A Discussion of Roger Farmer’s
Global Sunspots and Asset Prices in a
Monetary Economy

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Main questions

• How (Do sunspots matter?)
• Can (sunspots matter) enough?
The **How** question

Main mechanism is good old **real indeterminacy** of equilibrium
How - Historical detour

Once upon a time, D. Cass, J. Geanakoplos and A. Mas Colell, M. Magill and M. Quinzii, .... constructed economies where:

- Financial assets were nominal: $n^j = \begin{pmatrix} n^j_1 \\ \vdots \\ n^j_S \end{pmatrix}$ - $S = \{1, \ldots, S\}$ is the state space, $J = \{1, \ldots, J\}$ are the assets traded;
- Markets were incomplete, $J < S$. 

Bisin
How - Historical detour

In these economies:

- the relevant asset span is the real asset span $<[r^j]_{j\in J}>$, where

$$r^j = \begin{pmatrix} n_j^1 \\ p_1 \\ \vdots \\ n_j^S \\ p_S \end{pmatrix}$$

- Given $[n^j]_{j\in J}$ the real asset span is parametrized by $(p_2, \ldots, p_S)$.

$\implies$ real indeterminacy arises: that is, an $S - 1$-dimensional manifold of equilibria parametrized by state-dependent inflation rates.
How - This paper

- OLG perpetual youth model with (two types - not necessary for the HOW question?) complete markets
- Main friction: bond is nominal asset
- Equilibrium conveniently reduced to

\[
\begin{bmatrix}
  m(t+1) \\
  b(t+1)
\end{bmatrix} = \begin{bmatrix}
  F(m(t),b(t)) \\
  G(m(t),b(t))
\end{bmatrix}
\]

where \( m(t) \) is the marginal rate of substitution at \( t \).
How - This paper

- OLG implies solution is not a function of total wealth (value of tree + value of gov’t bonds) \( W = p_k(1 - \tau) + b \); this is because the consumption decisions of agents born at \( t \) only depends on \( p_k(t) \), as they hold no gov’t bonds;

- Initial conditions + transversality condition (that is, the restriction that exogenous initial condition, \( p_k(0) \) and \( b(0) \) induce the stochastic discount factor \( m(0) \) and \( b(0) \) to be on the stable manifold) do not determine both \( p_k(0) \) and \( b(0) \) distinctly (and - as noted - the sum is not enough to determine the solution)

\[ \Rightarrow \text{real indeterminacy arises: that is, a 1-dimensional manifold of equilibria parametrized by inflation rate at } t = 0: p(1)/p(0). \]
How - From real indeterminacy to sunspots

Let \((S, \mu, \Sigma)\) be a probability space and \(m\) an i.i.d. (over time) random variable in the space.

Then \((S, \mu, \Sigma)\) is the sunspot space.
How - Taking stock

• Sunspots do not really act on (force) \( m \) - which is not an exogenous parameter of the model - they act on (force) \( p \), which instead is indeed exogenous and parametrized the real indeterminacy in the model.

• Prices \( p \) are in principal observable.

This is good!!
The **Can** question

- The calibration in the paper - taken literally (which I have to) - provides an affirmative answer to the Can question.
- But only with no discipline on the forcing variable $p$ - no link to inflation in the calibration.
Conclusion: What is the real interesting question

• Why should we care whether sunspots CAN matter enough? [historical/inside reasons?]

• Why not instead go back to asking whether they DO matter (caveat for the reader: Cass and Shell posed their question as a DO question but they are theorists, they really answered the “Can sunspot matter?” question)

• Why not even ask HOW MUCH (do sunspots matter?), relatively to the many other asset pricing factors factors people have identified.
Conclusion: Very interesting paper

• If I am right that HOW MUCH (do sunspots matter?) is the most interesting question in this day and age;

• then this paper, linking sunspots to an observable variable (e.g., inflation) is a clear important step ahead in the right direction.