Unit 11 - Week 8: Optimal Portfolio and Consumption

Course outline

- How does an NPTEL online course work?
- MATLAB
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- Week 1: Basics of Probability Theory
- Week 2: Basics of Financial Markets
- Week 3: Mean-Variance Portfolio Theory
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  - Lec 2: Optimal portfolio for single-period discrete time model
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Assignment 8

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-11-11, 23:59 IST.

1) Consider a portfolio comprising of 1 bond and 1 stock, whose price at time $t = 0$, are 10 and 20, respectively. *1 point*
If the total wealth available at time $t = 0$ is $X(0) = 40$, then the consumption $c(0)$ at time $t = 0$,
that renders the portfolio as **exactly** self-financing, equals :

- 9
- 10
- 11
- 12

No, the answer is incorrect.
Score: 0
Accepted Answers:
10

2) Which of the following gives self-financing condition, before consumption at time t : *1 point*

- $X(t) - c(t) = \sum_{i=0}^{N} \delta_i(t) S_i(t)$
- $X(t) - c(t) = \sum_{i=0}^{N} \delta_i(t+1) S_i(t)$
- $X(t) = \sum_{i=0}^{N} \delta_i(t) S_i(t)$
- $X(t) = \sum_{i=0}^{N} \delta_i(t+1) S_i(t)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$X(t) = \sum_{i=0}^{N} \delta_i(t) S_i(t)$

3) Consider an investment opportunity which pays 1728 with probability $\frac{1}{2}$ or pays 125 with probability $\frac{1}{2}$. *1 point*
If an investor has the utility function $U(x) = x^{\frac{1}{3}}$, then the expected utility for the investor on this investment opportunity equals :

- 8.5
- 18
- 9
- 12

No, the answer is incorrect.
Score: 0
Accepted Answers:
8.5

4) Consider two opportunities over a single period ($t = 0$ and $t = 1$):

1. Opportunity 1: The invested money earns 0% interest rate.
2. Opportunity 2: The invested money doubles or halves each with equal probabilities.

If an amount of 40 is invested in Opportunity 1 and an amount of 60 is invested in Opportunity 2, with the utility function $U(x) = \sqrt{x}$, then the expected utility at time $t = 1$, equals:

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 10.45,10.55

1 point

5) Suppose that we have an amount of 100 for investment, for a single period.
We invest in 3 units of stock at time $t = 0$ at a price of $S(0) = 20$, per stock,
with the remaining amount being invested at the risk-free rate of 5% per period. If the stock is modeled using the binomial model with
$u = 1.1,\ d = 0.9,\ p = \frac{1}{2}$ and $q = \frac{1}{2}$, then the expected utility at time $t = 1$, for $U(x) = \sqrt{x}$ equals :

Hint

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 10.0 ,10.2

1 point

6) Consider a binomial model with $S(0) = 100,\ u = 1.1,\ d = 0.9\ p = \frac{1}{2}$ and $q = \frac{1}{2}$. *1 point*
If out of an initial amount of $x = 200$, investment is made in δ stocks with the remaining amount being invested at
the risk-free rate of $r = 5\%$ per period, then the optimal $\hat{\delta}$ for maximum expected log-utility over a single period, equals :

- 8
- -14
- 12
- -10

No, the answer is incorrect.
Score: 0
Accepted Answers:
-14

7) State whether the following is TRUE or FALSE : *1 point*
The Dynamic Programming Principle approach for portfolio optimization is used in the discrete time setup :

- TRUE
- FALSE

No, the answer is incorrect.
Score: 0
Accepted Answers:
TRUE

8) Suppose that the stock price follows a binomial model where the stock price goes up by a factor *1 point*
u (with probability q) or goes down by a factor d (with probability p), and the risk-free rate is given by r per period.
For an investor with $X(T-1) = x,\ S(T-1) = x$ and $U(x) = \sqrt{x}$, who invests a fraction δ of the wealth x
at risk-free rate and the remaining wealth in the stock, the Dynamic Programming Principle between time $T-1$ and T is given by :

- $V(T-1, x) = \max_{\delta} E_{T-1,x}\left[p\sqrt{(1+\delta)xu + \delta x(1+r)} + q\sqrt{(1-\delta)xd + \delta x(1+r)}\right]$
- $V(T-1, x) = \max_{\delta} E_{T-1,x}\left[p\sqrt{(1+\delta)xd + \delta x(1+r)} + q\sqrt{(1-\delta)xu + \delta x(1+r)}\right]$
- $V(T-1, x) = \max_{\delta} E_{T-1,x}\left[q\sqrt{(1-\delta)xu + \delta x(1+r)} + p\sqrt{(1-\delta)xd + \delta x(1+r)}\right]$
- $V(T-1, x) = \max_{\delta} E_{T-1,x}\left[q\sqrt{(1-\delta)xd + \delta x(1+r)} + p\sqrt{(1-\delta)xu + \delta x(1+r)}\right]$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$V(T-1, x) = \max_{\delta} E_{T-1,x}\left[q\sqrt{(1-\delta)xu + \delta x(1+r)} + p\sqrt{(1-\delta)xd + \delta x(1+r)}\right]$