
BOOK VALUE MULTIPLES
Problem 1

- A. False. If the $ROE < \text{Required rate of return}$, this can be justified.
- B. False, since the drop can be temporary. If the drop is permanent, this will be generally true, since there will be a two-layered impact. The growth will go down, pushing down Price/Book value ratios. The ROE will also go down pushing P/BV ratios down even further.
- C. True, but only if we hold risk constant. It is false if we consider very risky stocks.
- D. True. If other things (like risk) are not equal, this can be false.
- E. False. The growth rate will be lower for these firms. The net effect may be a lower price/book value ratio.

Problem 2

- A. Dividend Payout Ratio = $\$2/\$4 = 50\%$
 Return on Equity = $\$4/\$40 = 10\%$
 Cost of Equity = $7\% + 0.85 * 5.5\% = 11.68\%$
 Expected Growth Rate = 6%
 Price/Book Value Ratio = $(.1) (.5)(1.06)/(.1168 - .06) = 0.93$

A simpler solution might be the following:

$$\text{Price/Book Value Ratio} = (.10 - .06)/(.1168 - .06) = 0.70$$

(This solution is internally more consistent since it takes into account the relationship between ROE and g, i.e., $g=b(\text{ROE})$)

- B. If the P/BV ratio is 1.5, using the first approach,
 $1.5 = \text{ROE} (.5) (1.06)/(.1168 - .06)$,
 Solving for ROE = 16.08%
 Using the second approach,
 $1.5 = (\text{ROE} - .06)/(.1168 - .06)$
 Solving for ROE = 14.52%

Problem 3

- A. Average Price/Book Value Ratio = 2.28
 Average ROE = 12.44%
 Average Beta = 1.10

B. Cost of Equity (based upon average beta) = $7\% + 1.1 * 5.5\%$
 $= 13.05\%$

If $P/BV = (ROE - g)/(r - g)$,
 and $ROE < r$, (as in this case)
 then $P/BV < 1$.

Therefore, one may conclude that stocks in the industry are, on average, overvalued relative to book value (assuming that the industry overall is in stable growth, although individual firms might still have extraordinary growth).

Problem 4

A.

Price/Book Value of Equity

$$= 0.21 * \frac{0.10 * (1.30) * 1 - \frac{(1.30)^5}{(1.1633)^5}}{(.1633 - .30)} + 0.21 * \frac{0.60 * (1.30)^5 * (1.06)}{(.133 - .06) (1.1633)^5}$$

= 3.34

This takes the return on equity and the growth rate as a given. A more consistent result would be to estimate growth based upon the return on equity and retention ratio. If we did this, the expected growth rate in the high growth period would be:

Expected growth rate = $ROE * \text{Retention ratio} = 21\% * .9 = 18.9\%$

In stable growth, this firm should be able to payout out a lot more than 60%, with a growth rate of 6% and a ROE of 21%:

Stable payout ratio = $1 - g/ROE = 1 - 6/21 = 71.43\%$

Price/Book Value of Equity

$$= 0.21 * \frac{0.10 * (1.189) * 1 - \frac{(1.189)^5}{(1.1633)^5}}{(.1633 - .189)} + 0.21 * \frac{0.7143 * (1.189)^5 * (1.06)}{(.133 - .06) (1.1633)^5}$$

= 2.54

B. Using the first approach:

<i>Growth Rate</i>	<i>Price/Book Value Ratio</i>
10%	1.47
15%	1.83

20%	2.25
25%	2.75
30%	3.34
40%	4.81
50%	6.76

C. Between 11 and 12 years (this can be solved through trial and error).

Problem 5

A.

	Next 10 yrs	After yr 10
Payout Ratio	37.00%	60.00%
Expected Growth	19.85%	6.00%
Cost of Equity	12.88%	11.50%
ROE	31.50%	15.00%

$$\begin{aligned} \text{Expected Growth Rate} &= (1 - \text{Payout Ratio}) * \text{ROE} = (1 - .37) (.3150) \\ &= .1985 \end{aligned}$$

$$\begin{aligned} \text{Payout Ratio After Year 10} &= 1 - \text{Growth Rate} / \text{ROE} \\ &= 1 - 6\% / 15\% = .60 \end{aligned}$$

Price / Book Value of Equity

$$\begin{aligned} &= 0.315 * \frac{0.37 * (1.1985)^{10} * 1 - \frac{(1.1985)^{10}}{(1.1288)^{10}}}{(.1288 - .1985)} + 0.15 * \frac{0.60 * (1.1985)^{10} * (1.06)}{(.115 - .06) (1.1288)^{10}} \\ &= 4.80 \end{aligned}$$

B.

	<i>Next 10 years</i>	<i>After year 10</i>
Payout Ratio	37.00%	60.00%
Expected Growth	12.60%	6.00%
Cost of Equity	12.88%	11.50%
ROE	20.00%	15.00%

$$\text{Expected Growth Rate} = (1 - \text{Payout Ratio}) * \text{ROE} = (1 - .37) (.20)$$

$$= .126$$

$$\begin{aligned}
 \text{PBV} &= 0.20 * \frac{0.37 * (1.126) * 1 - \frac{(1.126)^{10}}{(1.1288)^{10}}}{(.1288 - .126)} + 0.15 * \frac{0.60 * (1.126)^{10} * (1.06)}{(.115 - .06) (1.1288)^{10}} \\
 &= 2.42
 \end{aligned}$$

Problem 6

A. The R squared of the regression measures the goodness of fit of the regression. A high R squared would provide the user with more comfort with the predictions from using the regression.

$$B. P/BV = 0.88 + 0.82 (0.2857) + 7.79 (.25) - 0.41 (1.05) + 13.81 (.175) = 5.05$$

This regression uses the information in the entire cross-section, and hence might capture more of the differences across firms in other industries.

Problem 7

$$\text{Return on capital} = 600 / (4000 + 1000) = 12\%$$

$$\text{Cost of capital} = 11\% (8000/9000) + 4\% (1000/9000) = 10.22\%$$

$$\text{Value to Book} = (\text{ROC} - g) / (\text{Cost of capital} - g) = (.12 - .04) / (.1022 - .04) = 1.29$$

Problem 8

$$\text{Value to book} = 2 = (\text{ROC} - .04) / (.10 - .04)$$

$$\text{Return on capital} = 16\%$$

Problem 9

$$\text{VBV} = 0.15 * \frac{(1 - \frac{.12}{.15}) * (1.12) * 1 - \frac{(1.12)^{10}}{(1.10)^{10}}}{(.10 - .12)} + 0.12 * \frac{(1 - \frac{4}{12}) * (1.12)^{10} * (1.04)}{(.09 - .04) (1.09)^{10}}$$

$$= 2.51$$

Problem 10

Tobin's Q measures the market value of assets in place as a ratio of the replacement cost of these assets. The market value of equity includes expected growth investments in the future and thus is much higher than the market value of assets in place.