

SHANGHAI UNIVERSITY OF FINANCE AND ECONOMICS

FINANCE 0003

INTRODUCTION TO FINANCIAL MANAGEMENT

JOHN L. TEALL

SUMMER 2016

Practice version 1

(Part 1: Closed Book; No papers, notes, books, calculators or phones; 100 minutes total)

1. List all of the factors that would affect the ending balance of a savings account with one deposit. List those factors whose increase would increase the ending balance of the savings account.
2. Under what circumstances might increasing the risk of one of the securities in a portfolio decrease portfolio risk?
3. In a perfectly efficient market, how can we expect security prices to evolve over time? That is, how do security prices change in a perfectly efficient market? Why?

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1. I have the opportunity to purchase for \$4,900 an investment that will pay \$1000 at the end of six months, \$1100 at the end of one year, \$1210 at the end of eighteen months, \$1331 at the end of two years and \$1464.10 at the end of thirty months. Assuming that I discount all of my cash flows at an annual rate of 20%, should I purchase this investment? Why or why not?
2. What is the internal rate of return for a perpetuity which will pay \$350 at the end of next year, \$385 the following year and continue forever to make annual cash flow payments which will be 10% larger than in the prior year? Assume that this perpetuity can be purchased for \$1400.
3. I have the opportunity to deposit \$10,000 into my savings account today that pays interest at an annual rate of 5.5%, compounded daily. What will be the ending balance of my account in five years if I make no additional deposits or withdrawals?
4. What would be the present value of a fifty-year annuity whose first cash flow of \$5,000 is paid in ten years and whose final (fiftieth) cash flow is paid in 59 years? Assume that the appropriate discount rate is 12% for all cash flows.
5. Stock A will generate a return of 10% if and only if Stock B yields a return of 15%; Stock B will generate a return of 10% if and only if Stock A yields a return of 20%. There is a 50% probability that Stock A will generate a return of 10% and a 50% probability that it will yield 20%.
 - a. What is the standard deviation of returns for Stock A?
 - b. What is the covariance of returns between Stocks A and B?
6. A firm needs to decide between the purchase of two computer systems. The first system, a Moon Microgalactica, currently sells for \$25,000; the second, a Star Minicom sells for \$30,000. Both systems have ten year life expectancies. The Moon system has an expected salvage value of \$5,000 and the Star system has an expected salvage value of \$10,000. The Moon system requires the firm to maintain a \$5000 inventory of miscellaneous hardware on hand; this hardware can be sold when the system is salvaged. Thus, this inventory can be treated as a working capital requirement. Both systems have identical operating costs and will be depreciated on a straight-line basis. The firm discounts all cash flows at a rate of ten percent and operates in a forty percent income tax bracket. Does the NPV of the Moon system exceed that of the Star system? If your answer is yes (or no), by how much do their prices differ?

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Solutions Practice version 1

1. Deposit amount, interest rate, the number of times interest is compounded, length of time deposit is maintained

2. Either of the following may be correct:

1. If security returns are appropriately inversely correlated. Increasing the investment in one security might decrease the risk of the portfolio if diversification improves, or

2. If the higher risk asset is short sold subject to and with appropriate weights

3. In a perfectly efficient market, security prices evolve randomly. This is because, in a perfectly efficient market, prices are a function of information. Prices evolve (change) because of new information (news). News occurs randomly; otherwise it isn't news. Therefore, price changes occur randomly.

1. The investment should not be purchased due to the following:

$$PV = \frac{\$1,000}{(1+.2)^5} + \frac{\$1,100}{(1+.2)^1} + \frac{\$1,210}{(1+.2)^{1.5}} + \frac{\$1,331}{(1+.2)^2} + \frac{\$1,464.1}{(1+.2)^{2.5}} = \$4602.47 < \$4,900$$

2. $0 = NPV = -\$1,400 + \$350/(r-.10)$; Solve for r ; $r = \$350/\$1400 + .10 = .35 = IRR$

3. $\$10,000(1+.055/365)^{5 \cdot 365} = \$13,165.03$

4. This problem can be solved with either of the following:

$$PV = \$5,000 \bullet \frac{\frac{1}{.12} - \frac{1}{.12(1+.12)^{50}}}{(1+.12)^9} = \$14,973.42$$

$$PV = \$5,000 \bullet \left(\frac{1}{.12} - \frac{1}{.12(1+.12)^{59}} \right) - \$5,000 \bullet \left(\frac{1}{.12} - \frac{1}{(1+.12)^9} \right) = \$14,973.42$$

4. Deposit amount, interest rate, the number of times interest is compounded, length of time deposit is maintained

5. Expected Return, Variance and Standard Deviation for Stock A

i	R _i	P _i	R _i P _i	R _i - E[R _a]	(R _i - E[R _a]) ²	(R _i - E[R _a]) ² P _i
1	.10	.50	.05	-.05	.0025	.00125
2	.20	.50	.10	.05	.0025	.00125

$E[R_a] = .15$
 Calculations for Stock B

$$\sigma_a^2 = .0025;$$

$$\sigma_a = .05$$

i	R_i	P_i	$R_i P_i$	$R_i - E[R_b]$
1	.15	.50	.075	.025
2	.10	.50	.05	-.025

$E[R_b] = .125$

Covariance between Returns on Stocks A and B

i	R_{ai}	R_{bi}	P_i	$R_{ai} - E[R_a]$	$R_{bi} - E[R_b]$	$(R_{ai} - E[R_a])(R_{bi} - E[R_b])P_i$
1	.10	.15	.50	-.05	.025	-.000625
2	.20	.10	.50	.05	-.025	-.000625

$COV(A,B) = -.00125$

6. The NPVs are the same. The working capital requirement offsets the difference between the purchase prices at time zero and the differences in salvage value in the tenth year. The depreciation write-offs are the same for both systems.

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1. What is the internal rate of return for an investment whose present value equals its terminal (or future) value? You may assume that discount rates equal interest rates.

- 2.a. What is the present value of a positive cash flow perpetuity whose growth rate exceeds its positive discount rate?
 - b. Under what circumstances is historical returns variance a good proxy (substitute) for projected (future) variance?

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Practice version 2 (Part 2: Open Book: No computers or phones)

1. The following table represents outcome numbers, probabilities and associated returns for stock A:

<u>outcome (i)</u>	<u>return (R_i)</u>	<u>Probability (P_i)</u>
1	.05	.10
2	.15	.10
3	.05	.05
4	.15	.10
5	.15	.10
6	.10	.10
7	.15	.10
8	.05	.10
9	.15	?
10	.10	.10

Thus, there are ten possible return outcomes for Stock A.

- a. What is the probability associated with Outcome 9?
 - b. What is the standard deviation of returns associated with Stock A?
2. What would be the present value of a 40-year annuity whose first cash flow is \$50, and subsequent cash flows are expected to grow each year at an annual rate of 15%, compounded annually? Assume that cash flows are paid at the beginning of each year and are discounted at an annual rate of 20%.
3. I expect to make a deposit of \$1000 into my pension fund account in one year, with additional deposits to follow for a total of forty years when I retire. The amount to be deposited in each year will be 5% larger than in the prior year (e.g: \$1050 deposited in the second year, \$1102.50 in the third year, etc.). Furthermore, the retirement account will accrue interest on accumulated deposits at an annual rate of 8%, compounded annually. What will be the terminal value of the account at the end of the forty-year period? Show how to derive a computationally efficient expression to solve this problem.
4. I have purchased a piece of equipment for \$10,000 that will be financed by a five year loan accumulating interest at an annual rate of ten percent. The loan will be amortized over the five-year period with equal annual payments. What will be the amount of the annual payment?
5. The expected variance of returns on my two-security portfolio is .08. The variance of my only risky security is .10; my other security is riskless and has an expected return of .10. The expected return of the risky security is .25. What is the expected return of my portfolio?
6. What is the standard deviation of returns for an equally weighted portfolio comprised of two independent securities with return variances equal to .09?

7. Assume that required returns equal expected returns. Security A will have a return of 15% if the market return is 10%; it will earn a return of 20% if the market return is 15% and will earn a return of 30% if the market return is 20%. These are the only potential outcomes, and they are equally likely.

a. What is the Beta of this security?

b. What is the riskless rate of return in this market?

8. The Smith Company is considering the purchase of a new machine to replace the one with which it currently operates. The old machine was purchased four years ago for \$700,000 and can be traded in now for \$300,000. Both machines may be depreciated on a straight line basis; both have expected salvage values of \$100,000. The old machine had a life expectancy when purchased of ten years and is capable of producing 60,000 units per year. Each unit can be sold for \$9. The new machine can be purchased for \$900,000 and qualifies the company to an investment tax credit totaling \$45,000. The new machine has a life expectancy of six years and is capable of producing 100,000 units. The company operates in the forty percent marginal income tax bracket and discounts all of its cash flows at eleven percent. Annual operating costs are the same (\$300,000) for both machines. Should the Smith Company purchase the new machine or continue to operate with the old machine? Would your answer change if the company discounted all of its cash flows at a twenty percent rate?

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Solutions Practice version 2

1. Since $FV = PV(1+i)^n$, $i=k$ must equal r which must equal zero.

2.a. infinity. The PV_{GP} formula suggests that the present value of such a perpetuity should be negative, which is obviously wrong. The perpetuity lasts forever and the present value of the cash flow in each successive year exceeds that for the prior year. Thus, its value approaches infinity as the series length approaches infinity.

b. when security risk or volatility is constant over time.

1. a. $Pr = .15$ since the sum of the probabilities equals 1.

b. $\sigma = .042$; It may be easier to combine those outcomes with identical returns before performing calculations.

2. $PV_{GA} = 817.75(1.2) = 981.30$ Don't forget to multiply PV_{GA} by $1+i$ since payments are made at the beginning of the year.
 $981.30 = [50 / (.2 - .15)] * [1 - (1+.15)^{40} / (1+.2)^{40}] * [1+.2]$

3. a. Calculate as follows:

$$FV_{GA} = \$1000x \left[\frac{1}{.08 - .05} - \frac{(1+.05)^{40}}{(.08 - .05)(1+.08)^{40}} \right] x (1+.08)^{40} = \$489,483.94$$

b. Either use the geometric expansion to obtain the following equation (multiplying both sides of the original function by $(1+g)/(1+k)$):

$$FV_{GA} = \$1000x \left[\frac{(1+.08)^{40} - (1+.05)^{40}}{(.08 - .05)} \right] = \$489,483.94$$

or, multiply the present value growing annuity function by $(1+k)^n$ to obtain the function used in part a.

4. Use present value annuity function to amortize the loan. The payment is \$2637.97.

5. $.08 = w^2_{risky} \cdot .10 + w^2_{riskless} \cdot 0$; $w_{risky} = .8944$

$$E[R_p] = .8944 \cdot .25 + .1056 \cdot .10 = .2342$$

6. $\sigma_p = [.5^2 \cdot .09 + .5^2 \cdot .09 + 2(.5 \cdot .5 \cdot 0)]^{1/2} = [.0225 + .0225]^{1/2} = .2121$

7. Calculate as follows:

j	$R_{A,j}$	$R_{M,j}$	P_j	
1	.15	.10	.33	$E[R_A] = .2167$
2	.20	.15	.33	$E[R_M] = .15$
3	.30	.20	.33	

a. $\sigma_{A,M} = \Sigma (R_{A,j} - E[R_A]) \cdot (R_{M,j} - E[R_M]) \cdot P_j = .0025$

$$\sigma_{M2} = \Sigma (R_{M,j} - E[R_M])^2 \cdot P_j = .001666666666667$$

$$\beta_A = \sigma_{A,M} \div \sigma_M^2 = 1.5$$

b. $E[R_{A,j}] = r_f + \beta_A(E[R_{M,j}] - r_f)$; Everything here is known except for r_f ; Solve for r_f ; $.21 = r_f + 1.5(.15 - r_f)$; $r_f = .03$

6. Calculate as follows:

$$NPV_{old} = [540,000(1 - .4)] + \left(\frac{700,000 - 100,000}{10} \times .4\right) \left[\frac{1}{.11} - \frac{1}{.11(1.11)^6}\right] + \frac{100,000}{(1 + .11)^6} = 1,525,691.257$$

$$NPV_{new} = -900,000 + 45,000 + 300,000 + [(700,000 - 240,000 - 300,000) \times .4] + [900,000(1 - .4)] + \left(\frac{900,000 - 100,000}{6} \times .4\right) \left[\frac{1}{.11} - \frac{1}{.11(1.11)^6}\right] + \frac{100,000}{(1 + .11)^6} = 2,027,583.21$$

Purchase the new machine. A higher discount rate will not change the answer.

EXTRA QUESTIONS

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Extra Practice Exam Questions

1. The Scamco mutual fund earned a return of 10% in 1992, somewhat less than the market return of 14%. However, the mutual fund did generate a higher return than treasury bills, which only realized 5%. Furthermore, the Scamco fund invests its money very conservatively, with a portfolio beta of only 0.4. How would you rate the performance of the Scamco mutual fund relative to the market in 1992? Why?
2. The current riskless return is 5%; the expected return on the market is 10%. The Beta of stock A is 2.5. Assume that the variance of market returns were to double without affecting expected or required returns on the market portfolio. What would be the return on stock A after the market variance doubles?
3. A stock whose returns covariance with the market equals zero is expected to pay a dividend equal to \$1 next year; this dividend is expected to grow at a constant compound rate of 10% each year thereafter. The current riskless return rate is 15% and the required return on the market portfolio is 20%. The variance of returns underlying the stock is .15; the variance of returns on the market portfolio is .10. What is the value of this stock?
4. The expected variance of returns on my two-security portfolio is .08. The variance of my only risky security is .10; my other security is riskless and has an expected return of .10. The expected return of the risky security is .25. What is the expected return of my portfolio?

SOLUTIONS TO EXTRA QUESTIONS

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Solutions to Extra Practice Exam Questions

1. $r_s = .05 + .4(.14 - .05) = .086 < .10$; Thus, Scamco outperformed the market.
2. The standard deviation of the market would increase by a multiple equal the square root of 2 (1.414) times its original level. A change in the standard deviation of market will not change its correlation with the security; the change in the numerator of the correlation coefficient formula changes just as the denominator. Thus, Beta will decrease by a multiple equal to $1/2^{.5} = .707$, or 1.7675. The expected return of the stock would drop to .138375.
3. $\beta = 0$; $r = r_f = .15 = k$, $PV = DIV_1 / (k - g) = 1 / (.15 - .10) = 20$
4. $.08 = w_{\text{risky}}^2 \cdot .10 + w_{\text{riskless}}^2 \cdot 0$; $w_{\text{risky}} = .8944$
 $E[R_p] = .8944 \cdot .25 + .1056 \cdot .10 = .2342$

Questions in Chapters not Covered

1. Financial ratios can often be used to draw inferences regarding a number of important firm characteristics. What characteristics of particular importance to a shareholder might be learned or inferred from a firm's leverage ratios?

1. Leverage ratios are useful for determining the risk (volatility of earnings) of a firm and its likelihood for long-term survival.

2. Under what circumstances will a creditor find the analysis of a series of liquidity ratios more useful than the analysis of a series of leverage ratios?

2. When the analyst is primarily concerned with the liquidity position of the firm; that is, when the analyst is concerned only with the firm's ability to satisfy its short run obligations.

3. (From Chapter 8) The Henderson Company needs to raise \$1,400,000 to purchase a new machine. The company wishes to maximize its annual earnings per share levels and must decide whether to borrow the required funds at an interest rate of 12% (the same rate as the average rate on its existing long term and short term debt) or to sell additional shares of stock at its current book value. Henderson currently has outstanding 100,000 shares of stock. The company is projecting an EBIT level next year of \$500,000 and is taxed at the corporate rate of 34%. Henderson's balance sheet is given as follows:

<u>ASSETS</u>	<u>CAPITAL</u>
Current Assets...\$ 400,000	Current Liabilities...\$ 200,000
	Long Term Debt.....\$1,200,000
Fixed Assets..... <u>\$3,600,000</u>	Equity..... <u>\$2,600,000</u>
Total Assets.....\$4,000,000	Total Capital.....\$4,000,000

How should the Henderson Company finance its purchase?

$$3. \text{EPS}_D = (500,000 - .12(1,200,000) - .12(1,400,000))(1 - .34) / 100,000 = 1.2408$$

$$\text{EPS}_E = (500,000 - .12(1,200,000))(1 - .34) / (100,000 + 1,400,000 / 26) = 1.5173$$

$\text{EPS}_D < \text{EPS}_E$ Therefore, sell equity