

New York University
Stern School of Business

Foundations of Finance: The Final Exam

Suggested Solutions

Fall 1998

Professor Ian Giddy

2 hours, 100 points.

1. Please read the question carefully, and answer it concisely.
2. If you don't know the answer, use common sense
3. If you feel there's an ambiguity in a question, *state your assumptions explicitly*, then proceed to answer it as best you can.
4. Use pen in preference to pencil, please.

1. (5 points)

True or false?

- (a) The bank discount rate uses simple rather than compound interest.
- (b) The bond equivalent yield uses simple rather than compound interest.
- (c) The APR uses simple rather than compound interest.
- (d) Bond equivalent yield < effective annual yield
- (e) Bank discount rate < bond equivalent yield

All true (see midterm)

2. (5 points)

Your company leases a forklift worth \$55,000 today for a 7-year annual-pay contract at 9%.
What will the annual cash flow be?

Use the PV of an annuity formula:

$$PV = PMT \cdot (1 - 1/(1+R)^n) / R$$

Hence

$$PMT = PV \cdot R / (1 - 1/(1+R)^n)$$

$$= 55,000 \cdot .09 / (1 - 1/(1+.09)^7) = \$10,928$$

3. (5 points)

Philips issued a 4-year 8% straight Eurobond a year ago. It's now trading at an 8% yield. What's its modified duration?

Duration = time-weighted PV of cash flows/Price

Modified duration=Duration/(1+yield)

$$\begin{aligned}\text{Duration} &= [1(80)(.926)+2(80)(.857)+3(1080)(.794)]/[80(.926)+80(.857)+1080(.794)] \\ &= 2771/996 \\ &= 2.78\end{aligned}$$

$$\text{Modified duration} = 2.78/(1+.08)=2.56$$

4. (5 points)

Sherman Bank pays 5 percent simple interest, paid semi-annually, on its savings account balances, while Tecumseh Bank pays 5 percent interest compounded annually. If you made a \$10,000 deposit in each bank, how much additional money would you earn from your Tecumseh Bank account at the end of 10 years?

Simple: $PV \cdot (1 + Rn) = 10,000 \cdot (1 + .025 \cdot 20) = 15,000$

Compound: $FV = PV \cdot (1 + R/m)^{(n \cdot m)} = 10000 \cdot (1 + .05)^{10} = 16,289$
 $16,289 - 15,000 = \$1,289$

5. (5 points)

You work at Bell Atlantic at an annual salary of \$102,000, paid monthly. You are offered a severance package that will pay 6 months salary now or you and your heirs \$7000 per year forever. If your required return is 12 percent, which should you choose, and why?

Answer: take the perpetuity!

6 months salary = $6(102,000/12) = \$51,000$

Perpetuity:

$PV = PMT \cdot (1/r)$ (present value of a perpetuity)

$$= 7000 / .12$$

$$= \$58,333$$

6. (5 points)

You own a stock portfolio invested 10% in Guidant (beta 1.2), 20% in Akzo-Nobel (beta 0.6), 30% in Ciba Speciality Chemicals (beta 1.5), and the remainder equally divided between treasury bills and the Fidelity Market Index Fund. What is the portfolio beta?

Portfolio beta is the weighted average of the components' betas, including T-bills (beta=0) and the index fund (Beta=1).

Portfolio beta=.10(1.2)+.20(0.6)+.30(1.5)+.20(0)+.20(1)=0.89

7. (5 points)

You have been hired to design a global portfolio based on two funds, Korea Fund and Con Ed. The standard deviation of returns on KF is 20% and on Con Ed 5%. They have a correlation coefficient of 0.30. KF's expected return is 22% and that of Con Ed 8%.

In order to minimize your client's portfolio's variance, how much should you allocate to Con Ed?

$$\text{Weight (Con Ed)} = \frac{[(SD_k)^2 - (SD_k)(SD_c)(\text{Corr}_{K,C})]}{[(SD_c)^2 + (SD_k)^2 - 2(SD_c)(SD_k)(\text{Corr}_{K,C})]}$$

$$\begin{aligned} \text{Weight (Con Ed)} &= \frac{[(.20)^2 - (.05)(.20)(.3)]}{[(.05)^2 + (.20)^2 - 2(.05)(.20)(.3)]} \\ &= 101.37\% \text{ (implying you short some Korea Fund)} \end{aligned}$$

8. (5 points)

Suppose the rate on government treasuries is 8% and the expected return on the market is 16%. If the equity of Yahoo, Inc. has a beta of 1.7, what is its expected return based on the CAPM?

$$\begin{aligned} E(r) &= RF + \text{Beta}[E(r_m) - RF] \\ &= .08 + 1.7(.16 - .08) = 21.6\% \end{aligned}$$

9. (5 points)

Trump's Kingdom has a beta of 1.59 and an expected return of 25%. Sears has a beta of .44 and an expected return of 12%. If the rate on T-bills is 6% and the market risk premium is 11.3%, what are the reward-to-risk ratios of the two stocks? Which would you buy? (Or sell short?)

$$\begin{aligned} \text{Reward-to-risk} &= [E(r) - RF] / \text{Beta} \\ \text{Market: } &11.3\% / 1 = 0.1130 \\ \text{Trump: } &19\% / 1.59 = .1195 \\ \text{Sears: } &6\% / .44 = .1364 \\ \text{So: } &\text{Buy Sears (and perhaps short the market)} \end{aligned}$$

10. (5 points)

Suppose IBM is able to borrow in the 6-month Canadian banker's acceptance market at a rate of 12%. The current exchange rate is C\$1=US\$0.72. The 182-day forward rate is \$0.70. Would this

be cheaper than borrowing in the US at 6.2%?

US is dearer at 6.2%

Canadian alternative:

Effective Rus $= (1 + .12/2) \cdot .70 / .72 - 1 = .0306$ **ie 6.12%**

So borrow in Canada.

11. (5 points)

Suppose IBM's pension fund is able to invest in \$25 million in 6-month Russian treasuries yielding 40%, less a 5% withholding tax. The current exchange rate is US\$1=R100. The 182-day forward rate is \$1=R125. If the Nikkei index rises 15% and the ruble falls to R135, what is the effective rate of return an unhedged investment in Russia would produce?

Unhedged alternative:

\$25*100Rubles earn 95% of 20% so at end of 6 months: $2500 \cdot .95 \cdot 1.2 = 2850$

2850Rubles/135=\$21.11million

Holding period return = $(21.11 - 25) / 25 = 15.56\%$

Annualized: $(1 - .1556)^2 - 1 = -.2869$ ie 28.69% negative return.

12. (5 points)

Your uncle Percy from Poughkeepsie buys a 5.5%, 20-year municipal bond with annual coupon payments. It is priced to yield him 10% taxable equivalent. If Percy's tax bracket is 33%, what is the bond's price?

Remember that the municipal tax exemption applies to interest income but not to capital gains. So Price (P) has two components:

$P = [\text{Coupon} / (1 - \text{Tax rate})] \{ [1 - 1 / (1 + Y)^n] / Y \} + 1000 [1 / (1 + Y)^n]$

$P = [55 / (1 - .33)] \{ [1 - 1 / (1 + .10)^{20}] / .10 \} + 1000 [1 / (1 + .10)^{20}]$

$= 698.87 + 148.65$

$= \$847.52$

(or \$84.75)

13. (15 points)

Giddy's Online Flagellation, Inc, is expected to have EPS in the upcoming year of \$6.00. The expected ROE is 18%. An appropriate required rate of return on the stock of the privately held company is 10% over the 4% treasury rate, based on its estimated beta of 1.35. If the firm has a plowback ratio of 70%, then

(a) its growth rate of dividends should be:

(b) its next annual dividend should be:

(c) if it did an IPO, its 10,000 shares should be worth:

(a) $g = .18(.70) = .1260$ or 12.6%

(b) $D_1 = 6.00(1-.70) = \$1.80$ per share

(c) $V_0 = [6.00(1-.70)] / [(.10+.04) - .18(.70)] = \128.57 per share or \$1,285,700

14. (5 points)

Pittsburgh Strip, Inc, is expected to pay a dividend of \$4.20 in the upcoming year. Dividends are expected to grow at the rate of 8% per year. The risk free rate is 4% and the expected return on the market portfolio is 14%. Investors use the CAPM to compute the market capitalization rate on the stock, and the constant growth DDM to determine the intrinsic value of the stock. The stock is trading in the market today at \$84.00. What is the estimated beta of Pittsburgh Strip?

$k = E(r) = D_1/P_0 + g$

$k = 4.20/84 + .08 = .1300$

From CAPM, $E(r) = RF + \text{Beta}[E(r_m) - RF]$

So $\text{Beta} = [E(r) - RF] / [E(r_m) - RF]$

$\text{Beta} = (.13 - .04) / (.14 - .04) = .90$

15. (5 points)

Ronnigan Research is expected to pay a dividend in year 1 of \$3, year 2 \$2, and year 3 \$1. After the third year, dividends are expected to decline at the rate of 2% per year. Investors require a rate of return of 8% per annum. What should the stock be worth?

First find the value at end of year 3

$V_3 = [1.00(1 + (-.02))] / (.08 - (-.02)) = 9.80$

Then find today's present value of all cash flows:

$V_0 = PV(3) + PV(2) + PV(1 + V_3)$

$= 3(.926) + 2(.857) + (1 + 9.80)(.794) = 13.06$

16. (5 points)

Long Term Capital enters into a \$10 million, 4-year interest-rate swap with Citi to hedge a corporate bond investment by converting the fixed rate on the bond into a floating rate of Libor + .35%. The bond yields Treasury + 1.90%. The swap rate is 8% vs quarterly Libor flat. 3-month Libor is 6.5%.

A year later, Libor is 6% and the 3-year rate is 7.75%. How much money changes hands during that quarter?

LTC, which wants to take its fixed receipts and exchange them for floating ones, needs a swap in which it receives quarterly Libor and pays a fixed rate (quarterly payment of 8% pa, ie 8%/4 each quarter).

If, at one particular quarter, Libor is 6%, then

LTC pays Citi: Fixed rate - Libor

\$10 million(8% fixed - 6% Libor)/4=\$0.05m=\$50,000 LTC pays to Citi

17. (5 points)

A call option on Juniper stock with an exercise price of \$75 and an expiration date one year from now is worth \$5 today. A put option on the same company with an exercise price of \$75 and one year to expire is priced at \$2.75. The interest rate is 8% and Juniper pays no dividends. What should the stock price be?

From put-call parity,

C-P=S-E/(1+r), so by rearranging,

S=5.00-2.75+75/(1+.08)=71.69

18. (5 points)

In a particular year, The Pontorno Fund earned a return of 2% by making the following investments in asset classes:

	WEIGHT	RETURN
Domestic	.10	.11
International	.90	.01

The return on the bogey portfolio was 5%, calculated as follows:

	WEIGHT	RETURN
US market (S& P Index)	.50	.10
International (EAFA Index)	.50	0

The contribution of security selection within asset classes to the total excess return was:

Excess return = .02-.05=-.03 or -3%

Contribution: (.11 - .10).10 + (.01 - 0).90 = .01 or 1%