Week 8

Difficulty level*is 7.038328

You are given the following information:

- The current price to buy one share of ABC stock is 50
- The stock does not pay dividends
- The risk-free rate, compounded continuously, is 5%
- European options on one share of ABC stock expiring in one year have the following prices:

Strike Price	Call Option Price
53	5.78
X	4.76

Joan creates a zero-cost call ratio spread that will have a profit of zero if the stock price in one year is equal to 68.3. Solve for X.

A) 55.70
B) 58.68
C) 57.22
D) 64.08
E) 61.34

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 7

Difficulty level*is 6.7603453

Calculate the modified duration of a five-year par value bond with 4% annual coupons and an effective rate of interest equal to 8%.

A) 4.25
B) 4.59
C) 3.97
D) 4.18
E) 4.31

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 6

Difficulty level*is 7.0897247

Consider the following information for an index:

- The index spot price is 1500.
- The continuously compounded risk-free rate is 4%.
- The 6-month forward price is 1507.55.

Solve for the implied dividend yield.

A) 0.030
B) 0.014
C) 0.034
D) 0.023
E) 0.028

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 5

Difficulty level*is 2.6321793

A two year par value bond with face value of 1000 pays 10% annual coupons is sold for 980.

Find the effective annual yield of this bond.

A) 11.2%
B) 11.0%
C) 11.1%
D) 11.3%
E) 11.4%

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 4

Difficulty level*is 7.1611607

A 5 year par value bond with a face value of 1000 and 4% semi-annual coupons is sold with an annual effective yield of 6%. The bond is sold immediately following the first coupon payment.

Find the price at the time of sale.

A) 925
B) 876
C) 1081
D) 834
E) 989

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 3

Difficulty level*is 5.1129909

Elizabeth has a choice between two equivalent investments.

Option A: Invest $1000 and receive $100 at the end of every two years forever.

Option B: Invest $1000 and receive $170 at the end of every three years forever.

Define i_A as the effective annual interest rate for investment A and i_B as the effective annual interest rate for investment B.

Calculate $\frac{i_A}{i_B}$.

A) 0.91
B) 0.99
C) 0.65
D) 0.88
E) 0.57

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 2

Difficulty level*is 6.6959705

Investor I.M. Young has been investing $100 per month for the last 20 years making payments at the beginning of each month. I.M. Young plans to continue this investment practice for the next 20 years.

Investor B. Tardy is just starting his savings program and plans to invest $400 per month for the next 20 years. B. Tardy's payments are made at the beginning of each month and at the same interest rate as I.M. Young. At the end of 20 years, Tardy's savings matches that of I.M. Young. Investor Rich Quick also begins his investment program today by investing 10,000 at the same interest rate. How many years are needed before Rich Quick has a savings of 90,000?

A) 40
B) 10
C) 18
D) 60
E) 27

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 1

Difficulty level*is 5.7348469

Tom purchases a study manual and a subscription to ADAPT to make sure he passes Exam 2/FM. Tom expects to spend 300 hours studying for the exam. For passing the exam, Tom anticipates he will earn an additional $100 per month payable at the end of each month starting six months from today. Tom plans to retire exactly 38 years from today. Using 6% effective annual interest, find the present value per hour of studying if Tom passes.

A) 56
B) 59
C) 61
D) 55
E) 58

*ADAPT questions have a difficulty definition on a scale from 1 to 10 with 1 representing easy and 10 representing very difficult.

Week 8

McDonald (2nd Edition) notes that "A ratio spread is constructed by buying m calls at one strike and selling n calls at a different strike, with all options having the same time to maturity and same underlying asset."
A zero-cost call ratio spread must be such that:

$$-mC_0(K_1, T) + nC_0(K_2, T) = 0$$

$$\frac{m}{n} = \frac{C_0(K_2, T)}{C_0(K_1, T)} = \frac{4.76}{5.78} = 0.82352941$$

For every X calls we sell we buy 0.8235 calls with strike price 53.

Long: $0.82352941(S_1 - 53)$

Short: $1(S_1 - x)$

$$0.82352941(S_1 - 53) = S_1 - X \Rightarrow X = 68.3 - 0.82352941(68.3 - 53)$$

X=55.7

Week 7

$$ModD = \frac{MacD}{1+i}$$

$$MacD = \frac{C(I\,a_{\overline{n}|}) + Rnv^n}{\text{Price}}$$

$$I\,a_{\overline{n}|} = \frac{\ddot{a}_{\overline{n}|} - nv^n i}{}$$

$$\ddot{a}_{\overline{n}|} = \frac{1-(1/1.08)^5}{.08/1.08} = 4.3121$$

$$nv^n = 5(1/1.08)^5 = 3.4029$$

$$I\,a_{\overline{n}|} = \frac{4.3121-3.4029}{.08} = 11.3650$$

$$\text{Price} = C\,a_{\overline{n}|} + Rv^n$$

$$= .04(3.9927) + 1(1/1.08)^5 = .1597 + .6806 = .8403$$

$$MacD = \frac{.04(11.3650)+1(3.4029)}{.8403} = 4.5942$$

$$ModD = \frac{MacD}{1+i} = \frac{4.5942}{1.08} = 4.2539$$

Week 6

$$F_{0,T} = S_0 e^{(r-\delta)T}$$

$$1507.55 = 1500 e^{(0.04-\delta)0.5}$$

$$\delta = r - \frac{1}{T} ln\left(\frac{F_{0,T}}{S_0}\right) = 0.04 - \frac{1}{.5} ln\left(\frac{1507.55}{1500}\right) = 0.030$$

Week 5

$$980 = 100v + 1100v^2$$
$$1100v^2 + 100v - 980 = 0$$

Now we must use the quadratic formula which is

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

where 'a' refers to the x^2 coefficient, 'b' refers to the x coefficient, and c refers to the constant

$$\frac{-100 \pm \sqrt{100^2 - 4(1100)(-980)}}{2(1100)} = \frac{-100 \pm 2078.9420}{2(1100)}$$

The positive answer is the only one that is relevant in this case.

The positive answer is .8995

$$v = .8995$$
$$v = \frac{1}{1+i} = .8995$$
$$1 = .8995(1+i)$$
$$1.1117 = 1+i$$
$$i = .1117 \text{ or } 11.17\ \%$$

Week 4

The value immediately following the first payment is simply the value of a bond with 9 payments of 20 and a redemption value of 1000. This bond has an annual effective yield of 6%. Then the semi-annual yield is $1.06^{.5}$ or 2.9563%

The value immediately following the first payment is

$$= 20\left[\frac{1-(1/1.029563)^9}{.029563}\right] + 1000(1/1.029563)^9 = 156.0400 + 769.3495$$

$$= \$\,925.39$$

Or using the financial calculator

N=9, 1/Y=2.9563, PMT=20, FV=1000

Then CPT FV to get -925.39 or $925.39

Week 5

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$$1.1117 = 1+i$$

$$i = .1117 \text{ or } 11.17\,\%$$

Week 3

Let the effective interest rate be compounded every two years for investment A to be denoted as i_2 and the effective interest rate compounded every three years for investment B to be denoted as i_3. Investment A could be considered as a perpetuity with interest i_2 and investment B could be considered as a perpetuity with interest rate i_3. In general, the present value of a perpetuity of \$1 paid at the end of every period is $\frac{1}{i}$. The equation of value for investment A is $1000 = 100\frac{1}{i_2}$ and the equation of value for investment B is $1,000 = 170\frac{1}{i_3}$. Rearranging the equations results in $i_2 = 0.10$ and $i_3 = 0.17$. The effective annual interest rate for investment A can be written as $i_A = (1+i_2)^{1/2} - 1$ and the effective annual interest rate for investment B can be rewritten as $i_B = (1+i_3)^{1/3} - 1$. By substitution, $i_A = (1+0.10)^{1/2} - 1 = 0.0488$ and $i_B = (1+0.17)^{1/3} - 1 = 0.0537$. This results in

$$\frac{i_A}{i_B} = \frac{0.0488}{0.0537} = 0.9084$$

Week 2

Define an equation of value between I.M. Young and B. Tardy.

$$100(12)s\ddot{}_{\overline{40}|}^{(12)} = 400(12)s\ddot{}_{\overline{20}|}^{(12)}$$

Simplify: $\left((1+i)^{40}-1\right) = 4\left((1+i)^{20}-1\right)$

Factor left side: $\left((1+i)^{20}-1\right)\left((1+i)^{20}+1\right) = 4\left((1+i)^{20}-1\right)$

Simplify: $(1+i)^{20}+1 = 4$

Simplify: $(1+i)^{20} = 3$

Equation of value for Rich Quick is $10,000(1+i)^{n} = 90,000$

Simplify: $(1+i)^{n} = 9$

Recall $(1+i)^{20} = 3$

Square both sides of the equation $(1+i)^{40} = 9$

$\Rightarrow n = 40$ Years

Week 1

In solving this problem it is easiest to work in months rather than years. Tom has 38*12 or 456 months until retirement. He will receive the extra 100 at the end of the last 450 of these months. The effective monthly interest rate is given by:

$$i = (1.06)^{\frac{1}{12}} - 1 = 0.00486755 \text{ so } v = 0.995156.$$

The present value of the future payments is:

$$PV = 100\, v^6 \frac{1 - v^{450}}{i} = 17,\, 710.08$$

Dividing those by the 300 hours we get the present value per hour of studying is 59.03