

Example 1: Efficient Risk Sharing in an Edgeworth Box Economy

Madonna owns a biotech startup company that will be worth \$100 million if it manages to get FDA approval for its new drug Nyuvana and \$50 million otherwise. Analysts put the probability of FDA approval at $1/3$. Sean has \$50 million in his trust fund, mainly invested in treasury securities. Neither of them has any other assets.

Sean and Madonna have similar attitudes toward risk. If either one of them spends $c \geq 0$ dollars on consumption, the utility from consumption is $u(c) = \ln c$, where $\ln c$ denotes the natural logarithm of the number $c \geq 0$. When faced with a choice under uncertainty, Sean and Madonna are assumed to maximize the expected value of utility.

1. What are the states of nature in this problem? What are their probabilities?
2. What are the contingent commodities? How would you describe a contingent commodity bundle?
3. Describe the individual's preferences using a utility function defined on contingent commodity bundles.
4. Describe an allocation for this economy? When is the allocation attainable?
5. What conditions must be satisfied in order for an allocation to be Pareto-efficient?
6. What does the set of Pareto-efficient allocations look like?

7. What do you notice about the co-movement of consumption between the two individuals?
8. Now suppose that there is a large number of individuals like Sean and Madonna who can trade contingent commodities at market-clearing prices. Describe the maximization problems that represent Sean's and Madonna's individual decisions.
9. Derive Sean's and Madonna's demand functions for contingent commodities.
10. What are the prices and quantities traded in a competitive equilibrium of this economy?