t^2 in real time
- Fundamental and Bubble REE:

$$\begin{aligned} c^F &= 0 \\ c^B &= \beta^{-1} \end{aligned}$$

- Learning model: all the action occurs when agents believe

$$\begin{aligned} k &= 0 \\ c &: \text{ close to but below } \beta^{-1} \end{aligned}$$

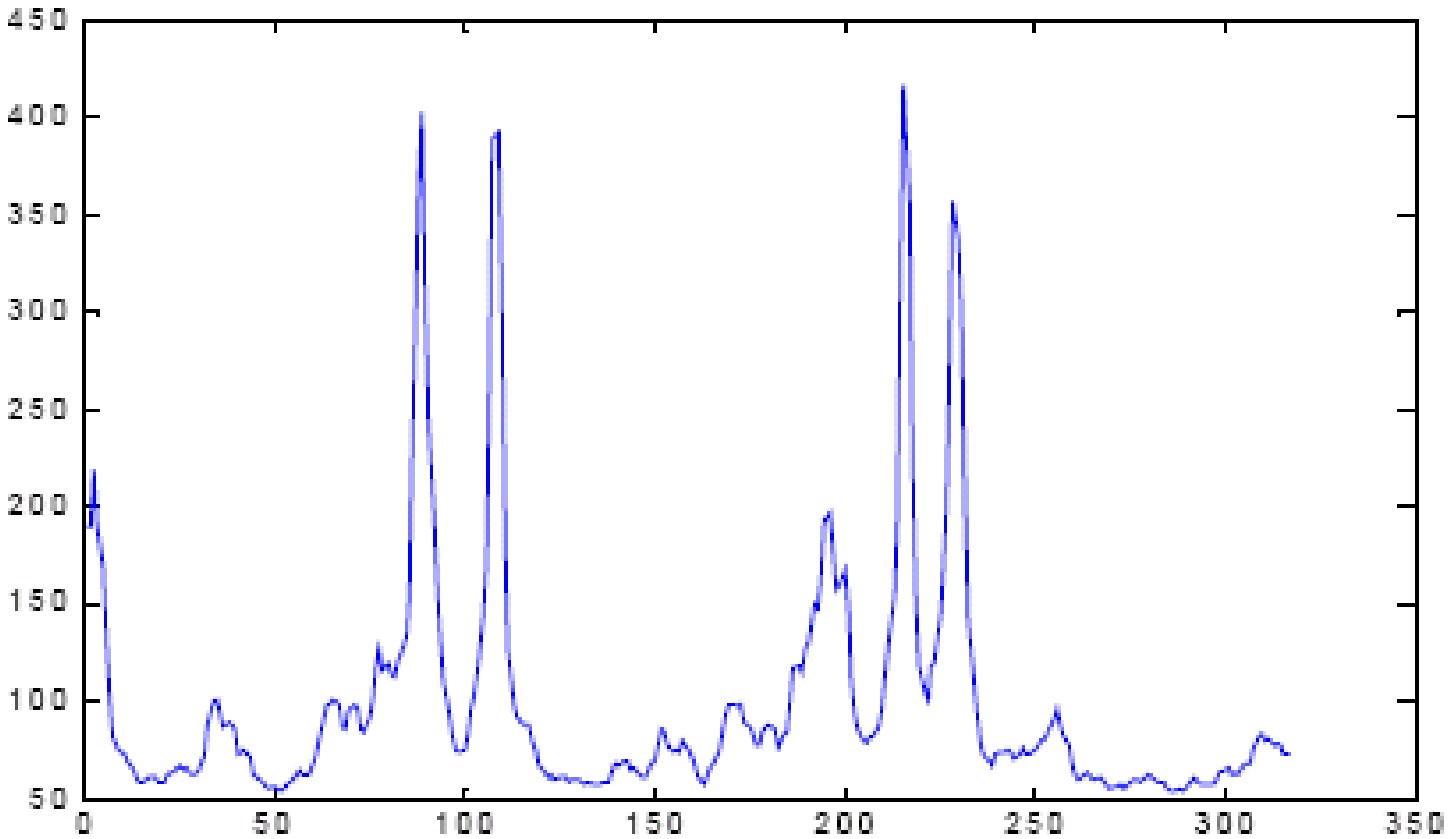
Relation to Earlier Work

- Adam, Marcet and Nicolini (ECB Working Paper No. 862, 2008) looked at the simpler model

$$\begin{aligned} p_t &= \beta E_t^*[p_{t+1} + y_{t+1}] \\ p_t &= cp_{t-1} \end{aligned}$$

  where in the REE c close to but below β^{-1}.
- AMN showed that once agents learn about c (rather than know it): tremendous improvement in asset pricing behavior
- Instead of white noise price process, our estimated learning model (quarterly US data 1926-2000) produced....

Relation to Earlier Work



Relation to Earlier Work

- Reason for empirical improvement:
  Feedback loop generated by forecasting equation

$$p_t = cp_{t-1}$$

  Expected capital gain $c \uparrow \implies$ actual capital gains $\uparrow$
- Momentum of returns and persistent deviations from REE fundamental value
- Difficulty in AMN: upward momentum could be so strong that estimates of c would cross the β^{-1}
- Had to impose an exogenous 'projection facility' to prevent this from happening

Innovation over Earlier Work

- Authors improve on these problems

$$p_t = \beta E_t^*[p_{t+1} + y_{t+1}] - \sigma_t^2 \widetilde{z}_t \tag{1}$$

- In the interesting learning state the forecasting equation is

$$p_t = cp_{t-1}$$

  where estimated c is close but below 1.
- If estimate of c would come close to β^{-1} (explosive dynamics) => variance estimate

$$\sigma_t = Var_t(p_{t+1} + y_{t+1})$$

  increases sufficiently fast & equation (1) implies dampening => system back to stability.
- This is great news with respect to AMN!

Discussion

- The issue here is that there is instability to the bottom:

$$p_t = \beta E_t^*[p_{t+1} + y_{t+1}] - \sigma_t^2 \widetilde{z}_t \tag{2}$$

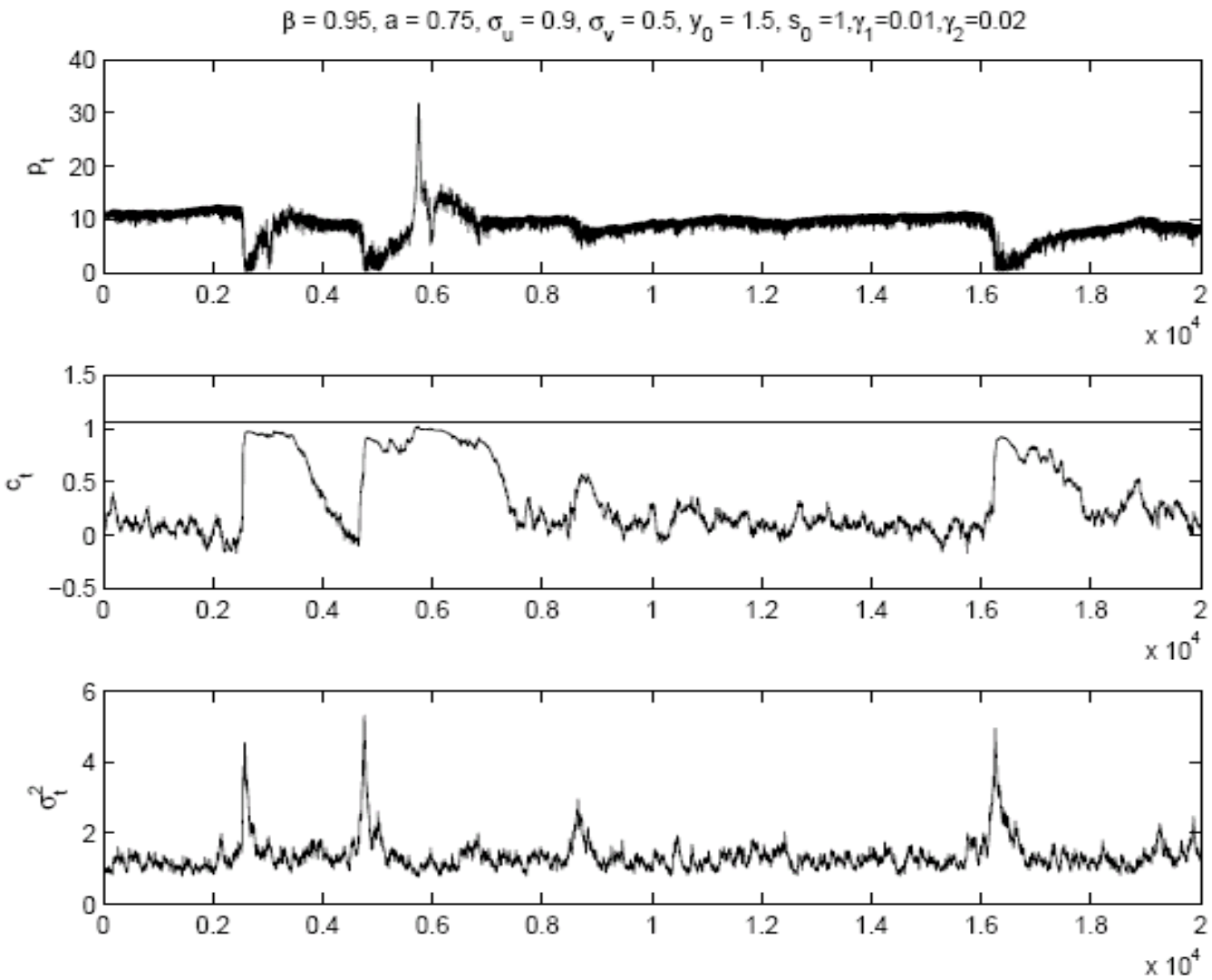
- Suppose estimated risk σ_t^2 increases => asset price decreases => further increase in risk & 'fast' learning on σ_t^2...
  => downward spiral has to be stopped somehow.
- Assumption: if price gets really low, then the share supply $\widetilde{z}_t$ shrinks to zero.
- Back in a model without role for σ_t^2: AMN (2008) -> no problem with negative share prices.
- Possibly mor attractive: exogenous share supply increases smoothly with stock price to get stability at the top & bottom, same learning speeds...

The Dynamics of Crashes and Bubbles

- Downward momentum effects very important:
  It is the crash that provides the foundation for a bubble!
- Asset price dynamics:
  (1) Start in the (empirically implausible) non-explosive REE
  (2) Downward spiral in p_t through increased risk estimates σ_t: *crash*
  (3) Agents increase estimated asset price persistence $c \approx 1$
  (4) As is known: $c \approx 1$ generates momentum effects
  (5) Recovery from low prices to higher prices and potentially overshooting of RE price: *bubble*
  (6) Reasons for bursting of the bubble: 'increased risk' but maybe still somewhat unclear

The Dynamics of Crashes and Bubbles

Figure 11: Constant gain learning with $\gamma_1 = .01, \gamma_2 = .02$.



Summary

Great paper!
Generates bubble and crash like asset price dynamics as escapes from fundamental towards bubble RE!
Challenge still open:
- construct a model of bubbles and crashes with only endogenous dynamics
Look forward to seeing more!