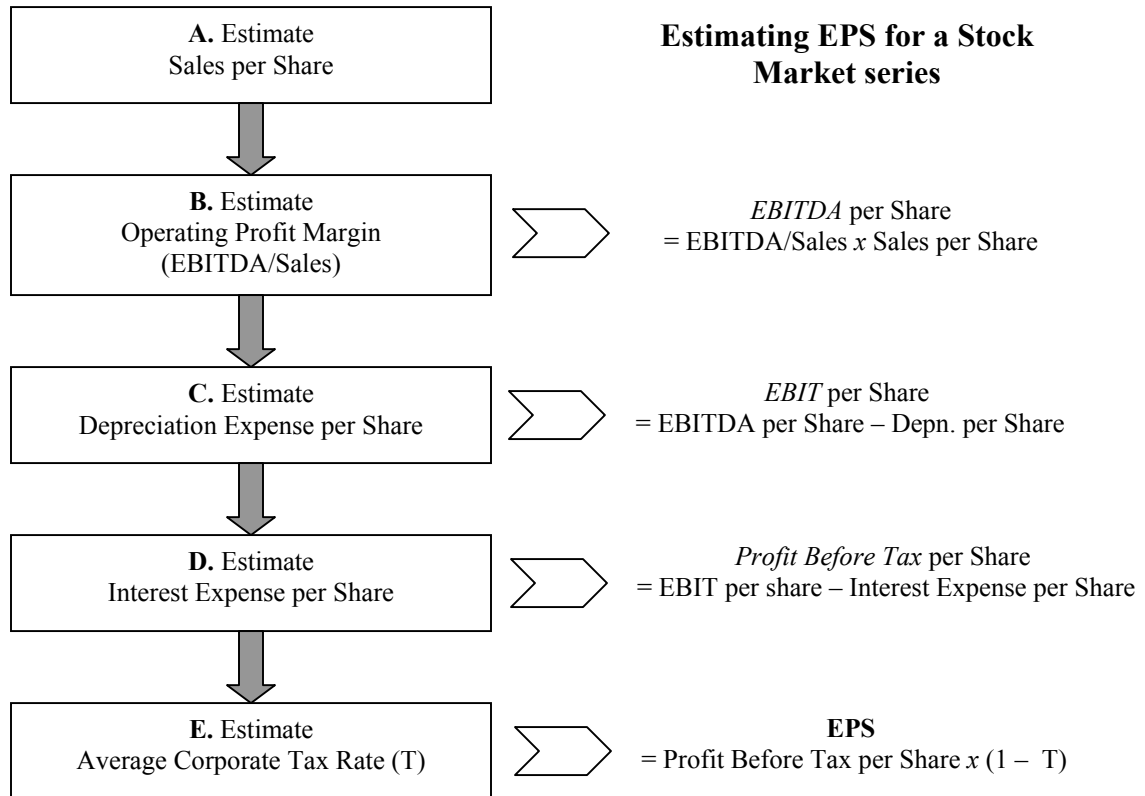


“Stock-Market Analysis”

LOS: 1.B.a. Calculate the earnings per share (EPS) of a stock market series.

Estimating EPS for a stock market series is a five step process as shown in the diagram below:



A. Estimating Sales per Share: Aggregate sales are a function of the GDP of a country. This is usually a positive relationship and can be determined with historical data and a simple regression model. Once the relationship has been estimated statistically, estimates of future nominal GDP can be obtained from financial service firms and economic forecasting services.

$$\text{Projected change in aggregate sales/share} = \text{Constant} + \text{Co-efficient} \times \text{Projected growth in GDP}$$

The estimated per-share change in sales is added to the latest period aggregate sales to arrive at the next period aggregate sales.

$$\text{Projected aggregate sales/share} = \text{Last period aggregate sales/share} + \text{Projected change in aggregate sales/share}$$

B. Estimating Operating Profit Margin: Operating profit margin defined as Earnings Before Interest, Taxes and Depreciation and Amortization (EBITDA) is the most stable profit margin measure as it is not affected by interest and depreciation costs, which are fixed in the short run, irrespective of capacity utilization.

The aggregate profit margin is affected by the following factors:

- *Capacity utilization rate at the aggregate level:* The greater the capacity utilization rate, the lower the fixed cost per unit of production which increases profit margins. Thus, there is a positive relationship between the capacity utilization rate and profit margin.
- *Average unit labor cost:* Unit labor cost is affected by two components – wage per unit hour and productivity per unit hour. If both increase, the latter would offset labor cost.

Net change in unit labor cost = change in unit wage cost – change in productivity.

If the two increase by the same amount, net increase in labor cost would be zero. There is a negative relationship between unit labor cost and operating margin.

- *Inflation:* There are two competing hypotheses regarding the effect of inflation on operating margins. One camp believes that it is good for margins as corporations can pass higher costs to customers in the form of increased prices. The other camp argues that corporations are not able to pass higher costs to customers due to elasticity of the demand curve – sales fall more than the increase in prices, lowering margins. On balance, it is safe to assume that inflation and operating margins have a negative relationship.
- *Competition from foreign producers:* The effect of foreign competition on margins is indeterminate given the current state of theory and empirical evidence.

A study by the authors of the reading found that capacity utilization and unit labor costs relationships with operating margin were as predicted: significantly positive and negative respectively. Effect of inflation and foreign competition were not found to be significant. The latter two can be ignored for practical purposes.

Effect of business cycle: At peak economic activity, capacity utilization would be high and labor costs would also be high. Any increase in capacity utilization would be small and high inflation would push wages up. Since increases in marginal productivity of labor at the peak would also be small, the overall profit margin would be under pressure. Just after a recession, the opposite would be true. Capacity utilization would be low and any increase in demand would bring down unit manufacturing costs. Labor productivity would be high and wages low. The two would combine to produce a higher profit margin. An analyst needs to take the business cycle into account when forecasting profit margins.

Operating margin is multiplied by sales per share to arrive at EBITDA per share:

$$EBITDA \text{ per share} = \text{Operating margin} \times \text{Sales per share}$$

- C. Estimating Depreciation Expense per Share:** Depreciation is a fixed expense and is related to the depreciation policies and property plant and equipment in place (PPE). It should not be estimated as a percentage of sales, which would be volatile and misleading. PPE can be projected with the help of the asset turnover ratio. In the US the historical turnover ratio (Sales/PPE) has ranged between 2.35 and 3.10 between 1977 and 2000. After the asset turnover ratio has been estimated,

$$\text{Estimated PPE per share} = \text{Sales per share} \div \text{Asset turnover ratio}$$

The result should be multiplied with the projected depreciation rate as a percentage of PPE. The latter has increased from 10% to 16% in the US between 1970s and 2000. Thus,

$$\text{Depreciation per share} = \text{Depreciation rate} \times \text{Estimated PPE per share}$$

This gives us EBIT per share,

$$EBIT \text{ per share} = EBITDA \text{ per share} - \text{Depreciation per share}$$

- D. Estimating Interest Expense per Share:** Interest expense is also a fixed financial expense in the short run and does not vary with sales. It should not be expressed as a percentage of sales. The forecasting method is similar to that for depreciation: project the level of debt per share and multiply it with the average interest rate. It should be noted that outstanding debt is also a function of interest rates. If rates decline, corporations tend to borrow more and vice-versa. This interaction between interest rates and debt in the following equation should not be ignored.

$$\text{Interest expense per share} = \text{Outstanding debt per share} \times \text{Interest rate}$$

$$\text{Profit before taxes per share} = EBIT \text{ per share} - \text{Interest expense per share}$$

- E. Estimating the Average Corporate Tax Rate:** The average corporate tax rate has fluctuated between 35 and 40% in the US, depending upon the latest tax legislation and tax credits available. Based on the current laws, once the corporate tax rate (T) has been projected,

$$\text{Estimated EPS} = \text{Profit before taxes per share} \times (1 - T)$$

Example:

Global Financial Analysts (GFA) has come up with the following estimates and relationships for a national economy, whose market series EPS is being projected. What is the estimated EPS for an average share next year in this economy?

Variable	Projection
Latest year sales per share	2,546,877 (actual)
Sales - GDP relationship ¹	$\Delta\% \text{ sale/share} = -0.019 + 1.18 \times \Delta\% \text{ GDP}$
Projected nominal GDP change	5.88%
EBITDA/sales	11.5%
Asset turnover rate (Sales/PPE)	2.76
Depreciation rate	14.5%
Outstanding debt per share	363,976
Average interest rate	7.95%
Average corporate tax rate (T)	36.8%

¹ $\Delta\%$ denotes change percent

Answer:

Step A: Compute aggregate sales per share

$$\text{Change in sales} = -0.019 + 1.18 \times 0.0588 = 0.0504, \text{ or } 5.04\%$$

$$\text{Projected sales per share} = (1 + 0.0504) \times 2,546,877 = 2,675,240$$

Step B: $EBITDA \text{ per share} = 0.115 \times 2,675,240 = 307,653$

Step C: Estimated PPE per share = $2,675,240 \div 2.76 = 969,290$

$$\text{Depreciation per share} = 0.145 \times 969,290 = 140,547$$

$$EBIT \text{ per share} = 307,653 - 140,547 = 167,106$$

Step D: Interest expense per share = $363,976 \times 0.0795 = 28,936$

$$\text{Profit before tax per share} = 167,106 - 28,936 = 138,170$$

Step E: $EPS = 138,170 \times (1 - 0.368) = 87,323$

LOS: 1.B.b. Calculate the expected P/E ratio (earnings multiplier) of a stock market series, using the series' expected dividend payout ratio, required rate of return, and expected growth rate of dividends.

Recall the P-E ratio formula from the previous reading:

$$\frac{P_0}{E_1} = \frac{D_1 / E_1}{(r_s - g)} = \frac{PO}{(r_s - g)}$$

We need the following inputs:

1. Dividend payout ratio
2. Risk adjusted discount rate. This further requires
 - Real risk free rate
 - Rate of inflation
 - Risk premium on common stock
3. Long term dividend growth rate. This further requires
 - Estimate of ROE, which in turn is based on the following three ratios
 - (a) Profit margin (Net Income/Sales)
 - (b) Total Asset Turnover
 - (c) Leverage ratio (Assets/Equity)

Example:

Assume that the aggregate payout ratio is 45%. Aggregate total asset turnover is 2.3 and net profit margin is 3.5%. Equity represents 60% of assets. The real risk free rate is 2.5% with annual inflation expected to be 3%. The market risk premium on equities is expected to be 5%. What is the appropriate P-E multiple for the market as a whole?

Answer:

Discount rate: $[(1 + \text{Real risk free rate})(1 + \text{expected inflation}) - 1] + \text{Risk premium}$
 $= [(1.025)(1.03) - 1] + .05 = 0.1058$, or 10.58%

ROE: Net margin \times Total asset turnover \times Leverage = $0.035 \times 2.3 \times (1/0.6) = 0.1342$, or 13.42%.

Growth rate: Retention rate \times ROE = $(1 - 0.45) \times 13.42 = 0.0738$, or 7.38%

P-E ratio = $\frac{0.45}{0.1058 - 0.0738} = 14.06$

LOS: 1.B.c. Estimate the value of, and **explain** the level of and changes in, the earnings multiplier of a stock market series.

Given the following equation, which is based on DDM,

$$\frac{P_0}{E_1} = \frac{D_1 / E_1}{(r_s - g)} = \frac{PO}{(r_s - g)}$$

There are two ways to estimate the aggregate P-E ratio:

- (1) *Point or specific estimate* – this approach has already been illustrated in the previous LOS. All inputs are projected and resulting values are inserted into the above equation. An analyst may go a step further and consider different possible scenarios and estimate the P-E ratio under each scenario and come up with a range of P-E ratios or its levels.
- (2) *Direction of change* – this approach does not focus on the levels but on changes in the inputs. The potential variables that can change are given below:
- dividend payout ratio
 - ROE – profit margin, asset turnover and leverage
 - real risk free rate
 - risk premium for stocks
 - expected rate of inflation
 - earnings retention rate which equals (1 – dividend payout ratio)

Under this approach, the magnitude is not highlighted but only the direction of change is emphasized. It is not a mathematical approach but an approximation. Given the changes in different variables, the analyst concludes whether the P-E ratio will be higher, lower or the same in the future.

For example, if the payout ratio is expected to increase, this would reduce the retention rate and lower the growth rate if nothing else changes. If leverage were to increase but asset turnover and net margin were to remain the same, ROE would go up, and so would financial risk. The product of lower retention rate and higher ROE may offset each other and the growth rate may remain the same.

In this manner the effect of all variables is considered. If the real rate is expected not to change, however, risk premium may go up due to increased financial risk. This would cause the discount rate to increase. Thus, a higher payout ratio would push the P-E ratio higher, whereas, a higher discount rate would push the P-E ratio lower at the same time. The two may offset each other or one of them may dominate. It is an analysis such as this that leads to a forecast of a potential change in the P-E ratio. Note that it is an inexact approach.

LOS: 1.B.d. Calculate the expected rate of return for a stock market series.

The expected rate of return for an index is based on its current value, end of period value, and the dividends expected to be paid at the end of the period.

$$\text{Expected return} = \frac{\text{End of period index value} - \text{Current index value} + \text{Expected dividends}}{\text{Current value}}$$

Example:

Given the following projections compute the expected return for the index for the first three years. The current index value is 6,995.76.

	Projected P-E ratio	Projected EPS	Projected payout
End of year 1	14.5	450	45%
End of year 2	17.3	475	48%
End of year 3	16.4	480	48%
End of year 4	18.9	510	52%

Answer:

Based on the following year's EPS we project end-of-year index values. Dividends are also projected on the basis of payout ratios.

	Projected index	Projected dividend
End of year 1	= 14.5 x 475 = 6,887.50	= 0.45 x 450 = 202.50
End of year 2	= 17.3 x 480 = 8,304.00	= 0.48 x 475 = 228.00
End of year 3	= 16.4 x 510 = 8,364.00	= 0.48 x 480 = 230.40

$$\text{Expected return for year 1} = \frac{6,887.50 - 6,995.76 + 202.50}{6,995.76} = 0.0135, \text{ or } 1.35\%$$

$$\text{Expected return for year 2} = \frac{8,304.00 - 6,887.50 + 228.00}{6,887.50} = 0.2388 \text{ or } 23.88\%$$

$$\text{Expected return for year 3} = \frac{8,364.00 - 8,304.00 + 230.40}{8,304.00} = 0.0350, \text{ or } 3.50\%$$

Note: We have used the EPS at the end of year 2 and multiplied it with the P-E ratio at the end of year 1 to get the index value at the end of year 1 and so on. This is consistent with the formula which focuses on forward looking EPS, not historic. In general,

$$I_t = P-E_t \times \text{EPS}_{t+1}$$

LOS: 1.B.e. Explain how the top-down approach can be used to analyze the valuation of world stock markets.

Top-down approach can be applied to individual country markets just like it was explained earlier.

Macroeconomic outlook based on GDP growth, interest rates, inflation, capital investment, and industrial production impacts valuation of securities. After analyzing the broad economy, the

focus shifts to the equity market where returns are projected on the basis of P-E ratios, earnings growth, and dividend yield. Goldman Sachs produces a world investment strategy report based on this approach.

QUICK REVIEW

Computation of EPS: The process for estimation of the EPS begins with sales per share, and then travels through operating profit, depreciation expense, interest expense, and finally income taxes.

Expected P-E ratio: This is based on the constant growth assumption and is a repeat of the previous reading. It equals the payout ratio divided by the difference between the required rate of return and the constant growth rate.

Changes in P-E ratio: P-E ratio may change over time due to changes in the payout ratio, a stock's risk level which would alter the required rate of return, and the estimated future growth rate of dividends. Dividend growth in turn depends upon ROE which is influenced by profit margin, leverage and turnover. The required rate is a function of the real rate, inflation premium and the risk of the stock.