Foundations of Finance
Practice Questions for Midterm
Prof. Anthony Lynch

I. [15 points] You will be making 20 annual contributions of $75 to a bank account (the first is made at the end of year 1) that pays an APR of 5.90% compounded semiannually. What will be the balance of the bank account at the end of year 20?

II. [10 points] I have available $5M to invest today. The continuously compounded annual interest rate is 10%. How much will I have in 6 months?

III. [15 points] One year ago XYZ stock had just run up from $12 per share to $25 per share. With a net worth of $20000, you bought $40000 worth of XYZ stock on margin at $25 per share. The call money rate (which was the rate at which your broker would lend to you) was 8.5% per annum EAR. The stock recently declared its first dividend: $1 per share. (The dividend is payable in 10 days. The ex dividend date is tomorrow.) The stock is presently trading at $27 per share. Commissions are $0.50 per share (each way), payable when you close out your position. If you close out your position today, what is your total profit or loss on the entire transaction.

IV. [30 points] Consider the following data:

Economy	Probability	Return on Arctic Stock	Return on Zebra Stock
Good	0.6	15%	30%
Bad	0.4	-10%	-15%

Stock	Expected Return	Standard Deviation of Return
Arctic	5%	12.25%
Zebra	?	?

A. What is the expected return on Zebra?
B. What is the return standard deviation on Zebra?
C. What is the covariance between Arctic's return and Zebra's return?
D. What are the expected return and standard deviation of return on a portfolio that is 20% invested in Zebra and 80% in Arctic?

V. [15 points] Consider the following data for QDF stock (1/29 is a Friday):

Date	1/29	2/1	2/2	2/3	2/4	2/5
Closing Price-QDF share	41	42.5	41.125	41.75	43.25	43

Dividend per QDF Share	Declared	Ex-date	Record Date	Payable Date
0.5	1/20	2/1	2/4	3/5

Calculate the daily return on QDF stock (buy at the close of the previous day and sell on the close of the current day) for the following dates:

A. 2/1.
B. 2/2.
C. 2/3.

VI. [15 points] You are saving to buy a $150000 house. At the end of each of the next five years, you will deposit $5000 into a bank account . At the end of five years you will use the money as a down payment on the house. You will finance the balance of the purchase price with a thirty-year annual-payment mortgage. If the investing rate is 5% per annum EAR and the borrowing rate is 7% per annum EAR, what is the size of your annual mortgage payments (which are made at the end of each year of the mortgage).

VII. [20 points] Consider the following:

	Expected Return	Standard Deviation of Return
Japanese Stock Fund	15%	20%
U.S. Stock Fund	12%	10%

The correlation between the return on the U.S. stock fund and the Japanese stock fund is 0.2. The rate on T-bills is 5%.

A. Suppose that Sure-thing Brokers' recommended portfolio is 70% in the U.S. stock fund and 30% in the Japanese stock fund. What is the expected return and standard deviation of return for this portfolio?
B. An investor is trying to allocate a $20000 investment between Sure-thing's recommended portfolio and T-bills to achieve a portfolio return standard deviation of 5%. What dollar amounts should be invested in the Japanese stock fund, the U.S. stock fund and T-bills.

VIII. [30 points] Consider the following data:

	Expected Return	Standard Deviation of Return
Bull Fund	16%	15%
Hosem Fund	12%	8%

The correlation between the return on the Bull fund and the Hosem fund is 0.7. The rate on T-bills is 8%.

A. Suppose I am trying to decide whether to hold Bull in combination with T-bills or Hosem in combination with T-bills. Which should I choose? (Show calculations to support your answer.)

B. Suppose instead that I can combine Bull and Hosem into a portfolio P which I would then combine with T-bills to obtain my final portfolio.
   1. What are the weights of Bull and Hosem in portfolio P?
   2. What is the expected return and standard deviation of return for portfolio P?

IX. [22 points] Mr X borrows a sum of money from the YZ bank on 1/1/96 at an APR of 15% compounded monthly. The loan agreement stipulates that he make monthly payments of $100 for 48 months, the first payment to made on 2/1/96. There are no up-front finance charges.

A. What is the effective annual rate for the loan?

B. What is the continuously compounded annual rate for the loan?

C. How much did Mr X borrow from the bank on 1/1/96?

D. What is the balance of the loan outstanding on 1/1/97 after the 12th payment has been made (calculate the balance exactly; do not use the rule of 78ths to estimate it).

X. [6 points] The specialist's order book and bid and ask prices for IBM on 3/9/96 are given by the following table:

Price	Limit Buy	Limit Sell	Specialist
101		100 sh	
100.875		100 sh	
100.75			ask
100.625	100 sh		
100.5	100 sh		bid
100.375	100 sh		
100.25	100 sh		

A. If a market buy order comes in for 100 shares, at what price will the trade execute?
B. If a market sell order comes in for 100 shares, at what price will the trade execute?

XI. [18 points] The following price data is available for VB stock and QM stock.

Date	12/31/93	12/31/94	6/30/95	12/31/95
VB	70	50	65	55
QM	10	15	20	18

At the end of 1994, with $50000 of your own money, you short sold $80000 worth of VB stock at $50 per share and used the proceeds together with your $50000 to buy QM stock at $15 per share (ignore any margin requirements associated with the short sale). The call money rate (which was the rate at which your broker would lend to you) was 5% per annum EAR. Neither stock paid any dividends in 1994 or 1995. Ignore commissions.

A. What is the 1995 return on VB (from the end of 1994 to the end 1995)?
B. What is the 2 year return on VB (from the end of 1993 to the end 1995)?
C. What is the 1995 return on QM (from the end of 1994 to the end 1995)
D. What is the one year return on your position if you close it out at the end of 1995?
E. What is your total dollar profit or loss on your transaction if you close it out at the end of 1995?

XII. [21 points] Consider the following:

	Expected Return	Standard Deviation of Return
U.S. Stock Fund	12%	10%
Japanese Stock Fund	16%	20%

The correlation between the return on the U.S. stock fund and the return on the Japanese stock fund is 0.4. The rate on T-bills is 5%.

A. Suppose that Sure-thing Brokers' recommended portfolio is 70% in the U.S. stock fund and 30% in the Japanese stock fund. What is the expected return and standard deviation of return for this portfolio?

B. An investor allocates a $20000 investment between Sure-thing's recommended portfolio and T-bills to achieve a portfolio return standard deviation of 6%. A positive amount is invested in Sure-thing's recommended portfolio. What is the expected return on the investor's investment?

C. Jack is a risk-averse investor who only cares about expected return and standard deviation of return. Jack can either hold the Japanese stock fund in combination with T-bills or the U.S. stock fund in combination with T-bills. Which of these risky assets (the Japanese stock fund or the U.S. stock fund) would Jack prefer to hold in combination with T-bills?

XIII. [21 points] Assume that the CAPM holds in the economy. The following data is available about the market portfolio, the riskless rate and two assets, Y and Z. Further, Tom Hyde, an individual in the economy, holds asset Y as his *total* portfolio of assets. The riskless rate R_f is 5%. Remember $\beta_{i,M} = \sigma[R_i, R_M]/(\sigma[R_M]^2)$.

Asset i	$E[R_i]$	$\sigma[R_i]$	$\beta_{i,M}$
M (market)	15%	12%	1
Y	?	9%	?
Z	?	9%	0.25

A. What is the expected return on asset Z (i.e., $E[R_Z]$)?

B. What is the correlation of asset Z with the market portfolio?

C. What is the expected return on asset Y (i.e., $E[R_Y]$)?

D. What is the Beta of asset Y with respect to the market portfolio (i.e., $\beta_{Y,M}$)?

XIV. [12 points] Suppose Tom and Joan both form portfolios using 3 risky assets Microsoft, ADM and Nike and the riskless asset. Both agree on the return distributions for the 4 assets and only care about expected portfolio return and standard deviation of portfolio return. Tom decides to hold the following weights in the 4 assets:

Asset	Riskless Asset	ADM	Microsoft	Nike
Weight	40%	10%	20%	30%

Joan decides to hold 70% in the riskless asset. Can you determine the weights of the 3 risky assets in her portfolio? If so, what are the weights of the 3 risky assets in her portfolio? If not, describe what is similar about the portfolios that Joan and Tom decide to hold and what is different?

XV. [16 points] Joe and Jane's new daughter Joanne has just been born. Joe and Jane would like to open a bank account today to pay for their daughter's education. The school that they have selected for Joanne has annual fees of $5000 payable on Joanne's birthday during each year that she attends the school. Her first year's fees would be paid on her 6th birthday and her last year's fees would be paid on her 17th birthday. The APR of their bank account is 12% compounded quarterly.

A. What is the effective annual rate (EAR) being offered by their bank account?
B. How much must they deposit today to be able to exactly pay the 12 annual payments of $5000 out of their account.

XVI. [6 points] The following data is available for asset L:

State	Good	Bad
Probability	0.4	0.6
Return on Asset L	25%	-5%

A. What is the expected return on asset L?
B. What is the variance of the return on asset L?

XVII. [8 points] Consider the following data for DFL stock (3/5 is a Friday):

Date	3/5	3/8	3/9	3/10	3/11	3/12
Closing Price-DFL share	41	42.5	41.125	41.75	43.25	43

Dividend per DFL Share	Declared	Ex-date	Record Date	Payable Date
0.8	2/20	3/9	3/12	3/28

Calculate the daily return on DFL stock (buy at the close of the previous day and sell on the close of the current day) for the following dates:

A. 3/9.
B. 3/11.

XVIII. [15 points] The following price data is available for VB stock and QM stock.

Date	12/31/93	6/30/94	12/31/94	12/31/95
VB	70	63	80.5	90
QM	10	15	20	18

At the end of 1993, using $50000 of your own money, you bought $70000 worth of VB stock at $70 per share *on margin*. The call money rate (which was the rate at which your broker would lend to you) was 5% per annum EAR. Neither stock paid any dividends in 1994 or 1995. Ignore commissions.

A. What is the 1994 return on VB (from the end of 1993 to the end 1994)?
B. What is the one year return on your position if you close it out at the end of 1994?
C. What is your total dollar profit or loss on your position if you close it out at the end of 1994?

XIX. [21 points] Consider the following:

	Expected Return	Standard Deviation of Return
S&P 500 Fund	12%	10%
Emerging Market Fund	16%	20%

The correlation between the return on the S&P 500 fund and the return on the Emerging market fund is 0.3. The rate on T-bills is 10%.

A. Suppose that Bull Broker's recommended portfolio is 60% in the S&P 500 fund and 40% in the Emerging market fund. What is the expected return and standard deviation of return for this portfolio?

B. An investor allocates a $10000 investment between Bull Broker's recommended portfolio and T-bills to achieve a portfolio return standard deviation of 7%. A positive amount is invested in Bull Broker's recommended portfolio. What is the expected return on the investor's investment?

C. Jill is a risk-averse investor who only cares about expected return and standard deviation of return. Jill can either hold the Emerging market fund in combination with T-bills or the S&P 500 fund in combination with T-bills. Which of these risky assets (the Emerging market fund or the S&P 500 fund) would Jill prefer to hold in combination with T-bills?

XX. [12 points] Suppose the following data is to be used by Ms Q (a risk-averse investor) to form a portfolio that consists of the small firm fund and T-bills.

$E[R_{Small}(t)] = 1.5$ $\sigma[R_{Small}(t)] = 8$ $E[DP(\text{start } t)] = 4.375$ $\sigma[DP(\text{start } t)] = 1.2$

$\mu_{Small,DP} = -2$ $\varphi_{Small,DP} = 0.8$

where DP(start t) is the dividend yield on the S&P 500 known at the start of month t.
$R_{Small}(t)$ is the return on the small firm fund in month t.
$\mu_{Small,DP}$ is the intercept and $\varphi_{Small,DP}$ is the slope coefficent from a regression of $R_{Small}(t)$ (dependent variable) on DP(start t).

A. Suppose it is the end of March 1997, Ms Q knows that DP(start Apr) is 3 and the return on T-bills for April is 0.5%.
   1. What is the expected April return on the small firm fund given DP(start Apr)?
   2. Will Ms Q short sell the small firm fund? Why or why not?

B. Suppose it is the end of October 1997, Ms Q knows that DP(start Nov) is 5 and the return on T-bills for November is 0.4%.
   1. What is the expected November return on the small firm fund given DP(start Nov)?
   2. Will Ms Q short sell the small firm fund? Why or why not?

XXI. [22 points] Assume that the CAPM holds in the economy. The following data is available about the market portfolio, the riskless rate and two assets, W and X. The riskless rate R_f is 4%. Remember $\beta_{i,M} = \sigma[R_i, R_M]/(\sigma[R_M]^2)$.

Asset i	$E[R_i]$	$\sigma[R_i]$	$\beta_{i,M}$
M (market)	?	10%	?
W	16%	12%	1.0
X	?	6%	0.6

A. What is the Beta of the market portfolio (i.e.,$\beta_{M,M}$)?
B. What is the expected return on the market portfolio (i.e., $E[R_M]$)?
C. What is the expected return on asset X (i.e., $E[R_X]$)?
D. What is the correlation of asset X with the market portfolio?
E. Does asset W lie on the Capital Market Line (CML)? Explain why or why not.
F. Would a portfolio with 40% in asset X and 60% in asset W lie on the Capital Market Line (CML)? Explain why or why not?

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I. $EAR = (1+0.059/2)^2 - 1 = 0.05987$.
$FV_{20} = 75\ FVAF_{5.987\%,20} = 75\ \{[(1.05987)^{20} - 1]/0.05987\} = 75 \times 36.7342 = 2755.07$.

II. $FV_{0.5} = 5M \times e^{0.1 \times ½} = 5M \times 1.051271 = 5.2564M$.

III.

Borrow at 8.5% one year ago	20000
Buy 1600 shs of XYZ @ $25 one year ago	-40000
Repay loan ($20000 x 1.085) today	-21700
Sell 1600 shs of XYZ @ $27 today	43200
Commission (2x1600 x $0.50)	-1600
Total Profit	-100

So the total loss is $100.
(Dividend is not paid until tomorrow and so is irrelevant; the price run up prior to purchase is also irrelevant.)

IV. Answer.
A. Expected Return Zebra = 0.6 x 30% + 0.4 x -15% = 12%.
B. Variance of Return Zebra = 0.6 x (30x30) + 0.4 x (-15x-15) - (12x12) = 486.
Std Dev of Return Zebra = 22.0454%.
C. Covariance Arctic & Zebra = 0.6 x (15x30) + 0.4 x (-10x-15) - (5x12) = 270.
D. Expected Portfolio Return = 0.8 x 5% + 0.2 x 12% = 6.4%.
Variance of Portfolio Return
= (0.8x0.8) x (12.25x12.25) + (0.2x0.2) x 486 + 2 x (0.8x0.2) x 270 = 201.88.
Std Dev of Portfolio Return = 14.2084%.

V. Answer.
A. Return 2/1 = {42.5 + 0.5 - 41}/41 = 4.878%.
B. Return 2/2 = {41.125 - 42.5}/42.5 = -3.2353%.
C. Return 2/3 = {41.75 - 41.125}/41.125 = 1.5198%.

VI. Savings at time 5 will be $5000 x $FVAF_{5\%,5}$ = $5000 x $\{[(1.05)^5-1]/0.05\}$ = $27628.16.
Amount to be borrowed at time 5 is $150000 - $27628.16 = $122371.84.
So letting C be the mortgage repayment:

$122371.84 = C x PVAF$_{7\%,30}$ = C x {[1-(1.07)$^{-30}$]/0.07}.
Thus, C = $122371.84 / 12.40904 = $9861.51.

VII. Let P be Sure-thing's recommended portfolio.

A. Expected Return for P = 0.7 x 12% + 0.30 x 15% = 12.9%.
Variance of Return for P
= (0.7x0.7) x (10x10) + (0.3x0.3) x (20x20) + 2 x (0.7x0.3) x(0.2x10x20)
= 49 + 36 + 16.8 = 101.8
Standard Deviation of Return for P = 10.0896.

B. Let Q be the investor's portfolio with a standard deviation of 5% which consists of portfolio P and T-bills. Let $\omega_{P,Q}$ be the weight of portfolio P in portfolio Q. Know $\sigma[R_Q] = |\omega_{P,Q}| \sigma[R_P]$ and since the expected return for P exceeds the T-bill rate, we know that the investor wants to hold a positive weight in P. So $\omega_{P,Q} = 5/10.0896 = 0.4956$.
So the weight of T-bills in Q is $(1- \omega_{P,Q}) = 0.5044$ which implies a dollar investment in T-bills of $20000 x 0.5044 = $10088.
The weight of the U.S stock fund in Q is $(0.7\ \omega_{P,Q}) = 0.7$ x0.4956 = 0.34692 which implies a dollar investment in the U.S. stock fund of $20000 x 0.3469 = $6938.4.
The weight of the Japanese stock fund in Q is $(0.3\ \omega_{P,Q}) = 0.3$ x0.4956 = 0.1487 which implies a dollar investment in the Japanese stock fund of $20000 x 0.14868 = $2973.6.

VIII. Answer.

A. Slope - CAL(Bull) = {16 - 8}/15 = 0.5333.
Slope - CAL(Hosem) = {12 - 8}/8 = 0.5.
Prefer Bull and T-bills since the associated CAL has a higher slope.

B. Portfolio P is the tangency portfolio.

1. To get the weight of Bull in P use the following formula

$$\omega_{B,P} = \frac{\sigma[R_H]^2\ E[r_B] - \sigma[R_B, R_H]\ E[r_H]}{\left[\begin{array}{l}\{\sigma[R_H]^2\ E[r_B] - \sigma[R_B, R_H]\ E[r_H]\} \\ + \{\sigma[R_B]^2\ E[r_H] - \sigma[R_B,R_H]\ E[r_B]\}\end{array}\right]}$$

where $r_i = R_i - R_f$ is the excess return on asset i . Can calculate
$\sigma[R_B,R_H] = 0.7 \times 15 \times 8 = 84$;
$\sigma[R_B]^2 = 15 \times 15 = 225$; $E[r_B] = 8$;
$\sigma[R_H]^2 = 8 \times 8 = 64$; $E[r_H] = 4$; to give
$\omega_{B,P}$ = {64x8 - 84x4}/[{64x8 - 84x4} + {225x4 - 84x8}]
= 176/[176 + 228] = 0.4356.
So the weight of Hosem in P is $(1 - \omega_{B,P}) = 0.5644$

2. Expected Return for P = 0.4356 x 16% + 0.5644 x 12% = 13.7424%.

Variance of Return for P = (0.4356x0.4356) x 225 + (0.5644x0.5644) x 64 + 2 (0.4356x0.5644) x 84 = 42.693 + 20.387 + 41.303 = 104.383
Standard Deviation of Return for P = 10.2168%.

IX.

A. $r_1 = APR_{12}/12 = 15\%/12 = 1.25\%$; $r_{12} = (1+r_1)^{12}-1 = (1+0.0125)^{12}-1 = 16.075\%$.
B. $r'_{12} = \ln(1+r_{12}) = \ln(1+0.16075) = 14.9066\%$.
C. $V^{48}_0 = 100 \times PVAF_{1.25\%,48} = 100\ [\{1-(1+0.0125)^{-48}\}/0.0125] = 3593.15$.
D. $V^{36}_{12} = 100 \times PVAF_{1.25\%,36} = 100\ [\{1-(1+0.0125)^{-36}\}/0.0125] = 2884.73$.

X.

A. 100.75 - lower of ask and lowest limit sell.
B. 100.625 - higher of bid and highest limit buy.

XI.

A. $R_{VB}(95) = (55-50)/50 = 10\%$.
B. $R_{VB}(94\text{-}95) = (55-70)/70 = -21.428\%$.
C. $R_{QM}(95) = (18-15)/15 = 20\%$.
D. $\omega_{VB,p} = -80000/50000 = -1.6$; $\omega_{QM,p} = (80000+50000)/50000 = 1 - \omega_{VB,p} = 2.6$;
$R_p(95) = \omega_{VB,p} R_{VB}(95) + \omega_{QM,p} R_{QM}(95) = -1.6 \times 10\% + 2.6 \times 20\% = 36\%$.
E. $Profit_p(\text{end } 95) = R_p(95)\ V_p(\text{end } 94) = 0.36 \times 50000 = 18000$.

XII.

A. $E[R_P] = 0.7 \times 12\% + 0.3 \times 16\% = 13.2\%$.
$\sigma^2[R_P] = (0.7x0.7) \times (10x10) + (0.3x0.3) \times (20x20) + 2 \times (0.7x0.3) \times (0.4x10x20)$
$= 49 + 36 + 33.6 = 118.6$; $\sigma[R_P] = 10.8904$.
B. $\sigma[R_I] = \omega_{P,I}\ \sigma[R_P]$; so $6\% = \omega_{P,I} \times 10.804\%$; so $\omega_{P,I} = 0.55094$.
$E[R_I] = \omega_{P,I} E[R_P] + (1 - \omega_{P,I})\ R_f = 0.5509 \times 13.2\% + 0.4491 \times 5\% = 9.5177\%$.
C. slope-CAL[US] = (12%-5%)/10% = 0.7; slope-CAL[J] = (16%-5%)/20% = 0.55;
slope-CAL[US] > slope-CAL[J] so prefer US and T-bills.

XIII.

A. Z plots on SML; so $E[R_Z] = R_f + \{E[R_M] - R_f\}\ \beta_{Z,M} = 5\% + \{15\text{-}5\}\% x 0.25 = 7.5\%$.
B. $\rho[R_Z,R_M] = \beta_{Z,M}\ \sigma[R_M]/\sigma[R_Z] = 0.25x12/9 = 0.3333$.
C. Since Hyde holds Y as his total portfolio, Y lies on CML;
so $E[R_Y] = R_f + \{E[R_M] - R_f\}\ \sigma[R_Y]/\sigma[R_M] = 5\% + \{15\text{-}5\}\% x 9/12 = 12.5\%$.
D. Y plots on SML; so $12.5\% = R_f + \{E[R_M] - R_f\}\ \beta_{Y,M}$;
and so $\beta_{Y,M} = (12.5\text{-}5)/(15\text{-}5) = 0.75$.

XIV.

Both Joan and Tom hold R_f and the same Tangency portfolio of the three risky assets. Joan has 30% in T and Tom has 60%. Can use Tom's portfolio to determine weights of risky assets in the Tangency portfolio: $\omega_{ADM,Tom} = \omega_{ADM,T}\ \omega_{T,Tom}$, so $\omega_{ADM,T} = \omega_{ADM,Tom} / \omega_{T,Tom} = 0.1/0.6 = 0.1667$; $\omega_{Ms,T} = \omega_{Ms,Tom} / \omega_{T,Tom} = 0.2/0.6 = 0.3333$; $\omega_{Nk,T} = 0.3/0.6 = 0.5$. Can now get weights of the three risky assets in Joan's portfolio:
$\omega_{ADM,J} = \omega_{ADM,T}\ \omega_{T,J} = 0.1667 \times 0.3 = 0.05$; $\omega_{Ms,J} = 0.3333 \times 0.3 = 0.1$; $\omega_{Nk,J} = 0.5 \times 0.3 = 0.15$.

XV.

A. $r_{1/4} = APR_4/4 = 12\%/4 = 3\%$; $EAR = r_1 = (1+r_{1/4})^4 - 1 = (1+0.03)^4 - 1 = 12.55\%$.

B. $V_5 = 5000 \times PVAF_{12.55\%,12} = 5000\ [\{1-(1+0.1255)^{-12}/0.1255] = 30198.35$.
$V_0 = V_5 \times PVIF_{1.2.55\%,5} = 30198.35\ (1+0.1255)^{-5} = 16720.74$.

XVI.

A. $E[R_L] = p\{G\}\ R_L\{G\} + p\{B\}\ R_L\{B\} = 0.4x25\% + 0.6x(-5\%) = 7\%$.

B. $\sigma^2[R_L] = p\{G\}(R_L\{G\}-E[R_L])^2 + p\{B\}(R_L\{B\}-E[R_L])^2 = 0.4x(25-7)^2 + 0.6x(-5-7)^2 = 216$.

XVII.

A. Return 3/9 = {41.125 + 0.8 - 42.5}/42.5 = -1.353%.

B. Return 3/11= {43.25 - 41.75}/41.75 = +3.593 %.

XVIII.

A. $R_{VB}(94) = (80.5-70)/70 = 15\%$.

B. Buying VB on margin: so other asset is the riskless asset.
$\omega_{VB,p} = 70000/50000 = 1.4$; $\omega_{f,p} = -20000/50000 = 1 - \omega_{VB,p} = -0.4$;
$R_p(94) = \omega_{VB,p}\ R_{VB}(94) + \omega_{f,p}\ R_f(94) = 1.4 \times 15\% + (-0.4) \times 5\% = 19\%$.

C. $Dollar\text{-}Profit_p(end\ 94) = R_p(94)\ V_p(end\ 93) = 0.19 \times 50000 = 9500$.

XIX.

A. $E[R_P] = 0.6 \times 12\% + 0.4 \times 16\% = 13.6\%$.
$\sigma^2[R_P] = (0.6x0.6) \times (10x10) + (0.4x0.4) \times (20x20) + 2 \times (0.6x0.4)\ x(0.3x10x20) = 36 + 64 + 28.8 = 128.8$; $\sigma[R_P] = 11.3490\%$.

B. $\sigma[R_I] = \omega_{P,I}\ \sigma[R_P]$; so $7\% = \omega_{P,I} \times 11.3490\%$;so $\omega_{P,I} = 0.6168$.
$E[R_I] = \omega_{P,I} E[R_P] + (1 - \omega_{P,I})\ R_f = 0.6168 \times 13.6\% + 0.3832 \times 10\% = 12.2205\%$.

C. slope-CAL[S&P]=(12%-10%)/10%=0.2; slope-CAL[EM]=(16%-10%)/20%=0.3; slope-CAL[EM] > slope-CAL[S&P] so prefer EM and T-bills.

XX.

A. Know DP(start Apr) = 3.

1. $E[R_{Small}(Apr)] = \mu_{Small,DP} + \varphi_{Small,DP}\ DP(start\ Apr) = -2 + 0.8 \times 3 = 0.4\%$
2. $E[R_{Small}(Apr)] < R_f(Apr) = 0.5\%$ so Mrs Q wants to short-sell Small to lie on the positive-sloped portion of Small's capital allocation line.

B. Know DP(start Nov) = 5.

1. $E[R_{Small}(Nov)] = \mu_{Small,DP} + \varphi_{Small,DP}\ DP(start\ Nov) = -2 + 0.8 \times 5 = 2.0\%$
2. $E[R_{Small}(Nov)] > R_f(Nov) = 0.4\%$ so Mrs Q does not want to short-sell Small so she can lie on the positive-sloped portion of Small's CAL.

XXI.

A. $\beta_{M,M} = 1$.

B. M lies on SML. W lies on SML. $\beta_{M,M} = \beta_{W,M} = 1$. So $E[R_M] = E[R_W] = 16\%$.

C. X plots on SML; so $E[R_X] = R_f + \{E[R_M] - R_f\}\beta_{X,M} = 4\% + \{16-4\}\%x0.6 = 11.2\%$.

D. $\rho[R_X,R_M] = \beta_{X,M}\ \sigma[R_M]/\sigma[R_X] = 0.6x10/6 = 1$.

E. W lies on CML if and only if $\rho[R_W,R_M] = 1$. But $\rho[R_W,R_M] = \beta_{W,M}\ \sigma[R_M]/\sigma[R_W] = 1x10/12 = 0.833<1$. So W does not lie on CML.

F. X lies on CML since $\rho[R_X,R_M] = 1$. W does not lie on CML. So $\rho[R_W,R_M] < 1$.

Thus, any portfolio, p, of X and W, with a non-zero weight in W, must have $\rho[R_p,R_M] < 1$. Thus, a portfolio with 40% in X and 60% in W does *not* lie on the CML. (Note that since X lies on the CML, $\rho[R_W,R_M] = \rho[R_W,R_X] = 0.833$. Can use this to calculate the standard deviation of the portfolio.)

X lies on CML. So X consists of the riskless asset and the market. W does not lie on the CML. So W does not consist of the riskless asset and the market. Thus, a portfolio of X and W cannot consist of the riskless asset and the market. Thus, a portfolio with 40% in X and 60% in W does not lie on the CML.