

QF600: Asset Pricing

State Prices

Share Prices

- Risk-free rate of 1.1 for riskless bond
- Initial share price of 45 for Stock A and B
- Final share price after one year:

State	Good	Normal	Bad
Phys Prob	0.3	0.5	0.2
Stock A	75	55	20
Stock B	60	50	40

State Prices

- Vector of state prices:

$$\begin{bmatrix} \frac{1}{1.1} & 45 & 45 \end{bmatrix} \begin{bmatrix} 1 & 75 & 60 \\ 1 & 55 & 50 \\ 1 & 20 & 40 \end{bmatrix}^{-1} = \begin{bmatrix} 0.2273 & 0.4091 & 0.2727 \end{bmatrix}$$

- Vector of risk-neutral probabilities:

$$\begin{bmatrix} 0.2273 & 0.4091 & 0.2727 \end{bmatrix} \times 1.1 = \begin{bmatrix} 0.25 & 0.45 & 0.30 \end{bmatrix}$$

Call Option

- Option to buy one share of Stock A and one share of Stock B for 100
- Vector of final payoffs for option:

$$\begin{bmatrix} \max(75 + 60 - 100, 0) \\ \max(55 + 50 - 100, 0) \\ \max(20 + 40 - 100, 0) \end{bmatrix} = \begin{bmatrix} 35 \\ 5 \\ 0 \end{bmatrix}$$

- Initial price for option:

$$35 \times 0.2273 + 5 \times 0.4091 = 10$$