Econ 136 PSET 10

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1. Companies PDQ and HAL

1(a).

Another way to look at risk is to compare the distance to default or higher debt to equity (leverage) ratio. We can use the DuPont formula given in class for Return on Equity (ROE) and solve for the financial leverage ratio:

ROE = Profit Margin x Asset Turnover x Financial Leverage or

$$Leverage = \frac{ROE}{Profit * AssetTurnover}$$

We can then calculate leverage for PDQ and HAL:

$$\begin{aligned} Leverage_{PDQ} &= \frac{0.25}{0.11 * 1.50} \\ &= 1.515152 \\ Leverage_{HAL} &= \frac{0.25}{0.14 * 1.30} \\ &= 1.373626 \end{aligned}$$

Since firm PDQ has a higher leverage ratio, it would be considered riskier.

1(b).

Using the growth rate definition where b is the dividend payout ratio:

$$\begin{aligned} g &= (1 - b) * ROE \\ &= (1 - 0.3) * 0.25 \\ &= 0.175 \end{aligned}$$

1(c).

Growth rate and risk are related through ROE but without comparing leverage that relationship can be hidden.

2. Two-stage dividend discount model

We find $r_s = r_s$ using CAPM:

$$\begin{aligned} r_s = r_h &= r_f + \beta\left[E(r_m) - r_f\right] \\ &= 0.0225 + 1.3(0.04 - 0.0225) = 0.04525 \end{aligned}$$

Then we plug this into the equation from Lecture 21:

$$\begin{aligned} V_0 &= D_0 \underbrace{\left[1 - \left(\frac{1+g_h}{1+r_h}\right)^T\right]\left(\frac{1+g_h}{r_h - g_h}\right)}_{high\ growth\ phase} + \underbrace{D_0\left(\frac{1+g_h}{1+r_h}\right)^T\left(\frac{1+g_s}{r_s - g_s}\right)}_{stable\ growth\ phase} \\ &= 1.65\left[1 - \left(\frac{1.0425}{1.04525}\right)^3\right]\left(\frac{1.0425}{0.00275}\right) + 1.65\left(\frac{1.0425}{1.04525}\right)^3\left(\frac{1.0375}{0.00775}\right) \\ &= 224.0723 \end{aligned}$$

3. Equity-Debt Correlation

Using Goal Seek and Eurotunnel information from the lecture, we find the implied volatility σ where it is equal to:

$$\sigma = \sqrt{w_E^2\sigma_E^2 + w_D^2\sigma_D^2 + 2w_E\sigma_E w_D\sigma_D\rho_{E,D}}$$

Our pricer shows that constraining the equity "call" option obtains an implied volatility of 0.1757:

Input		Output	
Stock price	2278	d1	-0.9194164
Strike	8865	d2	-1.5004508
volatility	0.175748558		
rate	0.06	Call	100.500002
time to expiry	10.93	Put	2423.67148
time to expiry	0.000001		
		CHECK	
		Call	100.500002
		Put	2423.67148

Solving the equation we can get $\rho_{E,D}$:

$$\begin{aligned} 0.1757 &= \sqrt{(0.15)^2(0.41)^2 + (0.85)^2(0.17)^2 + 2(0.15)(0.41)(0.85)(0.17)\rho_{E,D}} \\ 0.00620799 &= 0.0177735\rho_{E,D} \\ \rho_{E,D} &= 0.3492835 \end{aligned}$$

4. Black-Scholes Options Pricer

4(a). Reproduce slide 14

SD(both)	SD(LA)	weight(LA)	SD(GC)	weight(GC)	corr	time	rate	debt(LA)	debt(GC)
0.392428337	0.4	0.4	0.5	0.6	0.4	10	0.1	80	50
Value	LA	GC	Combined						
Firm	100	150	250						
Equity	75.94301475	134.48166	207.216044						
Debt	24.05698525	15.51834	42.7839557						

4(b). Change correlation to 0.25

SD(both)	SD(LA)	weight(LA)	SD(GC)	weight(GC)	corr	time	rate	debt(LA)	debt(GC)
0.373630834	0.4	0.4	0.5	0.6	0.25	10	0.1	80	50
Value	LA	GC	Combined						
Firm	100	150	250						
Equity	75.94301475	134.48166	206.366626						
Debt	24.05698525	15.51834	43.633374						

4(c). Explanation

The decrease in cash flow correlation caused the combined risk to decrease, indicating that some wealth has transfered from equity holders to debt holders (since less risk means that debt is worth more).

5. SEC

5(a). EMH

The three forms of the EMH are:

1. Strong: when prices accurately account for all information in the market
2. Semi-strong: when prices accurately account for all public information in the market
3. Weak: when past prices have no predictive power for future prices

Powers' actions imply that he does not think the strong EMH is true because otherwise, acting upon his privately obtained information would pose no gain to him.

5(b). Explanation

Powers bought SeaWorld stock at a low price (which only he would know from private earnings information) prior to the rise in stock price caused by the release of that information, and then sold the shares at a higher price, thus earning a profit of $65,000.