CHAPTER 17
Payout Policy

1. a. Distributes a relatively low proportion of current earnings to offset fluctuations in operational cash flow; lower P/E ratio.

   b. Distributes a relatively high proportion of current earnings since the decline is unexpected; higher P/E ratio.

   c. Distributes a relatively low proportion of current earnings in order to offset anticipated declines in earnings; lower P/E ratio.

   d. Distributes a relatively low proportion of current earnings in order to fund expected growth; higher P/E ratio.

2. a. A $t = 0$ each share is worth $20. This value is based on the expected stream of dividends: $1 at $t = 1$, and increasing by 5% in each subsequent year. Thus, we can find the appropriate discount rate for this company as follows:

   \[ P_0 = \frac{DIV_1}{r - g} \]

   \[ $20 = \frac{1}{r - 0.05} \quad \Rightarrow \quad r = 0.10 = 10.0\% \]

   Beginning at $t = 2$, each share in the company will enjoy a perpetual stream of growing dividends: $1.05 at $t = 2$, and increasing by 5% in each subsequent year. Thus, the total value of the shares at $t = 1$ (after the $t = 1$ dividend is paid and after $N$ new shares have been issued) is given by:

   \[ V_1 = \frac{1.05 \text{ million}}{0.10 - 0.05} = $21 \text{ million} \]

   If $P_1$ is the price per share at $t = 1$, then:

   \[ V_1 = P_1 \times (1,000,000 + N) = $21,000,000 \]

   and:

   \[ P_1 \times N = $1,000,000 \]
From the first equation:

\[(1,000,000 \times P_1) + (N \times P_1) = $21,000,000\]

Substituting from the second equation:

\[(1,000,000 \times P_1) + $1,000,000 = $21,000,000\]

so that \(P_1 = $20.00\)

b. With \(P_1\) equal to $20, and $1,000,000 to raise, the firm will sell 50,000 new shares.

c. The expected dividends paid at \(t = 2\) are $1,050,000, increasing by 5% in each subsequent year. With 1,050,000 shares outstanding, dividends per share are: $1 at \(t = 2\), increasing by 5% in each subsequent year. Thus, total dividends paid to old shareholders are: $1,000,000 at \(t = 2\), increasing by 5% in each subsequent year.

d. For the current shareholders:

\[
PV(t = 0) = \frac{$2,000,000}{1.10} + \frac{$1,000,000}{(0.10 - 0.05) \times (1.10)} = $20,000,000
\]

3. From Question 10, the fair issue price is $20 per share. If these shares are instead issued at $10 per share, then the new shareholders are getting a bargain, i.e., the new shareholders win and the old shareholders lose.

As pointed out in the text, any increase in cash dividend must be offset by a stock issue if the firm’s investment and borrowing policies are to be held constant. If this stock issue cannot be made at a fair price, then shareholders are clearly not indifferent to dividend policy.

4. The risk stems from the decision to not invest, and it is not a result of the form of financing. If an investor consumes the dividend instead of re-investing the dividend in the company’s stock, she is also ‘selling’ a part of his stake in the company. In this scenario, he will suffer an equal opportunity loss if the stock price subsequently rises sharply.
5. If the company does not pay a dividend:

<table>
<thead>
<tr>
<th>Cash</th>
<th>0</th>
<th>0</th>
<th>Debt</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing fixed assets</td>
<td>4,500</td>
<td>5,500 + NPV</td>
<td>Equity</td>
<td></td>
</tr>
<tr>
<td>New project</td>
<td>1,000 + NPV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$5,500 + NPV</td>
<td></td>
<td>$5,500 + NPV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If the company pays a $1,000 dividend:

<table>
<thead>
<tr>
<th>Cash</th>
<th>0</th>
<th>0</th>
<th>Debt</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing fixed assets</td>
<td>4,500</td>
<td>1,000</td>
<td>Value of new stock</td>
<td></td>
</tr>
<tr>
<td>New project</td>
<td>1,000 + NPV</td>
<td>4,500 + NPV</td>
<td>Value of original stock</td>
<td></td>
</tr>
<tr>
<td>$5,500 + NPV</td>
<td></td>
<td>$5,500 + NPV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Because the new stockholders receive stock worth $1,000, the value of the original stock declines by $1,000, which exactly offsets the dividends.

6. One problem with this analysis is that it assumes the company’s net profit remains constant even though the asset base of the company shrinks by 20%. That is, in order to raise the cash necessary to repurchase the shares, the company must sell assets. If the assets sold are representative of the company as a whole, we would expect net profit to decrease by 20% so that earnings per share and the P/E ratio remain the same. After the repurchase, the company will look like this next year:

| Net profit: | $8 million |
| Number of shares: | 0.8 million |
| Earnings per share: | $10 |
| Price–earnings ratio: | 20 |
| Share price: | $200 |

7. a. If we ignore taxes and there is no information conveyed by the repurchase when the repurchase program is announced, then share price will remain at $80.

b. The regular dividend has been $4 per share, and so the company has $400,000 cash on hand. Since the share price is $80, the company will repurchase 5,000 shares.
c. Total asset value (before each dividend payment or stock repurchase) remains at $8,000,000. These assets earn $400,000 per year, under either policy.

*Old Policy:* The annual dividend is $4, which never changes, so the stock price (immediately prior to the dividend payment) will be $80 in all years.

*New Policy:* Every year, $400,000 is available for share repurchase. As noted above, 5,000 shares will be repurchased at \( t = 0 \). At \( t = 1 \), immediately prior to the repurchase, there will be 95,000 shares outstanding. These shares will be worth $8,000,000, or $84.21 per share. With $400,000 available to repurchase shares, the total number of shares repurchased will be 4,750. Using this reasoning, we can generate the following table:

<table>
<thead>
<tr>
<th>Time</th>
<th>Shares Outstanding</th>
<th>Share Price</th>
<th>Shares Repurchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>( t = 0 )</td>
<td>100,000</td>
<td>$80.00</td>
<td>5,000</td>
</tr>
<tr>
<td>( t = 1 )</td>
<td>95,000</td>
<td>$84.21</td>
<td>4,750</td>
</tr>
<tr>
<td>( t = 2 )</td>
<td>90,250</td>
<td>$88.64</td>
<td>4,513</td>
</tr>
<tr>
<td>( t = 3 )</td>
<td>85,737</td>
<td>$93.31</td>
<td>4,287</td>
</tr>
</tbody>
</table>

Note that the stock price is increasing by 5.26% each year. This is consistent with the rate of return to the shareholders under the old policy, whereby every year assets worth $7,600,000 (the asset value immediately after the dividend) earn $400,000, or a return of 5.26%.

8. If markets are efficient, then a share repurchase is a zero-NPV investment. Suppose that the trade-off is between an investment in real assets or a share repurchase. Obviously, the shareholders would prefer a share repurchase to a negative-NPV project. The quoted statement seems to imply that firms have only negative-NPV projects available.

Another possible interpretation is that managers have inside information indicating that the firm’s stock price is too low. In this case, share repurchase is detrimental to those stockholders who sell and beneficial to those who do not. It is difficult to see how this could be beneficial to the firm, however.
9.  a. This statement implicitly equates the cost of equity capital with the stock’s dividend yield. If this were true, companies that pay no dividend would have a zero cost of equity capital, which is clearly not correct.

   b. One way to think of retained earnings is that, from an economic standpoint, the company earns money on behalf of the shareholders, who then immediately re-invest the earnings in the company. Thus, retained earnings do not represent free capital. Retained earnings carry the full cost of equity capital (although issue costs associated with raising new equity capital are avoided).

   c. If the tax on capital gains is less than that on dividends, the conclusion of this statement is correct; i.e., a stock repurchase is always preferred over dividends. This conclusion, however, is strictly because of taxes. Earnings per share is irrelevant.

10.  a. Because this is a regular dividend, the announcement is not news to the stock market. Hence, the stock price will adjust only when the stock begins to trade without the dividend and, thus, the stock price will fall on the ex-dividend date.

    b. With no taxes, the stock price will fall by the amount of the dividend, here $1.

    c. With taxes on dividends but no taxes on capital gains, investors will require the same after-tax return from two comparable companies, one of which pays a dividend, the other, a capital gain of the same magnitude. The stock price will thus fall by the amount of the after-tax dividend, here:

        $1 \times (1 - 0.30) = $0.70.

    d. If dealers are taxed equally on capital gains and dividends, then they should not demand any extra return for holding stocks that pay dividends. Thus, if shareholders are able to freely trade securities around the time of the dividend payment, there should be no tax effects associated with dividends.
11. a. If you own 100 shares at $100 per share, then your wealth is $10,000. After the dividend payment, each share will be worth $99 and your total wealth will be the same: 100 shares at $99 per share plus $100 in dividends, or $10,000.

b. With no taxes, it does not matter how the company transfers wealth to the shareholders; that is, you are indifferent between a dividend and a share repurchase program. In either case, your total wealth will remain at $10,000.

12. After-tax Return on Share A: At t = 1, a shareholder in company A will receive a dividend of $10, which is subject to taxes of 30%. Therefore, the after-tax gain is $7. Since the initial investment is $100, the after-tax rate of return is 7%.

After-tax Return on Share B: If an investor sells share B after 2 years, the price will be: \( (100 \times 1.10^2) = \$121 \). The capital gain of $21 is taxed at the 30% rate, and so the after-tax gain is $14.70. On an initial investment of $100, over a 2-year time period, this is an after-tax annual rate of return of 7.10%.

If an investor sells share B after 10 years, the price will be: \( (100 \times 1.10^{10}) = \$259.37 \). The capital gain of $159.37 is taxed at the 30% rate, and so the after-tax gain is $111.56. On an initial investment of $100, over a 10-year time period, this is an after-tax annual rate of return of 7.78%.

13. a. (i) The tax-free investor should buy on the with-dividend date because the dividend is worth $1 and the price decrease is only $0.90.

(ii) The dividend is worth only $0.60 to the taxable investor who is subject to a 40% marginal tax rate. Therefore, this investor should buy on the ex-dividend date.

[Actually, the taxable investor’s problem is a little more complicated. By buying at the ex-dividend price, this investor increases the capital gain that is eventually reported upon the sale of the asset. At most, however, this will cost: \( (0.16 \times 0.90) = \$0.14 \). This is not enough to offset the tax on the dividend.]

b. The marginal investor, by definition, must be indifferent between buying with-dividend or ex-dividend. If we let \( T \) represent the marginal tax rate on dividends, then the marginal tax rate on capital gains is \( 0.4T \). In order for the net extra return from buying with-dividend (instead of ex-dividend) to be zero:

- Extra investment + After-tax dividend + Reduction in capital gains tax = 0

Therefore, per dollar of dividend:
\[-0.85 + [(1 - T) \times 1.00] + [0.4T \times 0.85] = 0 \]
\[T = 0.227 = 22.7\%\]

c. We would expect the high-payout stocks to show the largest decline per dollar of dividends paid because these stocks should be held by investors in low, or perhaps even zero, marginal tax brackets.

d. Some investors (e.g., pension funds and security dealers) are indifferent between $1 of dividends and $1 of capital gains. These investors should be prepared to buy any amount of stock with-dividend as long as the fall-off in price is fractionally less than the dividend. Elton and Gruber’s result suggests that there must be some impediment to such tax arbitrage (e.g., transactions costs or IRS restrictions). But, in that case, it is difficult to interpret their result as indicative of marginal tax rates.

e. The tax advantage to capital gains has been reduced. If investors are now indifferent between dividends and capital gains, we would expect that the payment of a $1 dividend would result in a $1 decrease in price.

14. Reducing the amount of earnings retained each year will, of course, reduce the growth rate of dividends. Also, the firm will have to issue new shares each year in order to finance company growth. Under the original dividend policy, we expect next year’s stock price to be: ($50 \times 1.08) = $54. If N is the number of shares previously outstanding, the value of the company at \( t = 1 \) is (54N).

Under the new policy, n new shares will be issued at \( t = 1 \) to make up for the reduction in retained earnings resulting from the new policy. This decrease is: ($4 - $2) = $2 per original share, or an aggregate reduction of 2N. If \( P_1 \) is the price of the common stock at \( t = 1 \) under the new policy, then:

\[2N = nP_1\]

Also, because the total value of the company is unchanged:

\[54N = (N + n)P_1\]

Solving, we find that \( P_1 = $52. \)

If \( g \) is the expected growth rate under the new policy and \( P_0 \) the price at \( t = 0 \), we have:

\[52 = (1 + g)P_0\]

and:
\[ P_0 = \frac{4}{0.12 - g} \]

Substituting the second equation above for \( P_0 \) in the first equation and then solving, we find that \( g = 4\% \) and \( P_0 = $50 \), so that the current stock price is unchanged.

15. Assume that all taxpayers pay a 20\% tax on dividend income and 10\% tax on capital gains. Firm A pays no dividends but investors expect the price of Firm A stock to increase from $40 to $50 per share. Firm B pays a dividend of $5 per share and investors expect the price of Firm B stock to be $45 next year. Results for Firm A are:

<table>
<thead>
<tr>
<th></th>
<th>Before-tax rate of return</th>
<th>Tax on dividend at 20%</th>
<th>Tax on capital gains at 10%</th>
<th>Total after-tax income (dividends plus capital gains less taxes)</th>
<th>After-tax rate of return</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$10 / $40 = 25.00%</td>
<td>$0.00</td>
<td>$0.10 \times $10.00 = $1.00</td>
<td>$0 + $10 - $1 = $9.00</td>
<td>$9 / $40 = 22.50%</td>
</tr>
</tbody>
</table>

The price of Firm B stock today must adjust so as to provide an after-tax return equal to that of Firm A. Let \( X \) equal the current price of Firm B stock. Then, for Firm B:

<table>
<thead>
<tr>
<th></th>
<th>Next year’s price</th>
<th>Dividend</th>
<th>Today’s stock price</th>
<th>Capital gain</th>
<th>Before-tax rate of return</th>
<th>Tax on dividend at 20%</th>
<th>Tax on capital gains at 10%</th>
<th>Total after-tax income (dividends plus capital gains less taxes)</th>
<th>After-tax rate of return</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$45.00</td>
<td>$5.00</td>
<td>( X )</td>
<td>( $45 - X )</td>
<td>( \frac{[$5 + ($45 - X)]}{X} )</td>
<td>( 0.20 \times $5.00 = $1.00 )</td>
<td>( 0.10 \times ($45 - X) )</td>
<td>( [$5 + ($45 - X)] - [$1 + 0.10 \times ($45 - X)] )</td>
<td>( \frac{[$5 + ($45 - X)] - [$1 + 0.10 \times ($45 - X)]}{X} = 0.225 \Rightarrow X = $39.56 )</td>
</tr>
</tbody>
</table>

The price of Firm B stock adjusts so that the after-tax rate of return for Firm B is equal to 22.5\%, the after-tax rate of return for Firm A. To find today’s price for Firm A stock, solve the following for \( X \):

\[
\frac{[\$5 + (\$45 - X)] - [\$1 + 0.10 \times (\$45 - X)]}{X} = 0.225 \Rightarrow X = \$39.56
\]

16. a. The marginal investors are the institutions.

b. Price of low-payout stock: \( P_0 = \frac{\$20}{0.12} = \$166.67 \)
Price of medium-payout stock: \[ P_0 = \frac{10}{0.12} = 83.33 \] 

Price of high-payout stock: \[ P_0 = \frac{30}{0.12} = 250.00 \]

c. For corporations, after-tax return is 12% for each type of stock.

For individuals, after-tax returns are:

For low-payout stock:
\[
\frac{(0.50 \times 5) + (0.85 \times 15)}{166.67} = 9.15\%
\]

For medium-payout stock:
\[
\frac{(0.50 \times 5) + (0.85 \times 5)}{83.33} = 8.10\%
\]

For high-payout stock:
\[
\frac{(0.50 \times 30) + (0.85 \times 0)}{250.00} = 6.00\%
\]

For corporations, after-tax returns are:

For low-payout stock:
\[
\frac{(0.95 \times 5) + (0.65 \times 15)}{166.67} = 8.70\%
\]

For medium-payout stock:
\[
\frac{(0.95 \times 5) + (0.65 \times 5)}{83.33} = 9.60\%
\]

For high-payout stock:
\[
\frac{(0.95 \times 30) + (0.65 \times 0)}{250.00} = 11.40\%
\]

d.

<table>
<thead>
<tr>
<th></th>
<th>Low Payout</th>
<th>Medium Payout</th>
<th>High Payout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>$80 billion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporations</td>
<td></td>
<td>$10 billion</td>
<td></td>
</tr>
<tr>
<td>Institutions</td>
<td>$20 billion</td>
<td>$50 billion</td>
<td>$110 billion</td>
</tr>
</tbody>
</table>