

14.5: Solutions to CH 5 Exercises

Question 1

The three-step valuation process for stocks differs from bonds due to the differences in the structure of the cash flow stream. Conceptually, the process is different. However, the cash flow stream for stocks (dividends) has a variable, infinite time horizon which makes forecasting all expected cash flows impossible to do without some simplifying assumptions.

When forecasting dividends, we use one of three assumptions. First, we can assume that dividends exhibit no growth over time. The dividend will remain the same forever. Second, we can assume dividends grow at a constant rate over time. Third, we can assume dividends will grow at a non-constant rate for a specific number of years and then a constant rate after that. The assumption that we make about the dividend stream will determine how we solve for present value in step three of the 3-step valuation method.

The process of choosing an appropriate discount rate is similar (at least until we introduce the Security Market Line in Ch. 8). We need to determine the riskiness of the security and then select a discount rate based on the rate of return we can earn on other similar risk investments. One item of note is that the discount rate for stocks will tend to be higher than the discount rate for bonds due to the fact that stocks (on average) are riskier than bonds. With bonds, solving for PV was simply to use the 5-key approach to find PV.

With stocks, we need to either use a formula (for dividend assumptions one and two) or a process involving the CF worksheet (for dividend assumption three). The formula for the no-growth model is:

$$P_0 = D/k$$

The formula for the constant growth model is:

$$P_0 = D_1 / (k - g)$$

Question 2

Par value is the value stated on the stock certificate and is essentially a meaningless number. This reflects the minimum amount of capital that must be supplied by stockholders to meet the limited liability characteristic of stock ownership. If the stock is originally issued for less than par value, the stockholders are liable for the difference in the event of bankruptcy. However, in practice, most firms set par value for common stock so low (often \$0.01 per share or less) that it is of no practical meaning.

Book value represents the accounting value of each share of stock based on the balance sheet. Book value per share can be found by solving for one of the following two equations (note – both equations are identical since $A = L + OE$):

$$BV = (A - L) / (\text{number of common shares outstanding}) \text{ or}$$

$$BV = (OE) / (\text{number of common shares outstanding})$$

Book value tends to understate the true value of the firm because of the historical cost bias and the omission of most intangible assets.

Market value represents the “true” (sometimes called “economic” or “financial”) value of the share of stock. This is the price at which investors are willing to buy and sell shares.

No one individual determines market value, instead it is set by the equilibrium price in the financial markets (in other words, the price at which both buyers and sellers agree that they are getting their best price). Market value changes constantly based on new information. Any information that causes investors to change their perception on the magnitude, riskiness, or timeliness of expected cash flows will result in changes in the market value. When you look at a stock quote in the Wall Street Journal or online, this represents the market value.

Market value is the most important measure of value for a common stock because it reflects the current price at which people are willing to buy/sell the stock.

Question 3

The right to information – Stockholders have a right to know what is going on in the firm. At a minimum, firms must prepare quarterly and annual audited financial statements that are made available to the stockholders and have annual meetings which stockholders can attend. Most firms make significant information available on their company web page in an investor relations

section. Most of the information made available is detailed financial performance information and general firm strategy information.

Limited Liability – Stockholders can lose no more than their initial investment in common stock. This is a function of the separation of ownership and decision making within the corporate form of ownership. Since the stockholders are not making the management decisions, they are not liable for the results. The stock price can fall to zero and the investor can lose their entire investment made in the stock, but the investor can not be required to supply more money beyond that to meet creditor obligations.

The right to “control” – Stockholders get voting rights. These voting rights allow them to elect the board of directors who are responsible for hiring and compensating management as well as approving major strategic decisions. Stockholders also have voting rights on a limited set of corporate decisions such as authorizing additional shares of stock to be created and issued. However, for most practical purposes, the average stockholder has no real control over corporate activities. The way that board of director votes are handled are designed to keep current boards in place and unless there is a very significant amount of shareholder dissatisfaction their will not be any board shakeups. Also, shareholders do not vote or influence day-to-day corporate decisions or even larger corporate strategies. Finally, some firms issue dual-class shares where the public holds non-voting shares or shares with drastically diluted voting rights while the firm founders hold the shares with voting or super-voting rights.

The right to transfer – Stockholders can sell their shares in the open market whenever they choose. Thus, most stockholders will “vote with their feet” when they don’t like the way a company is running its business. Since they know their ability to influence company policy through voting rights is minimal at best, simply selling shares is often the best strategy. However, selling stock does not have to be due to dissatisfaction with the way the company is doing business. Shareholders may sell for many reasons including diversifying their holdings, taking profits, raising cash, cutting losses, etc. However, this ability to sell shares whenever one wants is critical to the success of corporate form of ownership as it creates liquidity which is necessary to get people to buy stock.

The right to residual income – this is the most important right associated with common stock and is the principle reason why people invest in common stock. When you buy common stock you are buying ownership into the company and with that ownership comes a right to your proportion of the profits. Residual income refers to income left over after preferred stockholders are paid. It is important to note that the right to residual income is NOT the same as the right to dividends. Firms can choose to pay out the residual income to investors in the form of dividends or they can reinvest into the firm. If the residual income is invested wisely, this will result in even more profits for stockholders later on. However, if it is invested poorly, it may all be lost before the stockholders receive any in dividends. Ultimately, if you bought every share of stock outstanding, you would own all of the firm’s profits and would be able to decide for yourself whether to pay dividends or reinvest in the firm.

Question 4

The holding period of a stock is irrelevant to determining its value. The value is based on the present value of all future dividends. The reason holding period is irrelevant is that when I sell the stock, I will be able to sell it for all the future dividends at that point. Whether I actually receive the dividends or sell the stock for the value of those dividends doesn’t matter. Another way to look at this is with the constant growth pricing model $\Rightarrow P_0 = (D_1)/(k - g)$. Note that no where in that model do you plug in your holding period. Since it is not part of the formula, it can’t have an influence on the price of the stock.

Question 5

No, it is not a realistic assumption. Dividends will grow at varying rates over time depending on the success of the firm and the new products it introduces. However, we know that our predictive ability is limited. How fast is Wal-Mart going to grow 16 years from now? How about 17 years? Since we know that there is no way to make precise forecasts, we assume that after a certain time, the firm will grow at approximately the same rate as the economy (or maybe a bit slower) and use this as our constant growth rate. This allows us to use what information we can to forecast growth rates (and dividends) as far as we can and then approximate the rest with a constant growth assumption. Is it 100% accurate? No. Is it more reasonable than trying to forecast year- by-year growth rates for the next 1000 years? Definitely!

Question 6

Market efficiency refers to the concept that all relevant information that influences a firm’s value is already reflected into its stock prices. As new information comes out, the stock price will respond immediately to reflect that new information. There are no “undervalued” stocks to buy that will earn us higher than a fair, risk-adjusted rate of return and there are no “overvalued” stocks

that we should sell. Instead (assuming market efficiency is valid), the best that we can do is own a diversified portfolio of stocks and expect to earn a fair, risk-adjusted rate of return.

The three types of market efficiency are weak form, semi-strong form, and strong form and the difference between the three is based on the definition of “relevant information.”

1. Weak Form Market Efficiency assumes all information related to past price data is already reflected in the current market price. Whether the stock is in an “uptrend” or “downtrend” is merely coincidence and doesn’t tell us anything about the future direction of the stock. If the stock increased in value for the past three days or decreased in value for the past three days, it is equally likely to increase or decrease the next day. Stock prices have no “memory.” If markets are weak-form efficient, technical analysis (a process of trying to identify stocks to buy or sell based primarily on charts and other forms of past price trends) is not going to work. A chart of a stock’s past price information is meaningless in helping us identify its future price information.
2. Semi-strong Form Market Efficiency assumes all publicly available information is already reflected in the current market price. This means that there can be no “edge” gained from evaluating a firm’s financial statements or trying to project its future cash flows based on economic, demographic, or firm specific factors that might influence the success (or lack of success) in a firm’s product line. Reading the Wall Street Journal, Business Week, financial statements, etc. will not allow you to identify which stocks to buy or sell. This process of trying to value stocks based on projecting future cash flows is referred to as fundamental analysis. If markets are semi-strong form efficient, fundamental analysis will not serve as a worthwhile tool for picking stocks other than to find a risk level that you are comfortable with. While new “fundamental” information will influence stock prices, it is only the “surprise” portion that will drive the stock price up or down. For instance, if a company was expected to report earnings of \$1.00 per share and a 15% growth rate from the previous year and instead reported earnings of \$0.90 per share and a 10% growth rate from the previous year, this would be a negative surprise (even though both earnings and growth were positive) and would cause the stock price to decline. However, the decline would be so immediate that you would not be able to respond to the news and sell before the price declined.
3. Strong Form Market Efficiency assumes all information, public or private, is already reflected in the current market price. Based on this, not even having access to inside information would allow you to identify good/bad stocks ahead of time.

Question 7

This would be evidence AGAINST semi-strong form market efficiency. If markets were semi-strong form efficient, the only way I would be able to earn a higher rate of return than the market with publicly available information would be if I (A) only (or primarily) invested in high risk stocks or (B) was lucky. Since the statement says that I’ve not faced higher than average risks, (A) is not valid. Also, since this is over a 10-year time horizon, it is not likely just luck (although that is still a possibility). Finally, I’ve done this using publicly available information. Therefore, this would be evidence AGAINST semi-strong form market efficiency.

Question 8

There are a couple of reasons why we would like to see markets be efficient. First, is that if markets were NOT efficient, then it would be difficult for management to know if they were maximizing firm value. If stock prices reflect all available information and management engages in value maximizing activities, the stock price should go up. If markets were not efficient, there would be no predictable relationship between management activities and stock price response so it would be hard for management to maximize value. As a side note, this is a very important issue. The more efficient markets are, the more focus management will place on long-term value maximization instead of short-term manipulation and accounting gimmickry. This is because investors will see through the manipulation and not “reward” management’s trickery. Instead, management that operates with a clear, long-term strategy will see higher stock prices.

A second reason has to do with a concept called allocational efficiency. Allocational efficiency means money flows to the “right” places (right \Rightarrow productive). Thus, if scientists are working for a cure for a major disease and have a real shot at producing it, markets will recognize this as a profitable opportunity and fund it. While it may seem cold-hearted to define the “correct” places to spend capital as those that produce the best risk-adjusted returns, it actually is just society “voting” on what is the best use of their dollars (as that spending is what produces profits). We may not individually agree with those decisions, but it is a much better system for allocating capital than any other.

Question 9

We expect markets to be efficient for the same reason we don't expect to find \$20 bills laying all over the hallways. People do not like to leave money on the table. There are a large number of extremely intelligent individuals with large budgets for information and information processing power constantly looking for opportunities to make money in the financial markets. As soon as they find those opportunities, they take advantage of them (pick up the \$20 bills). As such, we should not expect to see any unexploited opportunities. The profit motive creates a strong incentive to drive markets towards efficiency.

On the other hand, if people do not see the \$20 bills laying in the hallway, they will not pick them up. Despite the apparent precision of our stock valuation models, predicting prices is not a precise process. Given all the uncertainties involved in estimating growth rates, future cash flows, and discount rates it is hard to place 100% confidence in our final results. Let's say we found the stock value was \$50 and the current stock price was \$49. This means we get a free \$1 for every share we buy. Theoretically we would keep buying as much stock as possible until the stock price increased to \$50. However, how much are you willing to commit to your \$50 forecast being right?

Another argument against market efficiency (also related to us not "seeing" the opportunities) is that there may be behavioral biases built in to human nature that prevent us from being able to "pick up the free money." For instance, we tend to over-react to news and place too much weight on new evidence in some cases and in others we tend to under-react and place too much weight on our previous views. For instance, if Apple reports a bad quarter, we are apt to dismiss it as we "know" Apple is a good investment in the long-run. How do we know this? Because we rely on the past performance. On the other hand, when the Internet boom was underway in the late 1990's, we over-reacted to how that was going to make EVERY company related to the Internet profitable. We also do not process information very well and can easily be tricked by the way the information is presented. This is referred to as framing. The exact same information can be presented in two different ways and we will interpret it differently each time. How do these behavioral biases relate to market efficiency? Well, one way is that individuals tend to sell their winners too soon and hold their losers too long. The way the tax code is written, there is an advantage to hold on to winning stocks longer and to sell losing stocks quicker...however, there is strong evidence that people do the opposite which costs them money.

There are reasons why we should expect markets to be efficient and reasons why we should expect them to NOT be efficient, so which is it? Ask 100 different finance professors and you'll probably get 50 different answers ranging from markets are 100% efficient to markets are not even close to efficient. My view is that market inefficiencies exist, but taking advantage of them is not easy. For most individual investors (and institutional investors as well), attempting to "outperform the market" is not only a waste of time, but a costly waste of time. However, there are a few people that have both the ability and effort to earn higher than risk-adjusted rates of return. It requires two factors. One, being extremely intelligent (you have to outthink everyone else that is searching for those \$20 bills on the ground so that you can either "see" them more easily or grab them quicker). Two, you must be committed. Keep in mind that the more trading you do to outperform the market, the harder it is. That is because transaction costs (brokerage commissions, taxes, other costs) add up with each trade.

Problem 1

$$P_0 = D/k = (\text{Dividend Rate} * \text{Par Value})/k$$

$$P_0 = (0.06 \times \$80)/.07$$

$$P_0 = \$4.80/.07$$

$$P_0 = \$68.57$$

Problem 2

$$P_0 = D_1/(k - g)$$

$$P_0 = 3.50/(0.13 - 0.04)$$

$$P_0 = \$38.89$$

Problem 3

Part 3a

$$P_0 = D/k$$

$$P_0 = 2.00/0.12$$

$$P_0 = \$16.67$$

Part 3b

$$P_0 = D_1/(k - g)$$

$$P_0 = (2.00 \times 1.05)/(0.12 - 0.05)$$

$$P_0 = 2.10/0.07$$

$$P_0 = \$30.00$$

Part 3c

$$P_0 = D_1/(k - g)$$

$$P_0 = (2.00 \times 1.10)/(0.12 - 0.10)$$

$$P_0 = 2.20/0.02$$

$$P_0 = \$110.00$$

Part 3d

$$P_0 = D_1/(k - g)$$

$$P_0 = (2.00 \times 1.15)/(0.12 - 0.15)$$

$$P_0 = 2.30/-0.03$$

$$P_0 = -\$76.67$$

Part 3e

No, the answer to part 4 does not make sense. As we can see from part 1-3, increases in the growth rate make the stock more valuable. Also, due to the limited liability feature of corporations, the lowest value a stock can take is \$0.00. Therefore, it makes no sense to say that as growth increases from 10% to 15%, the stock price not only declines, it turns negative. The problem is that the formula we developed for solving for the present value of dividends when the growth rate is constant only works if the required return is greater than the growth rate ($k > g$). If that does not hold, the formula is no longer solving for present value, but instead is generating a meaningless number.

While this may appear to be a significant flaw at first glance, it really isn't as bad as it seems. Remember that the model assumes that the growth rate will continue not for a short time, but forever. How likely is it for a company to grow at 15% forever? Since the overall economy only grows at about a 3-4% annual rate, this company would overtake the world before too long. When companies exhibit extremely high growth rates, we know that their growth must decline over time because of (A) they will have no new areas of growth after they control their entire market or (B) new competition will enter the market. Consider Wal-Mart. It is unreasonable to assume they will grow at the same rate over the next 20 years as they have over the past 20 because they don't have as many untapped markets to expand into. When companies exhibit high growth rates, we must use the non-constant dividend growth model.

Problem 4

Step 1 – Forecast all dividends up to and including the first year of constant growth

$$D_1 = 3.00 \times (1.35) = \$4.05$$

$$D_2 = 4.05 \times (1.25) = \$5.06$$

$$D_3 = 5.06 \times (1.20) = \$6.07$$

$$D_4 = 6.07 \times (1.10) = \$6.68$$

Step 2 – Solve for the value of all dividends during the constant growth stage

$$P_3 = D_4/(k - g) = 6.68/(0.18 - 0.10) = \$83.50$$

Step 3 – Solve for PV

$$CF_0 = 0$$

$$CF_1 = 4.05$$

$$CF_2 = 5.06$$

$$CF_3 = 89.57 \leftarrow \$6.07 + \$83.50$$

$$I = 18$$

$$NPV = P_0 = \$61.58$$

Problem 5

Step 1 – Forecast all dividends up to and including the first year of constant growth

$$D_1 = 1.50 \cdot (0.90) = \$1.35$$

$$D_2 = 1.35 \cdot (1.00) = \$1.35$$

$$D_3 = 1.35 \cdot (1.20) = \$1.62$$

$$D_4 = 1.62 \cdot (1.20) = \$1.94$$

$$D_5 = 1.94 \cdot (2.50) = \$4.85$$

$$D_6 = 4.85 \cdot (1.03) = \$5.00$$

Step 2 – Solve for the value of all dividends during the constant growth stage

$$P_5 = D_6 / (k - g) = 5.00 / (0.15 - 0.03) = \$41.67$$

Step 3 – Solve for PV

$$CF_0 = 0$$

$$CF_1 = 1.35$$

$$CF_2 = 1.35$$

$$CF_3 = 1.62$$

$$CF_4 = 1.94$$

$$CF_5 = 46.52 \leftarrow \$4.85 + \$41.67$$

$$I = 15$$

$$NPV = P_0 = \$27.50$$

Problem 6

The key for this problem is to remember the concept that the value of the stock is equal to the present value of the remaining cash flows. The cash flows are the same as the ones we forecasted to solve for problem 5, except that we have moved through the first three years and the first three dividends are no longer associated with the stock. The person buying the stock is going to receive all of the dividends from year 4 on (but remember that since we are in year three, the year 4 dividend is only 1 year out).

$$CF_0 = 0$$

$$CF_1 = 1.94$$

$$CF_2 = 46.52$$

$$I = 15$$

$$NPV = P_3 = \$36.86$$

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