Problem set: Hand in 1

Exercise 1.

[1]

_ _ _ _ _ _ _ _ are financial assets.
A) Bonds
B) Machines
C) Stocks
D) A and C
E) A, B and C

Exercise 2.

[1]

The organized exchanges are examples of _ _ _ _ _ _ _ _ _.

A) auction markets
B) continuous markets
C) secondary markets
D) A and B
E) A, B, and C

Exercise 3.

[3]

In the event of the firm's bankruptcy

A) the most shareholders can lose is their original investment in the firm's stock.
B) common shareholders are the first in line to receive their claims on the firm's assets.
C) bondholders have claim to what is left from the liquidation of the firm's assets after paying the shareholders.
D) the claims of preferred shareholders are honored before those of the common shareholders.
E) A and D.

Exercise 4.

[3]

You sell short 100 shares of Loser Co. at a market price of $45 per share. Your maximum possible loss is

A) $4500
B) unlimited
C) zero
D) $9000
E) cannot tell from the information given

Exercise 5.

[3]

You purchased a share of stock for $20. One year later you received $1 as dividend and sold the share for $29. What was your holding period return?

A) 45%
B) 50%
C) 5%
D) 40%
E) none of the above

Exercise 6.

[5]

Toyco stock has the following probability distribution of expected prices one year from now:

State	Probability	Price
1	25%	$ 50
2	40%	$ 60
3	35%	$ 70

If you buy Toyco today for $55 and it will pay a dividend during the year of $4 per share, what is your expected holding period return on Toyco?

A) 7.27%
B) 18.18%
C) 10.91%
D) 16.36%
E) 9.09%

Exercise 7.

[3]

You purchased a share of stock for $120. One year later you received $1.82 as dividend and sold the share for $136. What was your holding period return?

A) 14.85%
B) 22.12%
C) 15.67%
D) 13.24%
E) none of the above

Exercise 8.

[Easy]

Discuss why common stocks must earn a risk premium.

Exercise 9.

[Moderate]

Discuss how the investor can use the separation theorem and utility theory to produce an efficient portfolio suitable for the investor's level of risk tolerance.

Exercise 10.

OBX stocks- correlations

In class you saw the correlation structure of the fifteen largest stocks in the OBX index. In this exercise you are asked to do the same exercise, but for the five lowest ranked stocks.

Specifically, the OBX consists of the following twenty five stocks: EQNR.OL, DNB.OL, AKRBP.OL, NHY.OL, YAR.OL, TEL.OL, MOWI.OL, ORK.OL, TOM.OL, STB.OL, KOG.OL, NOD.OL, SALM.OL, SUBC.OL, NEL.OL, VAR.OL, AUTO.OL, SCHA.OL, FRO.OL, KAHOT.OL, GOGL.OL, MPCC.OL, NAS.OL, RECSI.OL, PGS.OL

For the five last of these, download stock prices for the period 2016–2022, construct the time series of monthly returns, and calculate the estimated correlations between these five stocks. Show the table of correlations in a similar format to that shown in class.

In your solution include an appendix with your R code.

Exercise 11.

You have been given this probability distribution for the holding period return for a stock:

State of the Economy	Probability	Holding Period Return
Boom	0.40	22%
Normal growth	0.35	11%
Recession	0.25	−9%

1. What is the expected holding period return for the stock?

   A) 11.67%
   B) 8.33%
   C) 10.4%
   D) 12.4%
   E) 7.88%

2. What is the expected standard deviation for the stock?

   A) 2.07%
   B) 9.96%
   C) 7.04%
   D) 1.44%
   E) 12.17%

3. What is the expected variance for the stock?

   A) 142.07%
   B) 189.96%
   C) 177.04%
   D) 148.04%
   E) 128.17%

Exercise 12.

[3]

Which of the following statements regarding risk-averse investors is **true**?

A) They only care about the rate of return.
B) They accept investments that are fair games.
C) They only accept risky investments that offer risk premiums over the risk-free rate.
D) They are willing to accept lower returns and high risk.
E) A and B.

Exercise 13.

[3]

Consider the following two investment alternatives. First, a risky portfolio that pays a 15 percent rate of return with a probability of 60% or a 5 percent return with a probability of 40%, and second, a T-bill that pays 6 percent.

1. The risk premium on the risky investment is

   A) 11 percent.
   B) 1 percent.
   C) 9 percent.
   D) 5 percent.
   E) none of the above.

2. If you invest $50,000 in the risky portfolio, your expected profit would be_ _ _ _ _ _ _ _ _ _.

   A) $5,500
   B) $7,500

C) $25,000
D) $3,000
E) none of the above

Exercise 14.

[5]

	Investment	Expected Return E(r)	Standard Deviation
	1	0.12	0.3
Given	2	0.15	0.5
	3	0.21	0.16
	4	0.24	0.21

Utility function

$U = E(r) - (A/2)s^2$, where $A = 4.0$

1. Based on the utility function above, which investment would you select?
   A) 1
   B) 2
   C) 3
   D) 4
   E) cannot tell from the information given
2. Which investment would you select if you were risk neutral?
   A) 1
   B) 2
   C) 3
   D) 4
   E) cannot tell from the information given

Exercise 15.

[3]

The standard deviation of a portfolio that has 40% of its value invested in a risk-free asset and 60% of its value invested in a risky asset with a standard deviation of 40% is _____%.

A) 18
B) 14
C) 19
D) 24
E) 20

Exercise 16.

[3]

If the standard deviation of stock 'A' is 38, the standard deviation of stock 'B' is 27, and the correlation between stocks 'A' and 'B' is -0.6, the covariance between stocks 'A' and 'B' is ___.

A) 615.6
B) -615.6
C) 27
D) -27
E) 417.23

Exercise 17.

[1]

When a portfolio consists of only a risky asset and a riskless asset, increasing the fraction of the overall portfolio invested in the risky asset will

A) increase the expected return on the portfolio.
B) increase the standard deviation of the portfolio.
C) not change the risk-reward ratio.
D) Neither A, B nor C is true.
E) A, B and C are all true.

Solutions

Problem set: Hand in 1

Solution to Exercise 1.

[1]

D

Machines are real assets; stocks and bonds are financial assets.

Solution to Exercise 2.

[1]

E

The organized exchanges have all of the above characteristics.

Solution to Exercise 3.

[3]

E

Shareholders have limited liability and have residual claims on assets. Bondholders have a priority claim on assets, and preferred shareholders have priority over common shareholders.

Solution to Exercise 4.

[3]

B

A short seller loses money when the stock price rises. Since there is no upper limit on the stock price, the maximum theoretical loss is unlimited.

Solution to Exercise 5.

[3]

B

($1 + $29 - $20)/$20 = 0.5000, or 50%.

Solution to Exercise 6.

[5]

B

E(P1) =.25 (54/55 - 1) +.40 (64/55 - 1) +.35 (74/55 - 1) = 18.18%.

Solution to Exercise 7.

[3]

A

($1.82 + $136 - $120)/$120 = 0.1485, or 14.85%.

Solution to Exercise 8.

[Easy]

Most investors are risk averse; that is, in order to accept the risk involved in investing in common stocks, the investors expect a return from the stocks over and above the return the investors could earn from a risk-free investment, such as U. S. Treasury issues. This excess return (the return in excess of the risk-free rate) is the risk premium required by the investors to invest in common stocks.

The purpose of this question is to ascertain that the students understanding the basic risk-return relationship, as the relationship applies to investing in common stocks vs. a risk-free asset (i.e., why would investors be willing to assume the risk of common stock as investment vehicles)?

Solution to Exercise 9.

[Moderate]

One can identify the optimum risky portfolio as the portfolio at the point of tangency between a ray extending from the risk-free rate and the efficient frontier of risky securities. Below the point of tangency on this ray from the risk-free rate, the efficient portfolios consist of both the optimum risky portfolio and risk-free investments (T-bills); above the point of tangency, the efficient portfolios consist of the optimum risky portfolio purchased on margin. If the investor's indifference curve, which reflects that investor's preferences regarding risk and return, is superimposed on the ray from the risk-free rate, the resulting point of tangency represents the appropriate combination of the optimum risky portfolio and either risk-free assets or margin buying for that investor. Thus, the separation theorem separates the investing and financing decisions. That is, all investors will invest in the same optimal risky portfolio, and adjust the risk level of the portfolio by either lending (investing in U. S. Treasuries, i.e., lending to the U. S. government) or borrowing (buying risky securities on margin).

The purpose of this question is to ascertain whether the student understands the basic principles of utility theory, the optimal risky portfolio, and the separation theorem, as these concepts relate to constructing the ideal portfolio for a particular investor.

Solution to Exercise 10.

OBX stocks- correlations

This is a matter of adding the line

```
print(xtable(CorrMat[21:25,21:25]),file=ofilename)
```

to the end of the code provided,

Which results in a tible like the below

	GOGL.OL	MPCC.OL	NAS.OL	RECSI.OL
MPCC.OL	0.40			
NAS.OL	0.11	0.21		
RECSI.OL	0.05	0.12	0.06	
PGS.OL	0.34	0.31	0.20	0.07

For the interested, this is the full R code

```
library(quantmod)
library(zoo)
fdate <- as.yearmon("2015-01")
ldate <- as.yearmon("2022-12")

symbols <- read.table("../../misc/obx.txt",header=FALSE)
names(symbols) <- "symbols" # list with index constituents
started <- FALSE
all_obx_returns <- NULL
for (i in 1:nrow(symbols)){
    symbol <- trimws(symbols[i,1]) # the first date (fdate) needs to be defined
    data <- getSymbols(symbol, source="yahoo", auto.assign=FALSE, from=fdate)
    daily_prices <- na.omit(data[,6])
    monthly_returns <- monthlyReturn(daily_prices)
    names(monthly_returns) <- symbol
    index(monthly_returns) <- as.yearmon(index(monthly_returns))
    if (nrow(monthly_returns)>1) {
        if (!started){
            all_obx_returns <- monthly_returns
            started <- TRUE
        }
        else {
            all_obx_returns <- merge(all_obx_returns,monthly_returns,all=TRUE)
```

```
        }
    }
}
all_obx_returns <- window(all_obx_returns, start=fdate,  end=ldate)
CorrMat <- cor(all_obx_returns,use="pairwise.complete.obs")
CorrMat[upper.tri(CorrMat,diag=TRUE)]<-NA
print(CorrMat[21:25,21:25])
```

Solution to Exercise 11.

1. C
   HPR =.40 (22%) +.35 (11%) +.25 (-9%) = 10.4%
2. E
   s = $[.40\ (22 - 10.4)^2 + .35\ (11 - 10.4)^2 + .25\ (-9 - 10.4)^2]^{1/2} = 12.167\%$
3. D
   s = $[.40\ (22 - 10.4)^2 + .35\ (11 - 10.4)^2 + .25\ (-9 - 10.4)^2] = 148.04$

Solution to Exercise 12.

[3]

C

Solution to Exercise 13.

[3]

1. D
   15%(0.6) + 5%(0.4) = 11%; 11% - 6% = 5%.
2. A
   \$50,000(0.11) = \$5,500.

Solution to Exercise 14.

[5]

1. C U(c) = 0.21 - 4/2$(0.16)^2$ = 15.88 (highest utility of choices).
2. D
   If you are risk neutral, your only concern is with return, not risk.

Solution to Exercise 15.

[3]

D

(.6)*(40%) = 24

Solution to Exercise 16.

[3]

B

(-0.6)(38)(27) = -615.6

Solution to Exercise 17.

[1]

E

All three statements correctly describe a portfolio invested in a combination of a risky asset and a riskless asset.