

Economics of Finance

Tutorial 3

1. Suppose there are three possible states of the world in the next period, denoted by good weather (GW), fair weather (FW) and bad weather (BW). Also, three securities are available on the market with payoffs in each state listed below.

	Bond	Stock
GW	20	50
FW	20	30
BW	20	0

The prices of the two securities are: $p_{Bond} = 19$, $p_{Stock} = 16.5$.

(i) Suppose an investor needs to hedge the following payments:

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 $c = \begin{pmatrix} 0 \\ 6 \\ 20 \end{pmatrix}$
(states)

Is it possible to perfectly replicate the portfolio? Why?

(ii) Suppose a dealer now offer a European put option which expires at period 1. The strike price of the option is 20. The option is sold at 13, and the dealer does not allow shorting. Does the option help hedge the payments specified in part (i)?

(iii) In light of your answer to part (ii), the dealer hires you to provide a range of price for the option. What advice can you give?

(iv) Based on your analysis in part (i)-part (iii), comment on the role of financial engineering and financial market innovations.

2. Consider the following three bonds that make the coupon payments listed below:

	$B1$	$B2$	$B3$
Year 1	100	5	0
Year 2	0	5	0
Year 3	0	105	100

The prices of these bonds are as follows: $p_{B1} = 95$, $p_{B2} = 88$, $p_{B3} = 75$.

(i) Compute the discount factors for Years 1, 2 and 3.

(ii) Suppose an investor wants to receive the following payment vector:

$$c = \begin{pmatrix} 50 \\ 10 \\ 20 \end{pmatrix}$$

Construct a portfolio of the three bonds that generates this payment vector. What is the arbitrage-free price of this portfolio?

- (iii) Compute the interest rates $i(1)$, $i(2)$ and $i(3)$. Explain in words the interpretation on $i(3)$.
- (iv) Compute the duration and the modified duration of the three bonds. How do you interpret these numbers?

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