

15.433 INVESTMENTS
Class 19: Security Analysis

Spring 2003

Introduction

What explains the price we observe from the market?

In an efficient market, the price reflects all information available to public. Implicitly, there should be a pricing model that links the market information to the market price.

Gathering all of the relevant information, processing it through some pricing model, we have something to say about what the price of a security should be.

If the market is efficient, and our pricing model is right, then we will be in agreement with the market.

What if we disagree? Either our pricing model is wrong, or the market price is wrong.

What Information to Use?

1. The broad economic environment (a) The global economy (b) The domestic economy: GDP, employment, inflation, interest rates, budget deficit, consumer confidence index, the business cycle, economic indicators. (c) Federal government policy: fiscal policy, monetary policy, supply-side policies.

2. The industry environment (a) Sensitivity to the Business cycle (b) Industry life cycles (c) Industry structure and performance
3. The firm-specific information (a) accounting information, dividend payout (b) growth opportunity (c) ...

The Present Value Model

To determine the price of a treasury bond, we calculate the present value of future cash flow.

In principle, one can apply the same approach to stock valuation, thinking of the future dividend as a stream of coupon payments. Additional issues needed to be addressed:

- Unlike the coupon payments, the dividend payouts are uncertain. What are the appropriate discount rates?
- Dividends are known to be sticky, and some firms do not even pay dividends. Where do we get information about the growth component of a firm?
- Unlike fixed-income securities, stocks do not have maturity dates. How do we take care of dividend payments that are postponed into the infinite future?

A Simple Two-Period Model

By definition:

$$\tilde{R}_1 = \frac{\tilde{P}_1 + \tilde{D}_1 - \tilde{P}_0}{\tilde{P}_0} \quad (1)$$

Let I_0 be the collection of public information available at time 0, it must be

$$E(\tilde{R}_1 | \tilde{I}_0) = \frac{E(\tilde{P}_1 | \tilde{I}_0) + E(\tilde{D}_1 | \tilde{I}_0) - P_0}{P_0} \quad (2)$$

where we take our expectation conditioning on the information available in I_0 .

Define the intrinsic value of the firm

$$V_0 = \frac{E(\tilde{P}_1 | \tilde{I}_0) + E(\tilde{D}_1 | \tilde{I}_0)}{1 + E(\tilde{R}_1 | \tilde{I}_0)} \quad (3)$$

If the market is efficient, accurately reflecting $E(\tilde{P}_1 | \tilde{I}_0)$, $E(\tilde{D}_1 | \tilde{I}_0)$, and $E(\tilde{R}_1 | \tilde{I}_0)$, then the market price must agree with the intrinsic value of the firm.

Projecting into the Infinite Horizon

We can move into the future by applying the two-period recursively:

$$\begin{aligned} V_0 = & \frac{E(\tilde{D}_1)}{1 + E(\tilde{R}_1)} \\ & + \frac{E(\tilde{D}_2)}{(1 + E(\tilde{R}_1))(1 + E(\tilde{R}_2))} \\ & + \frac{E(\tilde{D}_3)}{(1 + E(\tilde{R}_1))(1 + E(\tilde{R}_2))(1 + E(\tilde{R}_3))} \\ & + \dots \\ & + \frac{E(\tilde{D}_n)}{\prod_{i=1}^n (1 + E(\tilde{R}_i))} + \dots \end{aligned} \tag{4}$$

where all expectations are taken with respect to the information available in I_0 .

The Gordon Model

Using all of the information available at time 0, the market participants agree that:

1. the dividend growth is constant

$$E\left(\tilde{D}_n\right) = D_0(1+g)^n \quad (5)$$

2. the expected return is constant

$$E\left(\tilde{R}_n\right) = k \quad (6)$$

where $g \geq 0$ and $k \geq 0$.

This implies that

$$V_0 = D_0 \sum_{n=1}^{\infty} \left(\frac{1+g}{1+k}\right)^n \quad (7)$$

Suppose that the expected rate of return is always higher than the expected growth rate:

$$k > g \quad (8)$$

Letting $x = (1 + g)/(1 + k) < 1$, we have

$$\begin{aligned} V_0 &= D_0 (x + x^2 + x^3 + \dots) \\ &= D_0 x (1 + x + x^2 + \dots) \\ &= D_0 x \frac{1}{1 - x} \end{aligned} \tag{9}$$

Now plugging $x = (1 + g)/(1 + k)$ back in:

$$\begin{aligned} V_0 &= D_0 \frac{1 + g}{1 + k} \cdot \frac{1}{1 - (1 + g)/(1 + k)} \\ &= D_0 \frac{1 + g}{1 + k} \cdot \frac{1 + k}{(k - g)} = D_0 \frac{1 + g}{(k - g)} \end{aligned} \tag{10}$$

What if $k < g$?

The Economic Implication?

The Gordon Model starts from an identity:

$$\tilde{R}_1 = \frac{\tilde{P}_1 + \tilde{D}_1 - \tilde{P}_0}{\tilde{P}_0} \quad (11)$$

Making additional assumptions about

- constant growth
- constant expected return

It then arrives at another identity:

$$V_0 = \frac{E(\tilde{D}_1)}{k + g} \quad (12)$$

There is no economic input in the process.

Nevertheless, it is widely used by stock market analysts.

Stock Prices, Dividend Policies, and Investment Opportunities

Cash Cow: 100% dividend payout ratio. It provides a stream of dividends $E(D_n) = \$5$, maintaining a zero dividend growth $g = 0$.

$$V_0^{cc} = \frac{\$5}{k^{cc}(13)}$$

Growth Prospects: 40% dividend payout ratio. In any given year, it plows back $(1 - 40\%)$ of its earnings to a project generating an expected return of k_* per year. That is, $E(D_1) = \$5 \cdot 40\%$ and $E(D_2) = (\$5 + \$5 \cdot (1 - 40\%) \cdot k_*) \cdot 40\%$, maintaining a dividend growth rate of $g = (1 - 40\%) \cdot k_*$.

What are the expected returns k_{CC} and k_{GP} ?

For example,

$$k^{cc} = E \left(\frac{P_1^{cc} + D_1^{cc} - P_0^{cc}}{P_0^{cc}} \right) \quad (14)$$

Suppose we pick k_{CC} and k_{GP} exogenously. For a risk-neutral investor, k_{CC} and $k_{GP} = r_f$.

1. If $r_f > k_*$, then
2. If $r_f < k_*$, then

What if k_{CC} and $k_{GP} = k_*$?

What makes the valuation of Cash Cow different from that of Growth Prospects? Different dividend policies? Different investment opportunities?

Earnings, Earnings Forecast, and Financial Analysts

One of the main determinants of a firm's value is its investment opportunity, which can be affected by macro-economic variables as well as the condition of the industry.

Focusing on each firm, however, its projected earnings are among the most informative in predicting the growth opportunity of a firm.

For this reason, the stock market analysts, as well as investors, pay close attention to firms' quarterly earnings reports.

In addition, financial analysts invest a great deal of time and energy in forecasting firms' future earnings.

Inflation and the Stock Market

Inflation neutral: changes in the rate of inflation, whether expected or unexpected, ought to have no effect on the expected real rate of return on common stocks.

This is consistent with the wisdom that common stock, representing ownership of the income generated by real assets, should be a hedge against inflation.

Empirically, however there is much evidence that common stock returns and inflation are negatively related during the post-1953 period. Possible explanations:

1. Stagflation: negative correlation between inflation and real activity.
2. Increased uncertainty when inflation is high, inducing a higher required rate of return.

Monetary Policy and the Economy

Using the tools of monetary policy, the Fed can affect the volume of money and credit and their price/interest levels.

The initial link between monetary policy and the economy occurs in the market for reserves. The Fed policies influence the demand for or supply of reserves at banks and other depository institutions, and through this market, the effects of monetary policy are transmitted to the rest of the economy.

A change in the reserves market will trigger a chain of events that affect other short-term interest rates, foreign exchange rates, long-term interest rates, and the amount of money and credit in the economy, and levels of employment, output, and prices.

Financial Statement Analysis

The major financial statements:

- The income statement is a summary of the profitability of the firm over a period of time, such as a year.
- The balance sheet provides a list of the firm's assets and liabilities at a particular time, say the year-end.
- The cash-flow statement details the cash flow generated by the firm's operations, investments, and financial activities.

Financial Leverage of ROE

Let $L = \text{Debt} / \text{Equity}$ be the leverage ratio of a firm. A firm with $L = 0$ is all-equity financed.

Let \tilde{R} be the return on assets, and ROE be the return on equity.

Let r be the interest rate on the firm's debt.

Suppose that the corporate tax rate is c .

A straightforward derivation shows that:

$$ROE = (1 - c) \cdot (\tilde{R} \cdot (1 + L) - r \cdot L) \quad (15)$$

Preparation for Next Class

Please read:

- Read BKM Chapters 26 & 27,
- Thomas (2000), Waring, Whitney, Pirone and Castille (2000), and
- Strongin, Petsch and Sharenow (2000).