1. You are considering the following project. The project costs $500 in year 0 and generates a (free) cash flow of $800 in year 3 only. The discount rate to use is 6%. What is the NPV of the project? (Choose the answer below that is closest to the value you computed.)

(A) 170

(B) 180

(C) 190

(D) 200

(E) 210

Answer: (A)

–500 + 800/1.06^3 = 171.7

2. Assume that the CAPM holds. What is the beta of a firm with cost of equity of 8%, if the risk-free rate is 2% and the market's expected return is 6%?

(A) 0.75

(B) 1.0

(C) 1.25

(D) 1.5

(E) 2.0

Answer: (D)

$(0.08 – 0.02)/(0.06 – 0.02) = 1.5$

3. Downward Corporation is expected to pay a dividend in year 1 of $1.5 and the dividends are expected to **decline** at a rate of 2% per year afterwards. An appropriate required rate of return for the stock is 8%. What should be the stock price of the company at year 0 based on the dividend discount model?

(A) $9

(B) $13

(C) $15

(D) $18

(E) $21

Answer: (C)

$$P_0 = \frac{1.5}{0.08 - (-0.02)} = 15$$

4. You are considering acquiring a common stock that you would like to hold for one year. You expect to receive both $1.41 in dividends and $33 from the sale of the stock at the end of one year. What is the price you would pay for the stock today, if you want to earn an 11% return?

(A) 23

(B) 26

(C) 29

(D) 31

(E) 35

Answer: (D)

$$0.11 = \frac{1.41 + 33 - P_0}{P_0}, \text{ Hence } P_0 = 31$$

5. You are running a pension fund for two years. YTM is 10%. As a liability, you have to pay $500 in year one and $500 again in year two. Calculate the modified duration for the liability (treat this in a similar way as if it was a "bond"). (Choose the answer below that is closest to the value you computed.)

(A) 1.2

(B) 1.35

(C) 1.5

(D) 1.75

(E) 2

Answer: (B)

$$PV = 500/1.1 + 500/1.1^2 = 867.7$$

$$w_1 = (500/1.1)/PV = 0.52, \quad w_2 = (500/1.1^2)/PV = 0.48$$

$$\text{modified duration} = (1 \times 0.52 + 2 \times 0.48)/1.1 = 1.35$$

6. The price of a one-year zero-coupon bond with face value of $100 is $80, and the price of a two-year zero-coupon bond with face value of $100 is $60. What is the price of a $1000 face value, 2-year coupon bond with 20% coupon rate paid annually?

(A) 680

(B) 780

(C) 880

(D) 980

(E) 1080

Answer: (C)

Based on the arbitrage pricing for bonds,

$$\text{price of the coupon bond} = 2 \times 80 + 12 \times 60 = 880$$

7. You would like to get the equity beta of Alibaba's stock, but given its short trading history, you decided to use the beta of a comparable company Amazon.com instead. Amazon.com has an equity beta of 2, and a debt-to-equity ratio of 1/2. Alibaba has the target debt-to-equity ratio of 0.25. The tax rate is 33.33%. Using the unlevering and relevering beta method, estimate the equity beta of Alibaba? (Choose the answer below that is closest to the value you computed.)

(A) 0.5

(B) 0.75

(C) 1.25

(D) 1.5

(E) 1.75

Answer: (E)

The unlevered asset beta of Amazon.com is $2/(1 + 0.6666/2) = 1.5$

The (re)levered equity beta of Alibaba is $1.5*(1 + 0.6666*0.25) = 1.75$

8. Suppose company QQQ has an equity cost of capital of 10%, market capitalization of $10.8 billion, and an enterprise value of $14.4 billion. Assume that QQQ's debt cost of capital is 6% and the tax rate is 40%. QQQ has a cash value of 0. What is QQQ's after-tax WACC? (Choose the answer below that is closest to the value you computed.)

(A) 6.8%

(B) 7.2%

(C) 7.6%

(D) 8.0%

(E) 8.4%

Answer: (E)

Debt value = 14.4 – 10.8 = 3.6

$$WACC = \frac{10.8}{14.4} \times 10\% + \frac{3.6}{14.4} \times 6\% \times 0.6 = 8.4\%$$

9. *JX Industries* has 10 million shares outstanding and a current share price of $40 per share. It also has debt outstanding. This debt is in the form of a risk-free coupon bond, is two years away from maturity, has annual coupons with a coupon rate of 10%, and has a $100 million face value. The first coupon payment will be paid in exactly one year. The YTM of the bond is 2%, which is the same as the risk-free interest rate. The equity beta of *JX Industries* is 2 and the expected market return is 6%. The tax rate is 35%. Based on this information, what is the after-tax WACC of *JX Industries*? (Choose the answer below that is closest to the value you computed.)

(A) 6%

(B) 6.5%

(C) 7%

(D) 7.5%

(E) 8%

Answer: (E)

Cost of equity = 2% + 2 × (6% – 2%) = 10%. Cost of debt = 2%

Value of equity = 40 ×10 = 400 million

Value (price) of debt = 10/1.02 + 110/1.02^2 = 115.53 million

WACC = 10% × 400/(400+115.53) + 2% ×(1–0.35) × 115.53/(115.53+400) = 8.05%

(Question 10 and 11 use the same information)

10. You are hired by *Apple* to evaluate a new product line for the company. The upfront investment cost required to launch the product line is $10 million. The product will generate a free cash flow of $500,000 in the first year, and this free cash flow is expected to grow at a rate of 5% per year. *Apple* has an equity cost of capital of 12%, a debt cost of capital of 3%, and a tax rate of 40%. *Apple* maintains a debt-equity ratio of 0.40. (There is no cash.) **Using the WACC method**, what is the NPV of the new product line? (Choose the answer below that is closest to the value you computed. You will NOT get any credit if you do not use the WACC method.)

(A) $1.25 million

(B) $2.25 million

(C) $3.25 million

(D) $4.25 million

(E) $5.25 million

Answer: (B)

WACC = 12%*5/7 + 3%*(1 – 0.4)*2/7 = 9.1%

EV of the new product line = 0.5/(9.1% – 5%) = 12.24 million

NPV of the new product line = –10 + 12.24 = 2.24 million

11. How much of the new product line's enterprise value is due to the present value of interest tax shields? (Choose the answer below that is closest to the value you computed.)

(A) 4.7%

(B) 5.7%

(C) 6.7%

(D) 7.7%

(E) 8.7%

Answer: (D)

Project debt capacity (i.e. how much debt *Apple* will use to fund the new product line) = EV of the new product line × target debt-to-value ratio = 12.24×2/7 = 3.5 million

Unlevered cost of capital = 12%*5/7 + 3%*2/7 = 9.43%

PV of interest tax shields = 3.5×3%×40% / (9.43% – 5%) = 0.95 million

% of new product line's EV due to PV of interest tax shields = 0.95/12.24 = 7.74%

12. Macrosoft will have EBIT this coming year (year 1) of $15 million. The total capital expenditures and increases in net working capital together will be $5 million in year 1, and the depreciation expenses will be $2 million. Macrosoft is currently an all-equity firm with a corporate tax rate of 40% and a cost of capital of 10%. The firm does not have any cash. If Macrosoft's free cash flows are expected to grow by 8% per year after year 1, what is the (intrinsic) value of its equity today? (Choose the answer below that is closest to the value you computed.)

(A) 100

(B) 200

(C) 300

(D) 400

(E) 500

Answer: (C)

FCF in year 1 = 15*(1 – 40%) – 5 + 2 = $6 million
Enterprise value = 6/(10% – 8%) = $300 million
Intrinsic value of equity = enterprise value = $300 million since there is no debt or cash.

13. You have an arrangement with your broker to request 1000 shares of all available IPOs. Suppose that 80% of the time, the IPO is "successful" and the stock price rises by 15% on the first trading day (after the IPO), and 20% of the time the IPO "fails" and the stock price falls by 10% on the first day. Suppose you expect to receive 200 shares when the IPO is successful, and 1000 shares when it fails. Assume the IPO price is $30 per share. What is your expected one-day (first-day) return on your IPO investments? (Choose the answer below that is closest to the value you computed.)

(A) –0.5%

(B) 0.2%

(C) 0.6%

(D) 1%

(E) 2%

Answer: (D)

You expect to get 0.8*200 + 0.2*1000 = 360 shares of the IPO at a cost of $30 per share.
Thus your expected IPO investment cost is 360*30 = $10800.
The expected total stock market value that you will have on the first trading day is
0.8*30*(1+15%)*200 + 0.2*30*(1 – 10%)*1000 = $10920
Therefore, your expect one-day (first-day) return on your IPO investments
= (10920 – 10800)/10800 = 1.11%

14. HHH is an all-equity firm whose cost of equity is 8%. HHH does a leveraged recapitalization, issuing debt and repurchasing stock, until its debt-equity ratio is 0.70. Due to the increased risk, shareholders now expect a return of 12% on HHH's equity. Assuming perfect capital markets, there are no taxes and HHH's debt is risk-free, what is the cost of debt for HHH? (Choose the answer below that is closest to the value you computed.)

(A) 1%

(B) 1.3%

(C) 1.6%

(D) 1.9%

(E) 2.2%

Answer: (E)

We are in the Modigliani-Miller world by assumption. Thus WACC is always = 8%.
Then,
8% = 12%*10/17 + cost of debt*7/17. Hence cost of debt = 2.29%

15. Below you will find the income statement and the balance sheet for *Example.com* for the years 2008 and 2009. Please notice that Cash on the balance sheet is ***not*** a part of the working capital. Year 0 (right now) is 2009.

All numbers are in thousands:	**INCOME STATEMENT**	
	2008	**2009**
Sales	800	1250
Costs	250	350
Depreciation	50	100
EBIT	500	800
Interest	100	100
EBT	400	700
Tax	160	280
Net Income	240	420

All numbers are in thousands:	**BALANCE SHEET**	
	2008	**2009**
Assets		
Cash	100	150
Accounts Receivable	250	400
Inventory	100	200
Total Current Assets	*450*	*750*
Property and Equipment	2000	2050
Goodwill	150	140
Total Assets	*2600*	*2940*
Liabilities		
Accounts Payable	200	250
Short-Term Debt	100	50
Total Current Liabilities	*300*	*300*
Long-Term Debt	1000	1000
Total Liabilities	*1300*	*1300*
Equity (market cap)	*1300*	*1640*

The capital expenditures in 2009 were 200 thousand. Assume that total unlevered free cash flows will grow at the rate of 30% each year until 2012, and then the growth rate will drop to 3% each year forever (i.e. terminal growth rate). You also have the following information:

- The company has 1 million shares outstanding in December, 2009
- The corporate tax rate is 40%
- The equity beta of *Example.com* is 0.94. The target debt-to-value ratio of *Example.com* is D/(D+E) = 0.3
- The risk-free rate is 4%, and the market risk premium is 6%
- You estimated the cost of debt for *Example.com* to be 5%

What is the intrinsic stock price of *Example.com* at 2009 (year 0)? (Choose the answer below that is closest to the value you computed.)

(A) $5

(B) $6

(C) $7

(D) $8

(E) $9

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Answer: (C)

First, we compute the *unlevered* free cash flow of *Example.com* in 2009.

$$\textit{Change in NWC} = (400 - 250) + (200 - 100) - (250 - 200) = 200 \text{ thousand}$$
$$FCF = 800*(1 - 0.4) + 100 - 200 - 200 = 180 \text{ thousand}$$

Second, we forecast the unlevered free cash flows of *Example.com* in 2010, 2011 and 2012.

$$FCF_{2010} = 180*1.3 = 234 \text{ thousand}$$
$$FCF_{2011} = 180*1.3^2 = 304.2 \text{ thousand}$$
$$FCF_{2012} = 180*1.3^3 = 395.46 \text{ thousand}$$

Third, we estimate the (after-tax) WACC for *Example.com.*

$$WACC = 0.3*0.6*5\% + 0.7*(4\% + 0.94*6\%) = 7.65\%$$

Fourth, we calculate the present value of all future FCFs for *Example.com*, including the terminal value post 2012.

$$PV(FCF) = 234/1.0765 + 304.2/1.0765\text{^}2 + 395.46/1.0765\text{^}3 + (395.46*1.03/(7.65\% - 3\%))/1.0765\text{^}3 = 7818.6 \text{ thousand}$$

Last, we obtain the intrinsic stock price of *Example.com* at 2009 (year 0).

$$\textit{Intrinsic Equity Value} = 7818.6 + 150 - 50 - 1000 = 6918.6 \text{ thousand} = 6.9 \text{ million}$$
$$\textit{Intrinsic Stock Price} = 6.9/1 = \$6.9 \approx \$7$$

16. One share of Bank of America (BAC) costs $10 right now. A European put with a strike price of $9 and a time to expiry of two years is trading at $2. The annual risk-free interest rate is 8%. If you expect BAC to pay out a dividend of $1 in year 1, how much should you be willing to pay for a European call option with a strike price of $9 which expires in two years? (Choose the answer below that is closest to the value you computed.)

(A) 2.75

(B) 3.35

(C) 3.75

(D) 4.35

(E) 4.75

Answer: (B)

Use put-call parity for a dividend paying stock to find the price of a European call. *c(S,K)=p(S,K)+S – K/(1+r)^2 – D/(1+r).* Hence *c = 2 + 10 – 9/1.08^2 – 1/1.08 = 3.358.*

17. Company AQR's stock is trading at $50 per share. After one year, the price will be either $70 a share, or $40 a share. There is no dividend. Consider a European Put option on AQR with the strike price of $80 and expiration in one year. Construct a portfolio of stock and TBills that replicates the payoffs of the put. Assume that the risk-free rate is 0% (zero). What is the number of shares invested in the stock, the amount invested in the TBills, and the price of the put option? (Choose the answer below that is closest to the value you computed.)

(A) –0.6 (shares of stock), 40 (amount in the TBills), 10 (price of the put)

(B) –0.7 (shares of stock), 50 (amount in the TBills), 15 (price of the put)

(C) –0.8 (shares of stock), 60 (amount in the TBills), 20 (price of the put)

(D) –0.9 (shares of stock), 70 (amount in the TBills), 25 (price of the put)

(E) –1 (shares of stock), 80 (amount in the TBills), 30 (price of the put)

Answer: (E)

$$c_u = \theta_s uS + \theta_B$$
$$c_d = \theta_s dS + \theta_B$$
$$\Rightarrow$$
$$\theta_S = \frac{c_u - c_d}{(u-d)S} = \frac{10-40}{70-40} = \frac{-30}{30} = -1$$
$$\theta_B = \frac{uc_d - dc_u}{(u-d)} = \frac{1.4\times 40 - 0.8\times 10}{1.4-0.8} = \frac{48}{0.6} = 80$$
$$\text{price of the put} = -1\times 50 + 80\times\frac{1}{1+0\%} = 30$$

18. Consider an American Call on *Drugs Inc.* with the strike price of $40 in the following two-period binomial model (the call expires in period 2). The current stock price of *Drugs Inc.* (at period 0, today) is $30 per share. In period 1, the price could become either $60 or $20. If the stock price is $60, then in period 2 it can change to $120 or $50. If the stock price is $20, then in period 2 it drops to $10 or rises to $40. *Drugs Inc.* does not pay dividends, and the risk-free rate over any one period is 5%. What is the price of the call right now at period 0? (Choose the answer below that is closest to the value you computed.)

(A) 5.5

(B) 6

(C) 6.5

(D) 7

(E) 7.5

Answer: (B)

At t=1:

- *In the "up" state:*
  $120\theta_S + \theta_B = 80$
  $50\theta_S + \theta_B = 10$
  So $\theta_S = 1$, $\theta_B = -40$. *Thus* $c_u = 60 - 40/1.05 = 21.9$.

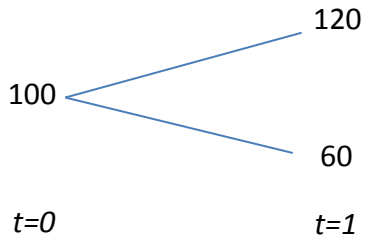
- *In the "down" state:*
  $40\theta_S + \theta_B = 0$
  $10\theta_S + \theta_B = 0$
  So $\theta_S = 0$, $\theta_B = 0$. *Thus* $c_d = 0$.

At t=0:

$60\theta_S + \theta_B = 21.9$
$20\theta_S + \theta_B = 0$

So $\theta_S = 0.5475$, $\theta_B = -10.95$. *Thus* $c_0 = \mathbf{0.5475 \times 30 - 10.95 / 1.05 = 6}$

19. Consider the following binomial tree for a stock (price). Assume the risk-free rate r =0.1. There is no dividend.



What is the price of an **American put** option with strike price K=108 at t=0? (Choose the answer below that is closest to the value you computed.)

(A) $4.3

(B) $6.4

(C) $7.2

(D) $8.1

(E) $9.0

Answer: (D)

Replicating portfolio:

$120\theta_S + \theta_B = 0$
$60\theta_S + \theta_B = 48$

Hence $\theta_S = -0.8$, $\theta_B = 96$, and $p_0 = -80 + 96/1.1 = 7.27$. However, if we exercise the American put option right now at t=0, we will get a payoff of 8 that is > 7.27. Hence the price of the option at t=0 is 8 (i.e. we exercise early).

20. You are the CEO of a **leveraged** buyout firm and are evaluating a potential buyout of BAD Company. BAD's stock price is $20, and it has 2 million shares outstanding. The company currently has no debt, nor does it have any cash. You believe that if you buy the company and replace its management, its total (enterprise) value will increase by 40%. You are planning on doing a **leveraged** buyout of BAD (i.e. through borrowing money/using debt), and will offer $25 per share for control of the company. Assuming you succeed and get 50% control (i.e. you bought 50% of all the shares outstanding at a price of $25 per share by borrowing the necessary amount of money), what is the equity value of the company BAD after the leveraged buyout? [After the leveraged buyout, you took the debt (i.e. the money you borrowed for the buyout) onto the company BAD's balance sheet.]

(A) 20

(B) 25

(C) 28

(D) 31

(E) 56

Answer: (D)

Total enterprise value of BAD before the buyout = 20*2 = $40 million
Total enterprise value of BAD after the buyout = 40*(1+40%) = $56 million
Total debt value of BAD after the buyout (i.e. the amount of money you borrowed for the leveraged buyout) = 25*2*0.5 = $25 million
Total equity value of BAD after the buyout = 56 – 25 = $31 million