UNIVERSITÀ DEGLI STUDI DI BERGAMO

Financial Assets (1)

Peter Cincinelli

University of Bergamo

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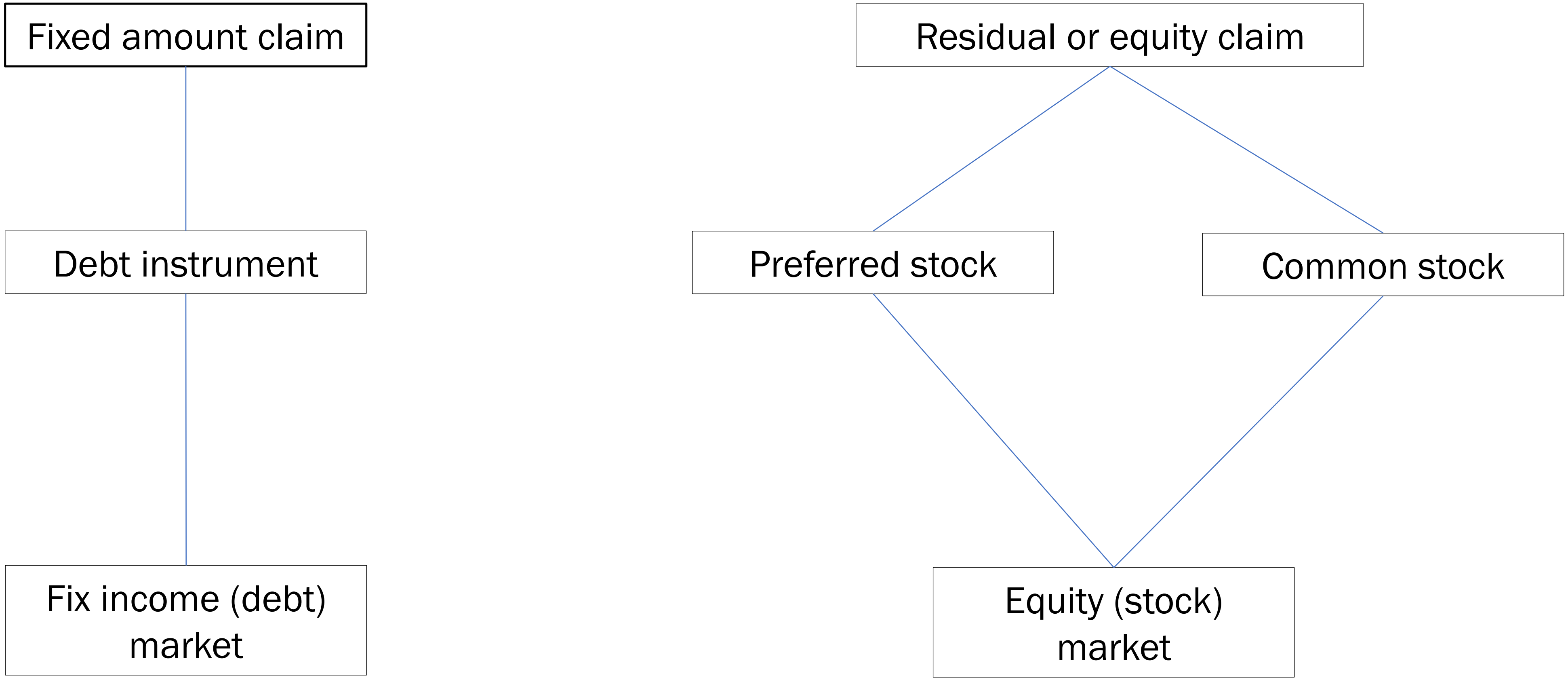
Aims of the lesson (Section 1)

- What is a financial asset?
- How is a financial asset different than a real asset?
- What are important features of broad classes of financial assets?

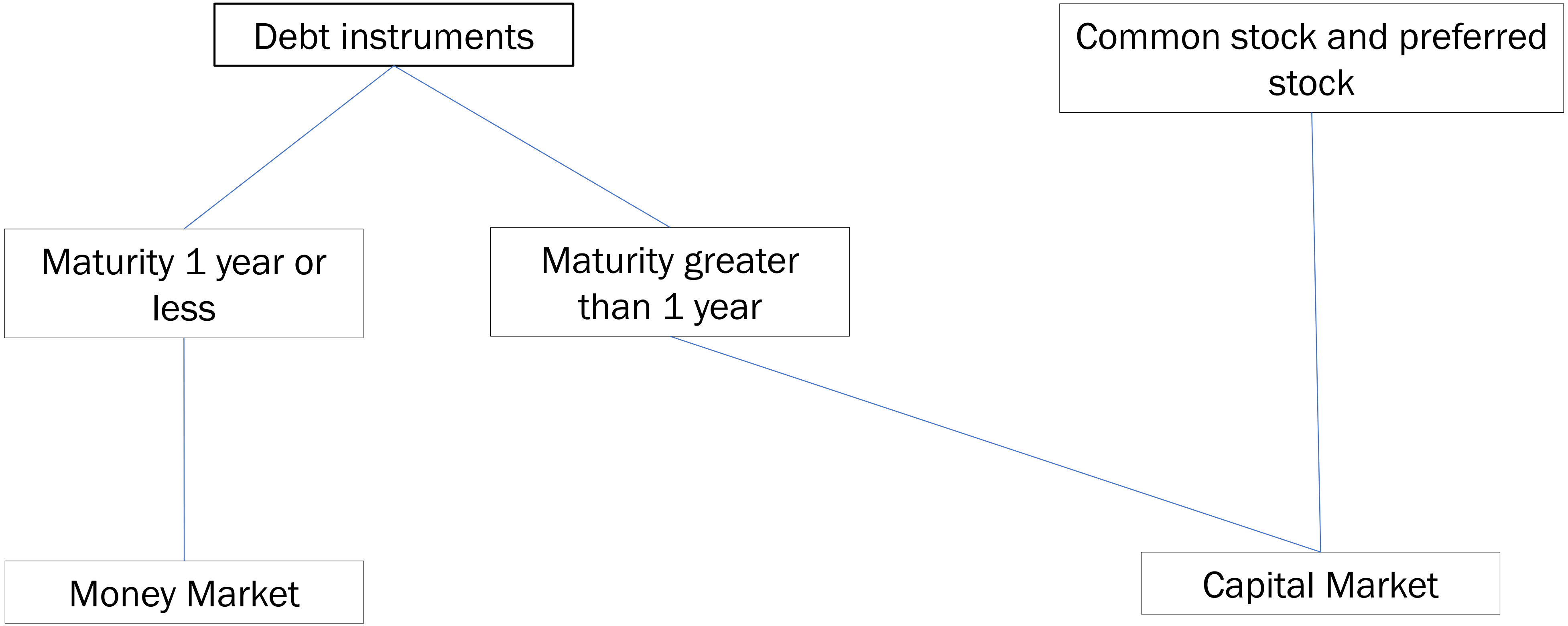
Financial Assets vs. Real Assets

- **Financial assets** are claims to future cash flows;
- **Some examples of financial assets**: a bond issued by the U.S. Department of Treasury; a bond issued by Apple; a bond issued by the Government of Greece; a bond issued by the Government of Italy; a home mortgage loan; common stock issued by Microsoft; common stock issued by Intesa San Paolo; common stock issued by Honda Motor Company;
- **Real assets** are what produce goods and services in the economy: land, building, machinery, etc…

Financial Assets: classification by financial claim



Financial Assets: classification by maturity of the claims



Classes of financial assets

- **Fixed income or debt instruments:**
  - Promise to pay a pre-determined stream of cash flows in the future;
  - Debt (Bond) market.
  - Money market: short-term (less than one year), low-risk* debt instruments, typically very liquid.
- **Equity instruments:**
  - Residual claim;
  - Represents ownership shares of a corporation.
- **Derivative securities:**
  - Contracts that derive their value from the underlying financial assets.

Aims of the lesson (Section 2)

- Bond valuation;
- Key features of a bond issue;
- The value of a zero-coupon bond;
- The value of coupon bond;
- The yield to maturity of a bond.

Bond pricing: key features

- A bond (or a fixed income instruments) is a promissory note that specifies exactly the (promised) future cash flows it pays;
- **Two types** of cash flows:
    - Principal (called **face value**=**F**) at maturity:
    - Amount returned to bondholders at maturity;
    - Face value also called par value, typically $;€;£1,000 for corporate debt (or to a lesser degree $;€;£ 100), as these are the most common denominations in which they are issued.
- Periodic cash flows (**called coupons**=**C**):
    - Percentage of face value;
    - Coupons are usually paid semi-annually.

Zero-coupon bond valuation

- Zero-coupon bonds have only single cash flow which is equal to the face value at maturity;

- The value of a zero-coupon is simply the discounted value of the single cash flow at maturity at time T;

- **Example**: A one year zero-coupon bond with a face value of €10,000 is sold in a market where the one year discount rate is 5.35%. What is the value of the bond?

Yield To Maturity (YTM)

- Conversely, we can ask what rate of return the bond promises, given the bond' promised cash flows and the current bond price;

- **Yield To Maturity (YTM)** is the single interest rate that sets the price equal to the present value (IRR);

- **Example**: suppose a 20 year zero-coupon bond with a face value of €1,000,000 is selling for €455,500. What is the yield to maturity on this bond?

Coupon bonds

- Bonds often make periodic payments – i.e. coupon payments. E.g., U.S. bonds typically make semi-annual bonds;

- The coupon rate is expressed as a percentage of the face value;

- **Example**: a 2 year bond with a face value of €1,000, a coupon rate of 12% and semi-annual coupon payments is sold in a market where the 12 month discount rate is 5.35%, compounded semi-annually. What is the market value of the bond?

Understanding bond market prices

- In the market, bond prices are quoted as a percent of the bond' face value:

Face Value:	Price Quoted as:	Market price:	The bond is trading at:
€1,000	100	€1,000	?
€1,000	102	€1,020	?
€1,000	97	€970	?
€5,000	99	€4,950	?

Aims of the lesson (Section 3)

- How do you value stock?
- Dividend Discount Model (DDM).

Stock valuation

- Identify the expected cash flows;
- Find the appropriate risk-adjusted discount rate;
- Discount the expected cash flows at the appropriate risk-adjusted discount rate.

Stock valuation

- Suppose we buy one share of stock and we expect to hold it for one period;

- **Example**: Mykonos is expected to pay a dividend of €0.71 next year, and the dividend is expected to grow by 12% forever. If investors require a 14.7% return on Mykonos, what should the value of Mykonos' stock be?

Aims of the lesson (Section 4)

- What are the main features of equity instruments?
    - Common stock;
    - Preferred stock.

- What distinguishes debt and equity instruments?

- Valuing a common stock.

Common stock

- Issued by corporations to raise equity capital;
- Represent ownership shares in the company:
  - Voting rights at shareholders' meetings;
  - Share of earnings in the form of **dividend payments**;
- Separation of ownership and management can lead to "**agency problems**";
- Shareholders are "**residual claimants**" – lowest priority – last in line of all those who have a claim on assets;
- **Limited liability**: the most shareholders can lose is the amount they have invested;
- **No maturity**.

Preferred stock

- Looks like “hybrid” of bond and stock;
- An equity instrument with **<u>bond-like features</u>**:
  - Promise to pay fixed dividends;
  - No voting rights;
- And **<u>stock-life features</u>**:
  - Firms have no contractual obligation to make dividend payments (but unpaid dividends accumulate and must be paid in full before any dividends may be paid to holders of common stock);
  - No specified maturity.

Equity securities vs. debt securities

- Debt claims are senior to equity claims;
- Interest payments on debt are tax-deductible;
- Dividend payments are not tax-deductible.

Major stock indices

- S&P 500;
- NASDAQ;
- FTSE 100 (UK);
- STOXX 600 Europe;
- Hang Seng (Hong Kong);
- Morgan Stanley Capital International (MSCI).

Return on a common stock

- Return to a common stock holder has two components:
  - **Dividends**;
  - **Capital gains**.
- Suppose we buy a share of stock today at time *t* and sell it one year at time *t+1*, what is the total returns?
- **Example**: you buy 100 shares of Amazon today for €84.40 and sell them €102.75 in one year. Over the next year, Amazon pays a €2.20 per share dividend. What is your total return?

$$Total\ Return = \frac{Div_{t+1} + (P_{t+1} - P_t)}{P_t}$$

Return on a common stock

- Where: $\frac{Div_{t+1}}{P_t}$ is the dividend yield; $\frac{P_{t+1}-P_t}{P_t}$ is the capital gain (or capital loss);
- However, what is the required rate of return for Amazon?
- The **Capital Asset Pricing Model** (CAPM) asserts that when stock market prices are at equilibrium levels, the rate of return that investors can expect to earn on a security is:

$$r_i = r_f + \beta_i(r_{mkt} - r_f)$$

- Where: r_f is the risk-free interest rate; r_{mkt} is the market returns; β_i is the systematic risk for the security *i*.

Dividend Discount Model (DDM)

- Consider an investor who buys a share of Milos stock, planning to hold it for one year;
- The intrinsic/fundamental value of the share is the present value of the dividend to be received at the end of the first year, Div_1, and the expected sales price, P_1. The P_0 is equal to:

$$P_0 = \frac{Div_1}{(1+k)} + \frac{P_1}{(1+k)}$$

- How is P_1 determined? The next investor who buys the share of Milos stock at $t = 1$ and hold it for one period again, what are going to get?

Dividend Discount Model (DDM)

- What are their expected cash flows? We can extend another period. Presumably, the investor is going to get the next dividend at $t = 2$ and she/he is going to be able to sell it for the price at $t = 2$:

$$P_1 = \frac{Div_2}{(1+k)} + \frac{P_2}{(1+k)}$$

- Let is substitute $P_1 = \frac{Div_2}{(1+k)} + \frac{P_2}{(1+k)}$ into P_1 of the previous equation:

$$P_0 = \frac{Div_1}{(1+k)} + \frac{Div_2}{(1+k)^2} + \frac{P_2}{(1+k)^2}$$

Dividend Discount Model (DDM)

- More generally, for a holding period of H years, we can write the stock value as the present value of dividends over the H years plus the ultimate sales prices, P_H:

$$P_0 = \frac{Div_1}{(1+k)} + \frac{Div_2}{(1+k)^2} + \cdots + \frac{D_H + P_H}{(1+k)^H}$$

- Note the similarity between this formula and the bond valuation formula. Each relates price to the present value of a stream of payments (coupons in the case of bonds, dividends in the case of stocks) and a final payment (i.e. the face value of the bond or the sales price of the stock);
- The **key differences** in the case of stocks are: the uncertainty of dividends, the lack of a fixed maturity date, and the unknown sales price at the horizon date.

Dividend Discount Model (DDM)

- Indeed, one can continue to substitute for price indefinitely to conclude that:

$$P_0 = \frac{Div_1}{(1+k)} + \frac{Div_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \cdots$$

- The equation states the stock price should equal the present value of all expected future dividends into perpetuity. This formula is called the **Dividend Discount Model (DDM)** of stock prices;
- It is tempting, but incorrect, to conclude from the previous equation that the DDM focuses exclusively on dividends and ignores capital gains as a motive for investing in stock;

Dividend Discount Model (DDM)

- Indeed, we assume explicitly that capital gains, as reflected in the expected sales price P_1, are part of the stock' value;
- At the same time, the price at which you can sell a stock in the future depends on dividend forecasts at that time;
- The reason only dividends appear in the last equation is not that investors ignore capital gains. It is instead that those capital gains will be determined by dividend forecast at the time the stock is sold;
- That is why we can write: $P_0 = \frac{Div_1}{(1+k)} + \frac{Div_2}{(1+k)^2} + \cdots + \frac{D_H+P_H}{(1+k)^H}$

The Constant – Growth DDM

- The equation: $P_0 = \frac{Div_1}{(1+k)} + \frac{Div_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \cdots$ as it stands is still not very useful in valuing a stock because it requires dividend forecasts for every year into the indefinite future.
- To make the DDM practical, we need to introduce some simplifying assumptions;
- A useful and common first pass at the problem is to assume that dividends are trending upward at a stable growth rate, g;
- Let assume that $g = 5\%$ and the $Div_0 = 3.81$. The expected future dividends are:

The Constant – Growth DDM

$$Div_1 = Div_0(1+g) = 3.81 * 1.05 = 4$$
$$Div_2 = Div_0(1+g)^2 = 3.81 * (1.05)^2 = 4.2$$
$$Div_3 = Div_0(1+g)^3 = 3.81 * (1.05)^3 = 4.41$$
$$\ldots$$

- Using these dividends forecasts in the Equation:

$$P_0 = \frac{Div_1}{(1+k)} + \frac{Div_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \cdots$$

- We solve for intrinsic value as:

$$P_0 = \frac{Div_0(1+g)}{(1+k)} + \frac{Div_0(1+g)^2}{(1+k)^2} + \frac{Div_0(1+g)^3}{(1+k)^3} + \cdots$$

The Constant – Growth DDM

- The latter can be simplified to:

$$P_0 = \frac{Div_0(1+g)}{k-g} = \frac{Div_1}{k-g}$$

- **Note that we divide Div_1 (not Div_0) by $k-g$ to calculate intrinsic value;**
- The equation is called the **Constant-Growth DDM** or the **Gordon model**;
- If dividends were expected not to grow, then the dividend stream would be a simple perpetuity, and the valuation formula for such a nongrowth stock would be:

$$P_0 = \frac{Div_1}{k}$$

The Constant – Growth DDM

- **Example:** Milos industries has just paid its annual dividend (Div_1) of €3 per share. The dividend is expected to grow at a constant rate of 8% indefinitely. The beta of Milos stock is 1, the risk-free rate is 6%, and the market risk premium ($r_{mkt} - r_f$) is 8%. What is the intrinsic/fundamental value of the stock? What would be your estimate of intrinsic value if you believed that the stock was risker, with a beta of 1.25?

The Constant – Growth DDM

- The constant-growth DDM is valid only when g is less than k. If dividends were expected to grow forever at a rate faster than k, the value of the stock would be infinite;
- If an analyst derives an estimate of g that is greater than k, that growth rate must be unsustainable in the long run. In this case, the appropriate valuation model to use is a multistage DDM;
- The constant-growth DDM is so widely used by stock market analysts that it is worth exploring some of its implications and limitations.

The Constant – Growth DDM

- The constant-growth DDM implies that a **stock’ value will be greater**:

1. **The larger its expected dividend per share**;
2. **The lower the market capitalization rate, k**;
3. **The higher the expected growth rate of dividends**.

- Another implication of the constant-growth model is that **the stock price is expected to grow at the same rate as dividends**;
- To see this, suppose Milos stock is selling at its intrinsic/fundamental value of € 57.14. Then:

The Constant – Growth DDM

- Then: $P_0 = \frac{Div_1}{k-g}$;
- Note that price is proportional to dividends. Therefore, next year, when the dividends paid to Milos stockholders are expected to be higher by $g = 5\%$, price also should increase by 5%. (Let assume that $k = 12\%$). We can confirm this:

$$Div_2 = €4(1.05) = €4.20;$$

$$P_1 = \frac{D_2}{(k-g)} = \frac{€4.20}{(0.12 - 0.05)} = €60.00$$

- P_1 is 5% higher than the current price $P_0 = €\,57.14$;

The Constant – Growth DDM

- To generalize:

$$P_1 = \frac{D_2}{(k-g)} = \frac{D_1(1+g)}{(k-g)} = \frac{D_1}{(k-g)} * (1+g) = P_0(1+g)$$

- Therefore, the DDM implies that, in the case of constant expected growth of dividends, the expected rate of price appreciation in any year will equal that constant growth rate, g.

The Constant – Growth DDM

- For a stock whose market price equals its intrinsic/fundamental value, the expected holding period return will be:

$$E_r = Dividend\ Yield + Capital\ gains(loss)yield$$

$$E_r = \frac{Div_1}{P_0} + \frac{P_1 - P_0}{P_0} = \frac{Div_1}{P_0} + g$$

- This formula offers a means to infer the market capitalization rate of a stock, for if the stock is selling at its intrinsic/fundamental value, then $E_r = k$, implying that $k = Div_1/P_0 + g$;
- By observing the dividend yield, Div_1/P_0, and estimating the growth rate of dividends, we can compute k. This equation is known also as the **Discounted Cash Flow (DCF) formula**.

Stock Prices and Investment Opportunities

- Consider two companies, **Cash Cow** and **Growth Prospects**, each with expected earnings in the coming year of €5 per share. Both companies could in principle pay out all of these earnings as dividends, maintaining a perpetual dividend flow of €5 per share;
- If the market capitalization rate were $k = 12.5\%$, both companies would then be valued at $Div_1/k = \frac{€5}{0.125} = €40.00$;
- Neither firm would grow in value, because with all earnings paid out as dividends, and no earnings reinvested in the firm, both companies' capital stock and earnings capacity would remain unchanged over time;
- **Earnings and dividends would not grow**.

Stock Prices and Investment Opportunities

- Suppose, instead, that one of the firms, Growth Prospects, engages in projects that generate a return on investment of 15% (Return on Equity, i.e., RoE), which is greater than the required rate of return, $k = 12.5\%$;
- If Growth Prospects retains or plows back some of its earnings into its highly profitable projects, it can earn a 15% rate of return for its shareholders, whereas if it pays out all earnings as dividends, it forgoes the projects, leaving shareholders to invest the dividends in other opportunities at fair market rate of only 12.5%;

Stock Prices and Investment Opportunities

- Suppose, therefore Growth Prospects chooses a lower dividend **<u>payout ratio</u>** (i.e., the fraction of earnings paid out as dividends), reducing payout from 100% to 40% and maintaining a **<u>plowback ratio</u>** (i.e., the fraction of earnings reinvested in the firm, which is also referred to as the **<u>earnings retention ratio</u>**) of 60%;
- The dividend of the company, therefore, will be only €2 (i.e., $Expected\ earnings * dividend\ payout\ ratio = €5 * 40\% = €2$;
- Will the share price fall? No, it will rise.
- Although dividends initially fall under the earnings reinvestment policy, subsequent growth in the assets of the firm because of reinvested profits will generate growth in future dividends, which will be reflected in today' share price;

Stock Prices and Investment Opportunities

- How much growth will be generated? Suppose Growth Prospects starts with plant and equipment of €100 million and is all-equity-financed. With a return RoE of 15%, total earnings are $RoE * €100mln = 0.15 * €100mln = €15mln$;
- If 60% of the €15 million in this year' earnings is reinvested, then the value of the firm' capital stock will increase by $0.60 * €15mln = €9mln$ or by 9%;
- The percentage increase in the capital stock is the rate at which income was generated (RoE) times the plowback ratio (i.e., the fraction of earnings reinvested in more capital), which we will denote as b;

Stock Prices and Investment Opportunities

- Now endowed with 9% more capital, the company earns 9% more income and pays out 9% higher dividends. The growth rate of the dividends, therefore, is:

$$g = RoE * b = 15\% * 0.60 = 9\%$$

- We can derive this relationship more generally by noting that with a fixed RoE, earnings (which equal $RoE * Book\ value$) will grow at the same rate as the book value of the firm. Abstracting from net new capital raised by the firm, the growth rate of book value equals $reinvested\ earnings/book\ value$. Therefore:

$$g = \frac{Reinvested\ earnings}{Book\ value} = \frac{Reinvested\ earnings}{Total\ \ earnings} * \frac{Total\ earnings}{Book\ value} = b * RoE$$

Stock Prices and Investment Opportunities

- If the stock price equals its intrinsic/fundamental value, and this growth rate can be sustained (i.e., if the RoE and payout ratios are consistent with the long-run capabilities of the firm), then the stock should sell at:

$$P_0 = \frac{Div_1}{k - g} = \frac{€2}{0.125 - 0.09} = €57.14$$

- When Growth Prospects pursued a no-growth policy and paid out all earnings as dividends, the stock was only €40. Therefore, you can think of €40 as the value per share of the assets the company already has in place;
- When Growth Prospects decided to reduce current dividends and reinvest some of its earnings in new investments, its stock price increased;

Stock Prices and Investment Opportunities

- The increase in the stock price reflects the fact that planned investments provide an expected rate of return greater than the required rate. In other words, the investment opportunities have positive **Net Present Value;**
- The value of the firm rises by the **NPV** of these investment opportunities. This NPV is also called the **Present Value of Growth Opportunities**, or **PVGO**;
- Therefore, we can think of the value of the firm as the sum of the value of assets already in place, or the no-growth value of the firm, plus the net present value of the future investments the firm will make, which is the PVGO;

Stock Prices and Investment Opportunities

- For Growth Prospects, PVGO=€17.14 per share:

$$Price = No - growth\ value\ per\ share + PVGO$$

$$P_0 = \frac{E_1}{k} + PVGO$$

$$€57.14 = €40 + €17.14$$

- However…

Stock Prices and Investment Opportunities -Some stylized facts-

- In reality, dividend cuts almost always are accompanied by steep drops in stock prices. Does this contradict our analysis? Not necessarily;
- Dividend cuts are usually taken as bad news about the future prospects of the firm, and it is the new information about the firm – not the reduced dividend yield per se – that is responsible for the stock price decline;
- **Some examples**: (i) when J.P. Morgan cut its quarterly dividend from 38 cents to 5 cents a share in 2009, its stock price actually increased by about 5%. The company was able to convince investors that the cut would conserve cash and prepare the firm to weather a severe recession;

Stock Prices and Investment Opportunities -Some stylized facts-

- When investors were convinced that the dividend cut made sense, the stock price actually increased;
- **<u>Some examples</u>**: (ii) similarly, when British Petroleum (BP) announced in the wake of the massive 2010 Gulf oil spill that it would suspend dividends for the rest of the year, its stock price did not budge;
- The cut already had been widely anticipated, so it was not new information;
- These examples show that stock price declines in response to dividend cuts are really a response to the information conveyed by the cut.

Stock Prices and Investment Opportunities

- It is important to recognize that growth per se is not what investors desire. Growth enhances company value only if it is achieved by investment in projects with attractive profit opportunities, i.e., when $RoE > k$;
- To see why, let is now consider Growth Prospects' unfortunate sister: Cash Cow. Cash Cow' RoE in only 12.5%, just equal to the required rate of return, k. Therefore, the NPV of its investment opportunities is zero;
- We have seen that following a zero-growth strategy with $b = 0$ and $g = 0$, the value of Cash Cow will be $E_1/k = €5/0.125 = €40.00$ per share;

Stock Prices and Investment Opportunities

- Now suppose Cash Cow chooses a plowback ratio of $b = 60\%$, the same as Growth Prospects' plowback. Then g would be:

$$g = RoE * b = 12.5\% * 0.6 = 7.5\%$$

- But the stock price is still:

$$P_0 = \frac{Div_1}{k - g} = \frac{€2}{0.125 - 0.075} = €40.00$$

- No different from the no-growth strategy;
- In the case of Cash Cow, the dividend reduction that frees funds for reinvestment in the firm generates only enough growth to maintain the stock price at the current level;
- This is as it should be: if the firm' projects yield only what investors can earn on their own, then NPV is zero, and shareholders cannot be made better off by a high reinvestment rate policy. This demonstrates that "growth" is not the same as growth opportunities;
- To justify reinvestment, the firm must engage in projects with better prospective returns than those shareholders can find elsewhere;

Stock Prices and Investment Opportunities

- It is worth noticing that the PVGO of Cash Cow is zero:

$$PVGO = P_0 - E_1/k = 40 - 40 = 0$$

- With $RoE = k$, there is no advantage to plowing funds back into the firm. This shows up as PVGO of zero;
- In fact, this is why firms with considerable cash flow, but limited investment prospects, are called "**cash cows**". The cash these firms generate is best taken out of or "**milked from**" the firm.

Stock Prices and Investment Opportunities

- **Example**: Takeover Target is run by entrenched management that insists on reinvesting 60% of its earnings in projects that provide an RoE of 10%, despite the fact that the firm' capitalization rate is k=15%. The firm' year-end dividend will be €2 per share, paid out of earnings of €5 per share. At what price will the stock sell? What is the present value of growth opportunities? Why should such a firm be a takeover target for another firm?

Life Cycles and Multistage Growth Models

- As useful as the constant-growth DDM formula is, you need to remember that it is based on a simplifying assumption, namely, that the dividend growth rate will be constant forever;
- In fact, firms typically pass through life cycles with very different dividend profiles in different phases;
- In early years, there are ample opportunities for profitable reinvestment in the company. Payout ratios are low, and growth is correspondingly rapid;
- In later years, the firm matures, production capacity is sufficient to meet market demand, competitors enter the market, and attractive opportunities for reinvestment may become harder to find;
- In this mature phase, the firm may choose to increase the dividend payout ratio, rather than retain earnings;
- The dividend level increases, but thereafter it grows at a slower rate because the company has fewer growth opportunities.

Life Cycles and Multistage Growth Models

- **<u>Example</u>**: Let us consider the following dividend forecasts: 2012: €0.72; 2013: €0.81; 2014: €0.90; 2015: € 1.00. Let us assume the dividend growth rate will be steady beyond 2015. The dividend payout ratio is 25% and the RoE is 10%. The beta is 0.90, the risk-free rate on long-term T-bonds is 2.9%, and that the market risk premium is 8%. What is a reasonable guess for that steady-state growth rate? What is the intrinsic/fundamental value in 2011?