

The Market Price of Risk and the Equity Premium: A Legacy of the Great Depression? by Cogley and Sargent

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Friedman and Schwartz

- The paper for this lecture is “The Market Price of Risk and the Equity Premium: A Legacy of the Great Depression?” by Timothy Cogley and Thomas J. Sargent.
- Friedman and Schwartz (1963), *Monetary History of the United States*.
- Depression shattered beliefs in natural economic stability.
- The “depression generation.”
- Quantify this idea.

Main ideas

- Consumption is driven by a two-state Markov process.
- Representative agent is a Bayesian learner.
- Initial beliefs from the 1930s are very pessimistic.
- Learning is slow.
- Asset pricing is distorted by these beliefs for a long time.

The equity premium

- Reconciling observed asset prices with standard models requires a large degree of risk aversion.
- Thought experiments suggest this degree of risk aversion is too large to be plausible.
- Distorted beliefs instead? “Small dose of initial pessimism.”
- Siegel (1992): EP 1802-1925 was 2.0 percent; 1926-1990 5.9 percent. *Prima facie* evidence.

Learning and pessimism

- Cecchetti, Lam, Mark (2000, AER): Equity premium due to distorted beliefs.
- No learning: agents are naturally and permanently pessimistic.
- This paper allows agents to learn their way out of their pessimism.
- No stability theorem. Agents simply learn the exogenous stochastic process governing consumption. GE?

Consumers

- Mehra-Prescott 85

$$U = E_0^s \sum_{t=0}^{\infty} \beta^t \frac{C_t^{1-\alpha} - 1}{1-\alpha}, \quad (1)$$

- Set $\alpha = 0.25$ and $\beta = 0.985$. “Mild risk aversion.”
- Expectations operator “subjective.”
- Consumption exogenously produced, nonstorable.
- Consumption growth follows a two-state Markov process, states g_h and g_ℓ , transition matrix F .
- Shares of exogenous productive unit are traded, also there is a risk free asset.

Asset prices

- Let

$$m_{t+1} = \beta \left(\frac{C_{t+1}}{C_t} \right)^{-\alpha} \quad (2)$$

- Then equity and risk-free asset prices are

$$P_t^e = E_t^s [m_{t+1} (P_{t+1}^e + C_{t+1})]$$

$$P_t^f = E_t^s [m_{t+1}]$$

- If E_t^s is the expectation implied by the true transition probabilities F , the agent has rational expectations. Call this E_t^a . The EP will be small in that case.
- Cecchetti et al 2000 showed that $E_t^s \neq E_t^a$ helps explain EP . But permanently distorted beliefs.

Convergence

- The consumption process is exogenous in this model.
- Learning about exogenous data is like econometrics: for stationary processes one can learn all moments of the distribution given enough data.
- That happens here but not in most models studied by Evans and Honkapohja.
- No feedback.
- Convergence to rational expectations means $EP \rightarrow 0$. How long does this take?

Consumption process

- Cecchetti et al 2000 (CLM) estimate 1890-1994

$$\Delta \ln C_t = \mu(S_t) + \epsilon_t \quad (3)$$

Table 1: Maximum Likelihood Estimates of the Consumption Process

	F_{hh}	F_{ll}	μ_h	μ_l	σ_ϵ
Estimate	0.978	0.515	2.251	-6.785	3.127
Standard Error	0.019	0.264	0.328	1.885	0.241

Note: Reproduced from Cecchetti, et. al. (2000)

- Has depression-like possibilities.
- Cogley-Sargent take the growth rate and transition probability estimates of the two states and set ϵ to zero.

Beliefs

- The household knows g_h, g_ℓ but does not know the transition probabilities.
- Household adopts a beta-binomial probability model for learning. (The “PLM”).
- The agent has independent beta priors over $(F_{hh}, F_{\ell\ell})$.
- This model works because the suppression of ϵ makes this the right model for learning about the two-state process.
- The agent counts the number of transitions and estimates the probability of switching.
- Suggests why this will be slow.

Passive learning

- This is partial equilibrium as is most of the asset pricing literature.
- The agent cannot affect the system by changing beliefs.
- Hence there is no active learning incentive here.

Decisions and prices

- At each date t the agent has an estimate of the transition probability matrix.
- The agent makes decisions based on the values in this matrix.
- The values are treated as constants when making decisions, but are random variables until convergence to REE.
- Kreps called this “anticipated utility.”
- A form of bounded rationality, but you can do the fully Bayesian optimal formulation.

The prior beliefs

- Cogley and Sargent would like to examine “shattered” prior beliefs.
- Suppose the household has initial, reference beliefs equal to the true transition probabilities.
- The depression “shatters” or distorts these beliefs in a particular way.
- These are the “worst case” transition probabilities that one could have given the reference model.
- The worst-case model should be hard to reject in a training sample T_0 . Detection probability model.

Simulation

- Draw 1,000 consumption growth paths of 70 years each.
- Let the pessimistic agent determine asset prices and apply Bayes rule each period.

Table 4: The Mean, Standard Deviation, and Sharpe Ratio for Excess Returns

	1872-2002	1872-1928	1929-2002	1929-1965	1966-2002
$E(R_{xt})$	0.0410	0.0266	0.0521	0.0708	0.0334
$\sigma(R_{xt})$	0.1734	0.1507	0.1892	0.2239	0.1474
$E(R_{xt})/\sigma(R_{xt})$	0.2364	0.1765	0.2754	0.3162	0.2266

Excess returns

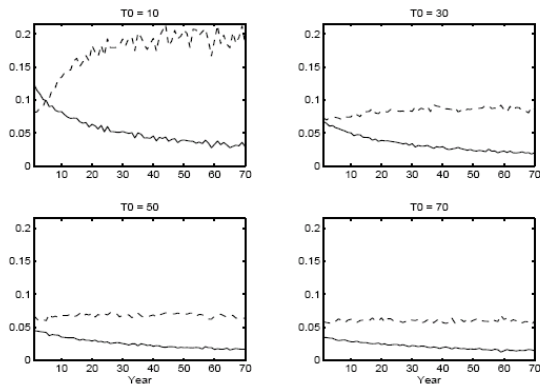


Figure 8: Mean and Standard Deviation of Excess Returns. Solid lines represent the mean and dashed lines the standard deviation.

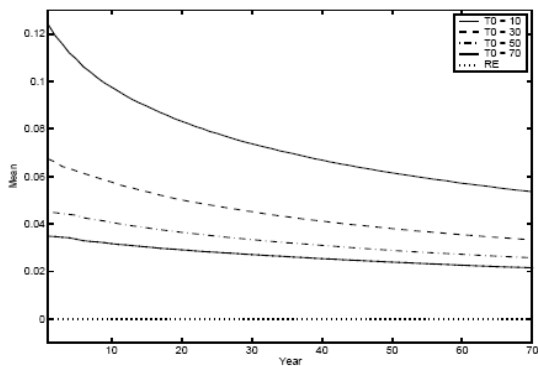


Figure 9: Mean Excess Returns from Year 1 Through Year t

Table 6: Model Equity Premia

	$T_0 = 10$	30	50	70
Full Simulation	0.0536	0.0333	0.0258	0.0216
First Half	0.0702	0.0431	0.0321	0.0263
Second Half	0.0370	0.0236	0.0195	0.0169

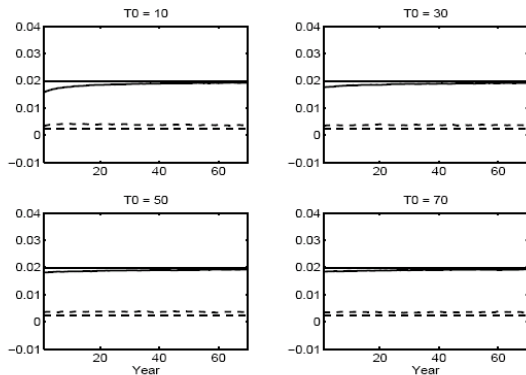


Figure 10: Mean and Standard Deviation of the Risk-Free Rate. Solid lines represent the mean, and dashed lines are standard deviations. Thick lines refer to the learning economy and thin lines to the rational-expectations equilibrium.

- This paper concerns Bayesian learning and asset pricing—a popular idea.
- The learning problem concerns exogenously generated data.
- The departure from RE is motivated by the Great Depression.
- Slow convergence is critical.