

## FA Module 7: Earnings per share and diluted EPS – practice problems

(The attached PDF file has better formatting.)

### Exercise 7.1: Basic earnings per share

Selected operating information from a firm's 20X2 financial statements is

- cost of goods sold = 100
- gross profit margin = 60%
- EBIT margin = 30%
- effective tax rate = 20%

The firm's capital structure is

- 150 par value of long-term debt with 10% annual coupons
- 50 preferred shares outstanding on January 1, with a 6% dividend rate and par value of 3.00 each
- 100 common shares outstanding on January 1, 20X2, with market price of 5.00 each
- 25 common shares issued on April 1, 20X2, at 5.40 each
- 15 common shares repurchased (Treasury shares) on October 1, 20X2, at 5.60 each

The firm pays shareholder dividends of 0.20 per common share on May 15, 20X2. Interest expense and preferred dividends are paid when due.

- What is net revenue in 20X2?
- What is earnings before interest and taxes in 20X2?
- What is interest expense in 20X2?
- What are earnings before tax in 20X2?
- What is tax expense in 20X2?
- What is net income in 20X2?
- What are preferred dividends paid in 20X2?
- What is net income available to common shareholders in 20X2?
- What is the weighted average number of common shares outstanding in 20X2?
- What is basic earnings per share in 20X2?
- If the firm pays a 20% stock dividend (0.2 new shares for each share owned) on November 15, 20X2, what is basic EPS in 20X2?

*Part A:* This exercise calculates basic earnings per share as (net income – preferred dividends) / the weighted average number of common shares outstanding. Net income is the last line on the income statement. This exercise derives net income from net revenue, the EBIT margin, interest expense, and the effective tax rate.

The gross profit margin =  $1 - \text{cost of goods sold} / \text{net revenue} \Rightarrow$

$$\text{net revenue} = \text{cost of goods sold} / (1 - \text{gross profit margin}) = 100 / (1 - 60\%) = 250$$

*Part B:* Earnings before interest and taxes are  $\text{EBIT margin} \times \text{net revenue} = 30\% \times 250 = 75$

*Question:* Is the EBIT margin the same as the operating margin?

*Answer:* Earnings before interest and taxes includes both operating income and non-operating income. Non-operating income is generally small, but it is not necessarily zero. If a final exam problem gives operating income and doesn't mention non-operating income, you may assume  $\text{EBIT} = \text{operating income}$ .

*Part C:* Interest expense = par value of long-term debt  $\times$  coupon rate =  $150 \times 10\% = 15$

*Part D:* Earnings before tax = EBIT – interest expense = 75 – 15 = 60.

*Part E:* Tax expense = effective tax rate × earnings before tax = 20% × 60 = 12.

*Part F:* Net income = earnings before tax – tax expense = 60 – 12 = 48.

*Part G:* Preferred dividends in 20X2 are the dividend rate × number of preferred shares × the par value =

$$6\% \times 50 \times 3 = 9$$

*Part H:* Net income available to common shareholders in 20X2 = 48 – 9 = 39.

*Part I:* We compute weighted average shares outstanding in 20X2:

- January 1 – March 31 (3 months): 100
- April 1 – September 30 (6 months): 125
- October 1 – December 31 (3 months): 110

The weighted average shares outstanding =  $(3 \times 100 + 6 \times 125 + 3 \times 110) / 12 = 115.0000$

*Question:* Do we round the weighted average shares outstanding to the nearest whole number?

*Answer:* We use the exact figure. If the firm issues or repurchases shares during the year, the weighted average shares outstanding is generally not a whole number.

*Part J:* Basic EPS =  $39 / 115 = 0.3391$

*Question:* How do the market price of common shares and the amount of shareholder dividends affect earnings per share?

*Answer:* Earnings per share divides income available to common shareholders by the weighted average number of shares outstanding; it is not affected by the market price of a share or the dividends per share.

- The price-earnings ratio relates the market price per share to the earnings per share.
- The dividend ratio relates the shareholder dividends paid to the price of the shares.

*Part K:* With the stock dividend, the weighted average common shares outstanding are  $115 \times 1.20 = 138$ .

The revised basic EPS is  $39 / 138 = 0.2826$ .

*Question:* If the stock dividend occurs during the year, do we use a weighted average of the shares outstanding before the stock dividend and the shares outstanding after the stock dividend, similar to the computation of the weighted average number of shares outstanding?

*Answer:* A stock dividend is not the same as issuing more shares.

- A stock dividend gives the new shares to investors without receiving any cash from them.
- A stock issues sells the new shares at their market values.

The effect on earnings per share is

- If a 100% stock dividend is paid (a 2 for 1 stock split), twice as many shares are outstanding after the stock dividend but each share is worth half as much. The earnings per share do not change in real terms; we simply refer to each old share as two new shares.
- If the firm issues new shares during the year, the market price of a share does not necessarily change. The same earnings are spread over more shares.

In practice, a new issue of stock may depress the stock price, since investors infer that the firm thinks the market price is too high. A new issue of stock might raise earnings, if the firm uses the cash received for profitable investments, but this increase in earnings is less common.

*Question:* The stock dividend affects the number of shares after November 15, not before November 15.

*Answer:* Each share before November 15 is equivalent to 1.2 shares after November 15. We can not take a weighted average of dissimilar items, so we treat the stock dividend as though it occurred on January 1.

*Question:* Do we adjust the stock issue on April 1 and the stock repurchase on October 1?

*Answer:* Issuing 25 of the old shares is equivalent to issuing  $25 \times 1.20 = 30$  of the new shares, and purchasing 15 of the old shares is equivalent to purchasing  $15 \times 1.20 = 18$  of the new shares. Instead of adjusting the number of shares outstanding in each part of the year, if the stock dividend occurs after the new stock issue and the stock repurchase, compute the weighted average shares outstanding without the stock dividend and multiply by  $(1 + \text{the stock dividend percentage})$ .

Some problems are more complex. Suppose a firm begins the year with 100 common shares outstanding and issues another 100 shares on July 1.

- If it pays a 20% stock dividend on June 1, it ends the year with 220 common shares outstanding.
- If it pays a 20% stock dividend on August 1, it ends the year with 240 common shares outstanding.

### Exercise 7.2: Diluted EPS for convertible preferred shares

In 20X2, a firm has net income of 1,800. Its capital structure consists of

- 400 common shares outstanding
- 30 convertible preferred shares outstanding, convertible into 4 common shares each

In 20X2, the firm pays dividends of 3 per common share and 8 per convertible preferred share.

- A. What is the firm's net income available to common shareholders for 20X2?
- B. What is the firm's earnings per share for 20X2?
- C. What is the firm's diluted earnings per share for 20X2?

*Part A:* The firm's net income available to common shareholders in 20X2 = net income – preferred dividends  
=  $1,800 - 30 \times 8 = 1,560$ .

*Part B:* The firm's earnings per share for 20X2 are  $1,560 / 400 = 3.90$ .

*Part C:* The "if-converted" method assumes the preferred shares are converted at the beginning of the year.

- Common shares outstanding increase to  $400 + 30 \times 4 = 520$ .
- Net income available to common shareholders increases to  $1,560 + 30 \times 8 = 1,800$

Diluted EPS =  $1,800 / 520 = 3.4615$

*Question:* For diluted EPS, do we use net income without any adjustments for preferred dividends?

*Answer:* The firm may have both non-convertible preferred shares and convertible preferred shares. We use net income reduced for non-convertible preferred dividends.

### Exercise 7.3: Diluted EPS for convertible debt

In 20X2, the corporate tax rate is 20% and a firm has net income of 1,600. Its capital structure consists of

- 400 common shares outstanding
- 5,000 (face value) of 8% convertible bonds, convertible into a total of 200 common shares

In 20X2, the firm pays dividends of 3 per common share.

- A. What is the firm's net income available to common shareholders for 20X2?
- B. What is the firm's earnings per share for 20X2?
- C. What is the firm's dividend payout ratio?
- D. What is the firm's earnings retention rate?
- E. What would net income be if the convertible debt had been converted at the beginning of the year?
- F. What is the firm's diluted earnings per share for 20X2?

*Part A:* The firm's net income available to common shareholders in 20X2 is its net income of 1,600.

*Question:* Why don't we subtract the  $8\% \times 5,000 = 400$  of interest paid on the debt?

*Answer:* Net income is after deducting interest expense. If the practice problem gives earnings before interest and taxes, subtract interest expense and tax expense. This problem gives net income, which is after interest and taxes.

*Part B:* The firm's earnings per share for 20X2 are  $1,600 / 400 = 4$ .

*Part C:* Earnings per share are 4 and dividends per share are 3, so the dividend payout ratio is  $3 / 4 = 75\%$ .

*Part D:* The earnings retention rate is the complement of the dividend payout ratio  $= 1 - 75\% = 25\%$ .

*Part E:* Interest expense is tax deductible, so we adjust for the corporate tax rate.

- *Pre-tax* income would be  $5,000 \times 8\% = 400$  higher if the debt had been converted.
- *Net* income would be  $400 \times (1 - 20\%) = 320$  higher if the debt had been converted.

*Question:* Why didn't the practice problem on convertible preferred shares also adjust for taxes?

*Answer:* Preferred dividends (like all shareholder dividends) are paid from after-tax income.

*Part F:* The "if-converted" method assumes the convertible debt is converted at the beginning of the year.

- Common shares outstanding increase to  $400 + 200 = 600$ .
- Net income available to common shareholders increases to  $1,600 + 320 = 1,920$

Diluted EPS =  $1,920 / 600 = 3.2000$

#### Exercise 7.4: Diluted EPS for stock options

In 20X2, the corporate tax rate is 20% and a firm has net income of 1,200. Its capital structure consists of

- 400 common shares outstanding
- 50 executive stock options issued on July 1, 20X2, with exercise prices of 30.

In 20X2, the firm pays dividends of 3 per common share. The average stock price is

- 35 during the first half of the year.
- 45 during the second half of the year.

- A. What is the firm's net income available to common shareholders for 20X2?
- B. What is the firm's earnings per share for 20X2?
- C. If the options are exercised, what does the firm receive?
- D. How many shares does the firm repurchase under the Treasury stock method?
- E. What is the firm's diluted earnings per share for 20X2?

*Part A:* The firm's net income available to common shareholders in 20X2 is its net income of 1,200.

*Part B:* The firm's earnings per share for 20X2 are  $1,200 / 400 = 3$ .

*Question:* The earnings per share of 3 equals the shareholder dividends of 3. Do firms commonly pay out all their earnings in shareholder dividends?

*Answer:* Firms often set their dividend rates by long-term average net income and do not change these rates for short term fluctuations in net income.

- If net income is unexpectedly low one year, the firm's dividend payout ratio is high.
- If net income is unexpectedly high one year, the firm's dividend payout ratio is low.

The dividend payout ratio in one year may not reflect the firm's long-term dividend payout strategy.

*Question:* Do firms generally have high or low long-term dividend payout ratios?

*Answer:* Young firms trying to grow often pay few dividends. Mature firms in steady or declining industries often pay high dividends, especially if the firm is earning money but has little opportunity to grow.

*Part C:* If the options are exercised, the firm receives  $50 \times 30 = 1,500$ .

*Part D:* The Treasury stock method assumes that if the options are exercised, the firm uses the money it receives to buy back shares in the open market.

The stock options were issued on July 1, 20X2, so we are adjusting shares for the second half of the year, when the average stock price is 45.

With 1,500, the firm buys  $1,500 / 45 = 33.3333$  shares at 45 per share.

*Part E:* The common shares if the options are exercised are  $400 + 50 - 33.3333 = 416.6667$ .

The stock options are issued on July 1, 20X2, so the weighted average common shares during the year if the stock options are exercised is  $(400 + 416.6667) / 2 = 408.3333$

The diluted EPS is  $1,200 / 408.3333 = 2.9388$ .

*Question:* Don't we assume the dilutive securities are exercised at the beginning of the year?

*Answer:* We assume the dilutive securities are exercised at the later of the beginning of the year and the issue date of the dilutive securities.

*Question:* If the executive stock options were issued before 20X2, how do we solve this problem?

*Answer:* Parts D and E change:

*Part D:* The average stock price is 40. With 1,500, the firm buys  $1,500 / 40 = 37.50$  shares

*Part E:* The common shares if the options are exercised are  $400 + 50 - 37.50 = 412.50$

The diluted EPS is  $1,200 / 412.50 = 2.9091$ .

### Exercise 7.5: Diluted EPS for stock options

In 20X2, a firm has 64 common shares outstanding and 40 executive stock options outstanding.

The average stock price during 20X2 is 50, and the firm pays shareholder dividends of 3 per share. The corporate tax rate is 20%. In 20X2, the firm's

- Basic EPS = 4.0
- Diluted EPS = 3.2

- A. What is the firm's net income in 20X2?
- B. What is the numerator of the diluted EPS ratio in 20X2?
- C. What is the denominator of the diluted EPS ratio in 20X2?
- D. How many shares are added by exercise of the stock options minus repurchase of shares?
- E. How many shares are repurchased?
- F. How much cash was used to exercise the stock options?
- G. What is the exercise price of the stock options?

*Part A:* Common shares outstanding = 64 and basic EPS = 4, so net income =  $64 \times 4 = 256$ .

*Part B:* The exercise of stock options does not change the numerator of the diluted EPS ratio, so it is 256.

*Part C:* The diluted EPS = 3.2 and the numerator is 256, so the denominator =  $256 / 3.2 = 80$ .

*Part D:* Common shares outstanding = 64, so  $80 - 64 = 16$  shares are added by exercise of the stock options minus repurchase of shares (the Treasury stock method).

*Part E:* Exercise of the stock options adds 40 shares, so  $40 - 16 = 24$  shares are repurchased.

*Part F:* The average stock price in 20X2 is 50, so cash used to repurchase shares is  $50 \times 24 = 1200$ .

*Part G:* The options outstanding = 40, so the exercise price =  $1200 / 40 = 30$ .



### Exercise 7.6: Diluted EPS convertible preferred shares

A firm's capital structure consists of

- 400 common shares outstanding
- 30 convertible preferred shares outstanding

In 20X2, the firm pays dividends of 3 per common share and 8 per convertible preferred share, and

- its basic earnings per share is 4.6
- Its diluted earnings per share is 4.0

- A. What are the preferred dividends paid in 20X2?
- B. What is the numerator of the basic EPS ratio in 20X2?
- C. What is the firm's net income in 20X2?
- D. What is the numerator of the diluted EPS ratio in 20X2?
- E. What is the denominator of the diluted EPS ratio in 20X2?
- F. Into how many common shares can a convertible preferred share be converted?

*Part A:* In 20X2, the firm pays  $30 \times 8 = 240$  of preferred dividends.

*Part B:* The basic EPS ratio in 20X2 is 4.6, and the number of common shares outstanding is 400, so the numerator of the basic EPS ratio in 20X2 is  $400 \times 4.6 = 1840$ .

*Part C:* The numerator of the basic EPS ratio = net income – preferred dividends  $\Rightarrow$

net income = the numerator of the basic EPS ratio + preferred dividends =  $1840 + 240 = 2080$ .

*Part D:* The numerator of the diluted EPS ratio = the numerator of the basic EPS ratio + convertible preferred dividends =  $1840 + 240 = 2080$ .

*Part E:* The diluted earnings per share is 4.0 and the numerator of the diluted EPS ratio = 2080, so the denominator of the diluted EPS ratio is  $2080 / 4.0 = 520$ .

*Part F:* The denominator of the diluted EPS ratio is 520 and the denominator of the basic EPS ratio is 400, so the 30 convertible preferred shares are converted into  $520 - 400 = 120$  common shares. The conversion ratio is  $120 / 30 = 4$ .

### Exercise 7.7: Diluted EPS convertible debt

A firm's capital structure consists of

- 800 common shares outstanding
- 10,000 par value of convertible debt, that can be converted into 400 common shares.

The corporate tax rate is 20%. In 20X2, the firm's

- basic earnings per share is 4.0
- diluted earnings per share is 3.2

- A. What is the firm's net income in 20X2?
- B. What is the denominator of the diluted EPS ratio in 20X2?
- C. What is the numerator of the diluted EPS ratio in 20X2?
- D. What is the after-tax interest paid on the convertible debt in 20X2?
- E. What is the pre-tax interest paid on the convertible debt in 20X2?
- F. What is the interest rate on the convertible debt?

*Part A:* The firm has 800 common shares outstanding and a basic EPS of 4, so net income =  $800 \times 4 = 3200$ .

*Part B:* The denominator of the diluted EPS ratio is the number of common shares are conversion of the convertible debt =  $800 + 400 = 1200$ .

*Part C:* The numerator of the diluted EPS ratio = the denominator of the diluted EPS ratio  $\times$  the diluted EPS ratio =  $1200 \times 3.2 = 3840$ .

*Part D:* The after-tax interest paid on the convertible debt = the addition of the numerator of the diluted EPS ratio =  $3840 - 3200 = 640$ .

*Part E:* The pre-tax interest paid on the convertible debt = the after-tax interest /  $(1 - \text{tax rate}) =$

$$640 / (1 - 20\%) = 800.$$

*Part F:* The interest rate on the convertible debt = the pre-tax interest / the par value =  $800 / 10,000 = 8\%$ .