

VALUING PRIVATE FIRMS

Problem 1

a. & b.

Average beta=	1.35666667
Average debt/equity=	0.13653333
Unlevered beta =	1.24764572
Total beta =	2.49529144
Total levered beta=	2.71306233
Cost of equity =	20.92%
Cost of capital =	19.08%

After year 5, I use a total beta of 2.00 (Market beta of 1/ 0.5)

Cost of equity = 6% + 2*5.5% = 17%

Cost of capital = 17% (.88) + 8.75% (1-.36)(.12) = 15.63%

Year	Current	1	2	3	4	5 Terminal Year	
Revenues	\$50.00	\$65.00	\$84.50	\$109.85	\$142.81	\$185.65	\$196.79
EBIT	\$9.50	\$12.35	\$16.06	\$20.87	\$27.13	\$35.27	\$37.39
EBIT (1-t)		\$7.90	\$10.28	\$13.36	\$17.37	\$22.57	\$23.93
- Net cap ex	\$3.50	\$4.55	\$5.92	\$7.69	\$10.00	\$13.00	\$13.77
- Chg in WC		\$1.50	\$1.95	\$2.54	\$3.30	\$4.28	\$1.11
FCFF		\$1.85	\$2.41	\$3.13	\$4.07	\$5.30	\$9.04
Terminal value						\$93.86	
PV		\$1.56	\$1.70	\$1.86	\$2.03	\$41.40	
Firm Value	\$48.54						
- Debt	\$5.83						
Value of Equity	\$42.72						

c. For an initial public offering, you would use a market beta

Year	Current	1	2	3	4	Terminal 5 Year	
Revenues	\$50.00	\$65.00	\$84.50	\$109.85	\$142.81	\$185.65	\$196.79
EBIT	\$9.50	\$12.35	\$16.06	\$20.87	\$27.13	\$35.27	\$37.39
EBIT (1-t)		\$7.90	\$10.28	\$13.36	\$17.37	\$22.57	\$23.93
- Net cap ex	\$3.50	\$4.55	\$5.92	\$7.69	\$10.00	\$13.00	\$13.77
- Chg in WC		\$1.50	\$1.95	\$2.54	\$3.30	\$4.28	\$1.11
FCFF		\$1.85	\$2.41	\$3.13	\$4.07	\$5.30	\$9.04
Terminal value						\$188.65	
PV		\$1.56	\$1.70	\$1.86	\$2.03	\$80.99	
Firm Value	\$88.13						

- Debt	\$10.58	
Value of Equity	\$77.55	
Average beta=	1.35666667	
Average debt/equity=	0.13653333	
Unlevered beta =	1.24764572	
Total beta =	1.24764572	
Total levered beta=	1.35653116	
		High Growth Stable Growth
Beta	1.36	1.00
Cost of equity =	13.46%	11.50%
Cost of capital =	12.52%	10.79%

Problem 2

a. Using the Silber regression

Silber regression = $(100 - \exp(4.33 + 0.036 * \text{LN}(\text{Revenues}) - 0.142 * \text{LN}(\text{Block size} * 100) + 0.174 * \text{Earnings Dummy})) / 100$

Revenues = 200 million

Block Size = 100% = 1

Earnings Dummy = 1 (positive earnings)

Discount = $(100 - \exp(4.33 + 0.036 * \text{LN}(200) - 0.142 * \text{LN}(1 * 100) + 0.174 * 1)) / 100$
= 43.13%

Value of firm = $250 (1 - .4313) = \$142$ million

b. Adjusting the base discount

Base discount for firm with revenues of \$ 10 million = 25%

Adjustment for revenues = $((100 - \exp(4.33 + 0.036 * \text{LN}(10) - 0.142 * \text{LN}(1 * 100) + 0.174 * 1)) / 100 - (100 - \exp(4.33 + 0.036 * \text{LN}(200) - 0.142 * \text{LN}(1 * 100) + 0.174 * 1)) / 100) = 5.81\%$

Adjusted discount = 25% - 5.815 = 19.19%

Value of firm = $250 (1 - .1919) = \$ 202$ million

Problem 3

a. Value of Business

Assuming that the business will be sold to a diversified buyer, we use the market beta:

Cost of equity = $7\% + 1.1 * (5.5\%) = 13.05\%$

Cost of capital = $13.05\% (.5) + 8\% (1 - .4) (.5) = 8.925\%$

To estimate cashflows, we consider only the portion of the operating income that is not due to the current owner:

EBIT	=	60000	
EBIT (1-t)	=	36000	
- Net Cap ex	=	10000	
FCFF	=	26000	
Present value of \$26,000 growing at 5% a year for 10 years	=		\$203,486
Present value of Salvage value of \$ 500,000 in 10 years	=		\$212.664
Value of Business	=		\$ 416,150

b. If the chef offers to stay on,

	1	2	3
EBIT	105000	110250	115762.5
EBIT without chef	63000	66150	69457.5
Additional income	42000	44100	46305
After-tax income	25200	26460	27783
PV	23135	22301	21497

Additional value of cashflows = \$ 66,934

Value of Business = 416150 + 66934 = \$ 483, 084.

Problem 4

a. Cost of capital

Unlevered beta = 1.20

Estimated market value of equity = \$ 10 million * 3 = \$ 30 million

Debt/Equity = 10/30

Levered beta = 1.20 (1 + (1-.40)(10/30)) = 1.44

Cost of equity = 6% + 1.44 (5.5%) = 13.94%

Cost of debt = 1/10 (I am assuming that the debt is recent)

Cost of capital = 13.94% (30/40) + 10% (1-.4) (10/40) = 11.94%

When we get to the terminal year, I would lower the beta to 1

Cost of equity = 11.5%

Cost of capital = 11.5% (30/40) + 10% (1-.4) (10/40) = 10.13%

(You could also adjust the cost of debt down)

b. & c. Firm Value & Equity value per share

Reinvestment rate after year 5 = $g/ROC = 5\%/15\% = 33.33\%$

Cap ex in year 6 = $(3.14 * .3333) + \text{Depreciation in year 5 (1.05)}$

Year	Current	1	2	3	4	5	Terminal year
Revenues	\$20.00	\$24.00	\$28.80	\$34.56	\$41.47	\$49.77	\$52.25
EBIT	\$2.00	\$2.40	\$2.88	\$3.46	\$4.15	\$4.98	\$5.23
EBIT (1-t)		\$1.44	\$1.73	\$2.07	\$2.49	\$2.99	\$3.14
+ Depreciation	\$0.50	\$0.60	\$0.72	\$0.86	\$1.04	\$1.24	\$1.31
- Cap Ex	\$1.00	\$1.20	\$1.44	\$1.73	\$2.07	\$2.49	\$2.35
FCFF		\$0.84	\$1.01	\$1.21	\$1.45	\$1.74	\$2.09
Terminal value = $2.09 / (.1013 - .05) =$						\$40.78	
PV (@11.94%)		\$0.75	\$0.80	\$0.86	\$0.92	\$24.20	
Value of firm =		\$27.54					
- Debt		\$10.00					
Value of Equity =		\$17.54					
Value per share =		\$17.54					

Problem 5

I would make two adjustments. First, I would use the total beta, rather than the market beta:

First 5 years

Total Beta = $1.44/0.6 = 2.40$

Cost of equity = $6\% + 2.4 (5.5\%) = 19.20\%$

Cost of debt = $10\% (1-.4) = 6\%$

Cost of capital = $19.20\% (30/40) + 6\% (10/40) = 15.90\%$

Terminal year

Total Beta = $1/0.6 = 1.67$

Cost of equity = $6\% + 1.67 (5.5\%) = 15.17\%$

Cost of capital = $15.17\% (30/40) + 6\% (10/40) = 12.88\%$

Year	Current	1	2	3	4	Terminal year	
Revenues	\$20.00	\$24.00	\$28.80	\$34.56	\$41.47	\$49.77	\$
EBIT	\$2.00	\$2.40	\$2.88	\$3.46	\$4.15	\$4.98	
EBIT (1-t)		\$1.44	\$1.73	\$2.07	\$2.49	\$2.99	
+ Depreciation	\$0.50	\$0.60	\$0.72	\$0.86	\$1.04	\$1.24	

- Cap Ex	\$1.00	\$1.20	\$1.44	\$1.73	\$2.07	\$2.49
FCFF		\$0.84	\$1.01	\$1.21	\$1.45	\$1.74
Terminal value						\$26.54
PV		\$0.72	\$0.75	\$0.78	\$0.80	\$13.52
Value of firm =		\$16.58				
- Debt		\$10.00				
Value of Equity =		\$6.58				

I would apply a liquidity discount:

$$\text{Illiquidity Discount} = 0.14 - 0.015 (\ln(\text{Revenues})) = .0951$$

$$\text{Value of Equity} = 6.58 (1 - .0951) = \$5.96 \text{ million}$$