

Problem Set 7: Asset Pricing

Econ720. Fall 2009. Prof. Lutz Hendricks

1 Lucas trees¹

Consider a version of Lucas's asset pricing model with a large number of identical households each endowed with one tree. Each tree produces a stream of dividends, d_t , where $d_0 = 1$ and $\frac{d_{t+1}}{d_t}$ can take on one of two values, $\mu + \sigma$ or $\mu - \sigma$, where $\mu > 1$. The dividend growth rate is an i.i.d. random variable where the probability associated with each state is 0.5. Each household has preferences given by $E \sum_{t=0}^{\infty} \beta^t \ln c_t$ and c is consumption and β is the discount factor.

1. Define a recursive competitive equilibrium for this economy. Include markets for trees as well as contingent claims.
2. Compute the equilibrium prices for trees and contingent claims.
3. Use contingent claims prices to verify that your derivation for the price of trees is correct.
4. Using the contingent claim prices, obtain the price of a riskless bond – an asset that yields one unit of consumption the following period come what may.
5. Compute the average rate of return on bonds and trees. For riskless bonds, the return obviously is R whereas on equities (share of trees) the average return is the expected return $E(R_t^e) = E_t \left\{ \frac{p_{t+1} + d_{t+1}}{p_t} \right\}$. What is the equity premium ($E(R_t^e) - R_t$) for this economy?

¹Due to Rajesh Singh.