GFLEC
GLOBAL FINANCIAL LITERACY
EXCELLENCE CENTER

Saving and Investing

Lecture 4

Common investment products

There are many investment products and asset classes available to consumers and investors. Some of the most popular are:

- Bank savings accounts and certificates of deposit (CDs).
- Corporate or government bonds.
- Common stock.
- Mutual funds, including index funds
- Hedge funds.
- Real estate (covered in future classes)

Each of these assets, and their unique characteristics, will be discussed in this lecture.

Liquidity

Many financial assets, after they are first issued, can be sold in the secondary market:

- **Secondary market**: Market where assets that are issued in the primary market can be bough and sold
  - Ex: NYSE
  - Most government bonds have efficient secondary markets
- Having secondary markets increases the liquidity of an asset
  - Easy to sell or buy

Savings accounts and CDs

- **Savings accounts** at a bank are one of the more ubiquitous savings products (though not everyone has one!).
- Savings accounts are convenient because the savings can be **withdrawn on demand** without any fees.
- **Certificates of deposit** (**CDs**) are also offered by banks.
- CDs differ from savings accounts in that they **must remain deposited for a predetermined period** (usually 3 months to 5 years) and so cannot be withdrawn on demand without a fee (generally a number of month's interest).
- To compensate savers, banks offer higher interest rates on CDs, and longer maturity CDs offer higher interest.
- Savings accounts and CDs at U.S. banks are regarded as safe investments because the **Federal Deposit Insurance Corporation (FDIC)** guarantees all deposits up to a certain limit (currently $250,000 per accountholder per bank) in the event of a bank failure.

Corporate Bonds and Treasuries

Bonds

- **Bonds are a loan** from the investors to the issuer.
- When an issuer (either a **corporation or a government**) sells a bond issue, investors buy the bonds, which gives them the right to receive bond payments in the future.
- Effectively, the issuer receives cash from the investors at issuance. The issuer then makes payments to the bondholders over time. This is equivalent to a loan.
- Because the issuer may default on the bond, investors require that bonds pay a higher rate of interest than a savings account, and **the greater the risk of default, the higher the interest rate the bondholders demand**.
- Bonds issued by the U.S. government, or **Treasury Bonds**, are considered to be **free of default risk**, and so offer a lower interest rate than corporate bonds. However, they offer higher interest than a savings account because investments may not be withdrawn on demand.

Treasury bills and discount interest

Treasury bills, or **T-bills**, are short-term bonds issued by the U.S. government.

- T-bills don't make explicit interest payments and instead are sold at a **discount**.
- The investor purchase the T-bill for less than the **face value**, or **par value**, of the bond, which is what the Treasury will pay the bondholder when the bill matures.
- The interest is the difference between what an investor pays for a T-bill and its face value. This is known as **discount interest**.
- For example if an investor purchases $3,000 worth of three-month Treasury bills for $2,980, the he will pay $2,980 today and receive $3,000 in three months. The $20 difference is the discount interest. This corresponds to an annualized return of 2.71%.

Treasury bill auctions

T-bills are sold in an auction at *www.TreasuryDirect.gov*.

- Potential investors bid for the bonds by setting their bid at a price that will give them their desired rate of interest.
- The Treasury will then sell its bond issue to the highest bidders.
- For example, you plan to participate in the Treasury's six-month T-bill auction and desire an annualized rate of return of at least 3%, you will be willing to pay up to $985.33 per $1,000 of par:

Time Value of Money	
P/Y	1
FV	$1,000
N	0.5
PMT	$0
I/Y	3%
PV=	-$985.33

- If the Treasury is able to sell the entire **bond issue** to other bidders at a higher price, you will not receive any T-bills. Otherwise, the Treasury will accept the your bid and sell you bonds at this price.

Long-term bonds

Longer term bonds, which may be issued by either governments or corporations, differ from short-term Treasury bills in that they make explicit interest payments.

- The periodic interest payments are known as **coupon payments**, and are often paid in quarterly or annually. The **coupon rate** is the APR at which interest accrues.
- When the bond matures, one final coupon payment is made and the issuer also pays the bondholder the **face value** of the bond.
- For example, consider a five-year corporate bond that paid quarterly coupons at 8%. An investor with $100 worth of the bond would receive $2 coupon payments every quarter ($8 per year) for 20 quarters (five years), and an additional $100 in five years:

Treasury bond valuation

Like T-bills, medium-term **Treasury notes (T-notes) and** long-term **Treasury bonds (T-bonds)** are also sold in an auction at *www.TreasuryDirect.gov*.

- Because T-bills make no coupon payments, they are referred to as **zero-coupon bonds**. Longer term Treasuries are **coupon bonds** that make coupon payments semi-annually.
- Treasuries with maturities between one and ten years are referred to as **Treasury notes (T-notes)** while those with maturities of greater than ten years are referred to as **Treasury bonds (T-bonds**).
- For example, an investor that bids on a ten-year T-bond with a 6% coupon rate is bidding for the following cash flows per $1,000 par:

- If such an investor required a return of 7% on such an investment, he would bid $928.94 per $1,000 par.

Treasury bond valuation

Bond valuation is simple with a financial calculator.

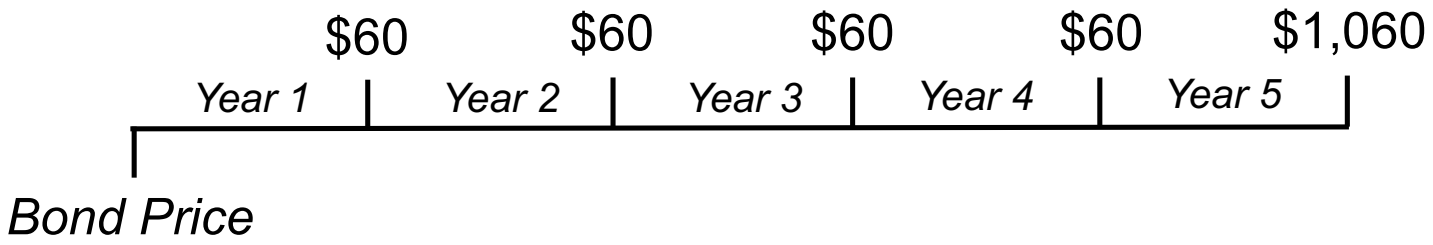
- A ten-year semi-annual coupon bond will have 20 semi-annual payments (two per year for ten years).
- If the coupon rate is 6%, the semi-annual coupon payment will be 3% (6% divided by number of payments per year) of the face value. So for $1,000 of par, the semi-annual coupon payment will be 0.03*$1,000 = $30.
- The price of the bond, given a desired interest rate of 7%, can be calculated with the TVM function (note that P/Y is two):

Time Value of Money	
P/Y	2
FV	$1,000
N	20
PMT	$30
I/Y	7%
PV=	-$928.94

- In this case the price is less than the $1,000 face value. A bond may trade above or below face value…

Bond valuation

Ex. Consider a five-year corporate bond that pays annual coupon payments of 6%. The cash flows associated with this bond, per $1,000 par, are:



The price of the bond rate at 5%, 6%, and 7% discount rates can be quickly found using a financial calculator.

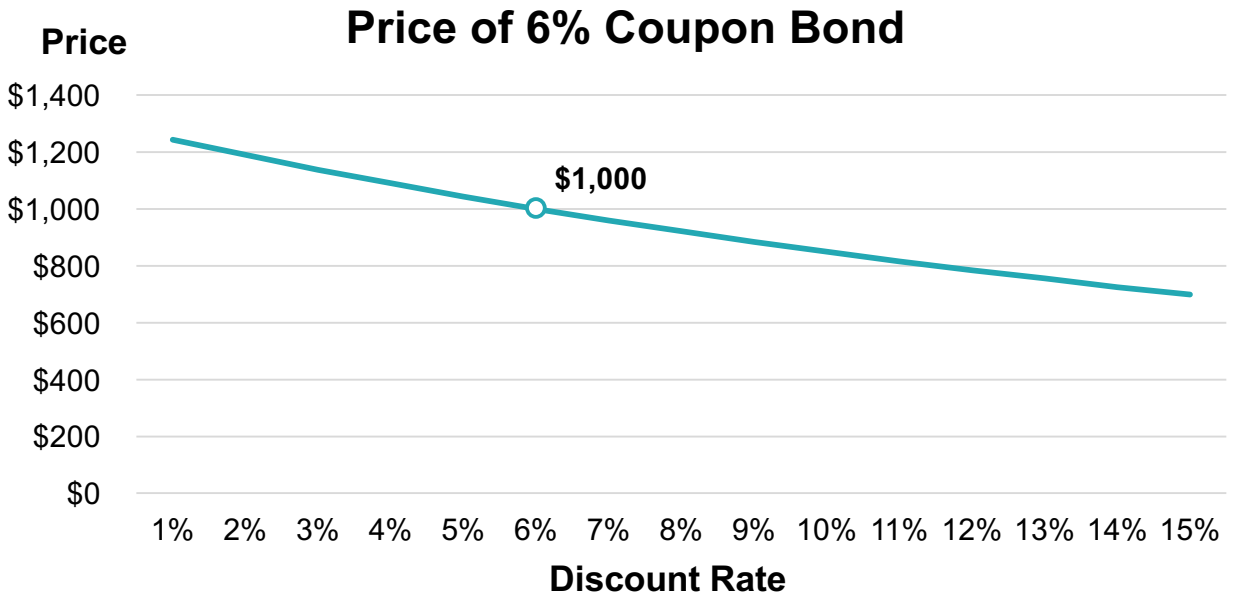
Time Value of Money		
P/Y	1	
PMT	$60	
FV	$1,000	
N	5	
I/Y	5.0%	
PV=	-$1,043.29	**(@ 5%)**
I/Y	6.0%	
PV=	-$1,000.00	**(@ 6%)**
I/Y	7.0%	
PV=	-$959.00	**(@ 7%)**

Bond valuation

Ex. (continued)

Discount Rate	Bond Price (6% Coupon)
5%	$1,043.29
6%	$1,000.00
7%	$959.00

Note that as the interest rate increases, the bond price declines. Again, **bond prices are inversely related to interest rates:**



Pars, premiums, and discounts

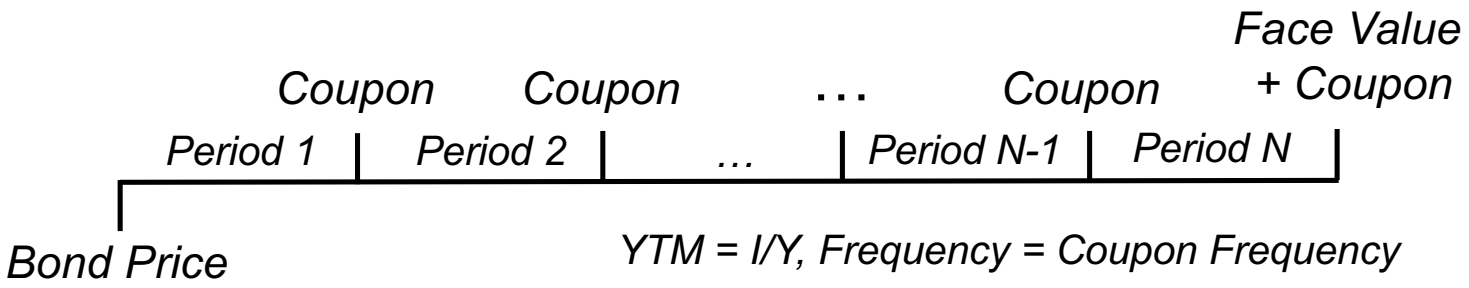
Note that, when a bond is discounted at its coupon rate, the bond price is $1,000 per $1,000 of par.

- When the interest rate used to value the bond is equal to the coupon rate, the bond sells at the $1,000 face value, and the bond is said to be selling at **par**.
- When the interest rate exceeds the coupon rate, the price of the bond is less than the face value, and the bond is said to be selling at a **discount**.
- When the interest rate is less than the coupon rate, the bond's price is greater than the face value, and the bond is said to be selling at a **premium**.
- In other words, the **coupon rate is not necessarily the interest rate realized by the investor**. When the bond sells at a discount, the investor will realize a return greater than the coupon rate. When it sells at a premium, the return will be less than the coupon rate.

Yield-to-maturity

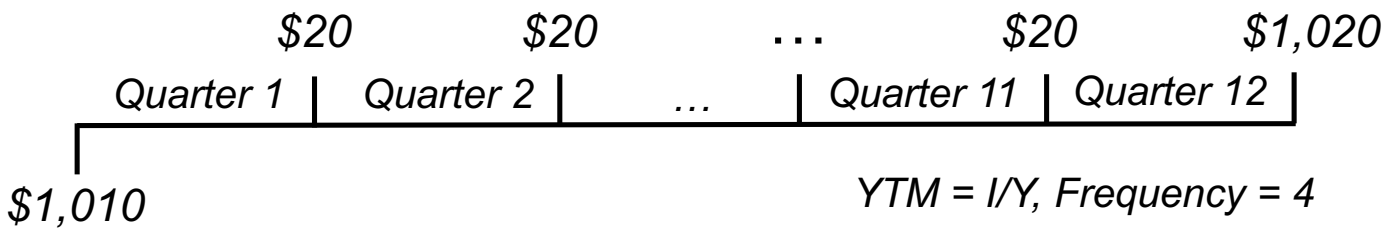
Corporate and Treasury bonds that have already been issued trade actively between investors in **secondary markets**. Given the price a bond is trading at, an investor can calculate the implicit interest rate, or **yield-to-maturity (YTM)**, offered by that bond.

To find the YTM, find the annualized interest rate *I/Y* that satisfies the following cash flows:



Yield-to-maturity

Ex. A five-year corporate bond that pays quarterly coupons at 8% currently has three years left to maturity. It sells at $1,010 per $1,000 par. The cash flows on the bond are:



And the YTM of this bond is 7.62%:

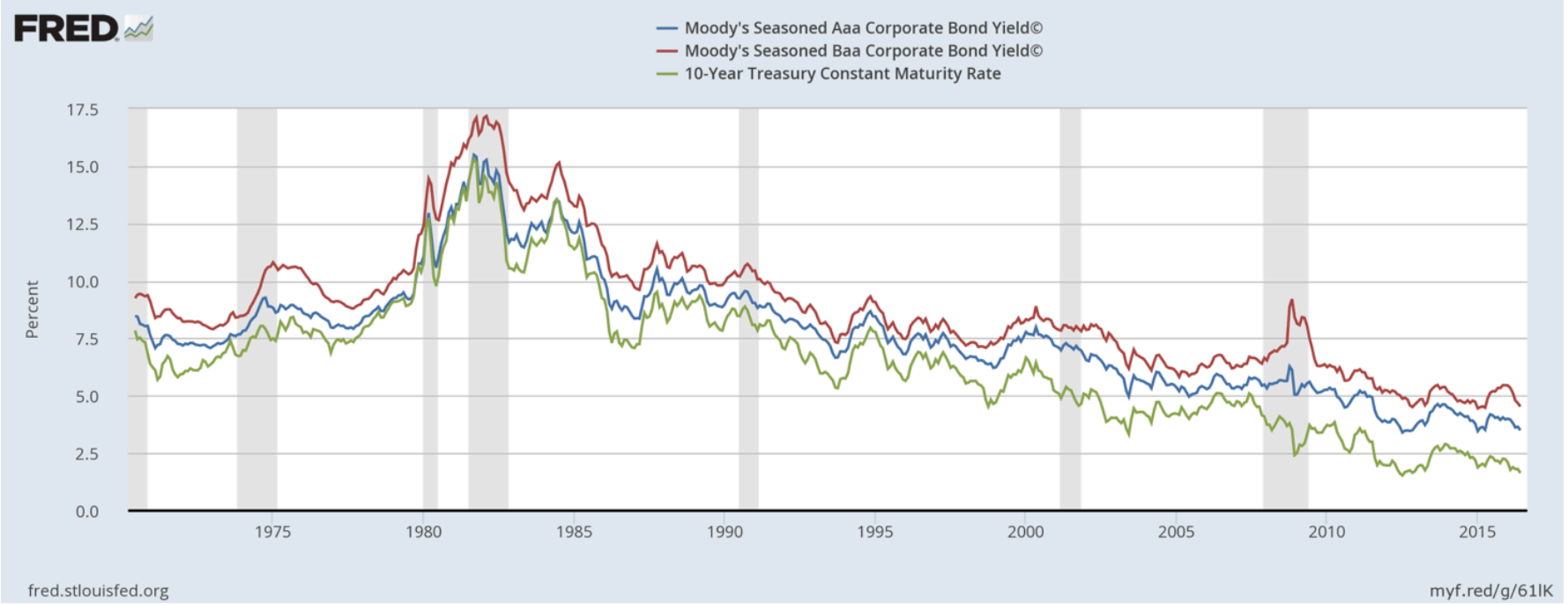
Time Value of Money	
P/Y	4
PV	-$1,010
FV	$1,000
PMT	$20
N	12
I/Y=	7.62%

Note that the YTM on the bond is different than its coupon rate!

Historical bond yields

The cash flows paid by Treasury and investment grade bonds are easy to predict (except in cases of default, the cash flows will equal the contractual coupon payments). The primary driver in the value of a bond is the yield demanded by investors. The chart below shows historical bond yields over time.

Bond Yields



Source: Federal Reserve of St. Louis Economic Data (FRED)

Common Stock

Common stock

- **Stock represents a proportional ownership stake in a corporation**. When an investor holds a share of stock in a company, that investor is a partial owner of the company.
- As a partial owner of a company, a **stockholder is entitled to a portion of that company's profits**.
- Corporations pay out their profits as **dividend** payments.
- Many stocks are **publically traded** between investors, so an investor may be able to profit by selling a stock at a higher price than that at which it was purchased.
- Stocks entail considerable **financial risk**. If the company is unprofitable, dividends may be scarce or, if the company's business prospects may deteriorate, the investor may be forced to sell the shares at a loss.
- The riskier the company is determined to be, the higher will be the expected return investors demand from that stock.

Common stock

The following real-world example demonstrates how stock ownership works.

Ex 1. The Coca-Cola Company has 4.5 billion shares of common stock outstanding. An investor that owns one share of Coca-Cola owns 1/4,500,000,000th of the company and so would be entitled to 1/4,500,000,000th of the company's profits in any given year.

In 2012Q3, Coca-Cola had about $2.3 billion in profits and paid out about $1.2 billion of these profits to shareholders, in which case each shareholder received about $1,200,000,000/4,500,000,000 = $0.26 per share in dividends.

The remaining $1.1 billion was invested in Coca-Cola's business operations with the expectation that this investment will increase profits in the future and allow the company to pay its shareholders higher dividends in the future.

Common stock

The next example demonstrates how a business can raise capital by issuing stock.

Ex 2. A budding entrepreneur plans to start a cake-baking business, for which she needs $60,000 in capital. The entrepreneur has $30,000 to invest in the business and two friends willing to invest $15,000 each. The business owner incorporates the business by dividing ownership of the business into 4,000 shares.

In this case, each share is worth $60,000/4,000 = $15 and the entrepreneur receives 2,000 shares and each friend receives 1,000 shares.

At the end of the first year, the business generates $16,000 in profits. The entrepreneur decides to reinvest $8,000, or half, of these profits in the business and pays out the rest in dividends.

This implies that the dividend is $8,000/4,000 = $2 per share and that the entrepreneur will therefore receive $2 * 2,000 = $4,000 in dividends and each friend will receive $2*1,000 = $2,000 in dividends.

Common stock valuation

Existing shares of a company's stock are often bought and sold between investors in the **secondary market**.

- The stock of large, **publicly-listed** firms trades on an exchange, such as the **New York Stock Exchange**.
- The **price** at which a company's shares transact **depends on the dividends** the company is expected to pay its shareholders.
- Specifically, **a stock's price should be equal to the present value of its future dividends**:

$$P = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \cdots$$

- Unlike payments on a bond, however, dividend payments from a stock are not known in advance and may vary with business conditions and management decisions.
- So, **stock valuation requires assumptions about dividends…**

The constant dividend model

One model of stock valuation is the **constant dividend model**, which assumes the dividends remain **constant** over the life of the company. In this case the stock is valued as:

$$P = \frac{D}{1+r} + \frac{D}{(1+r)^2} + \frac{D}{(1+r)^3} + \cdots$$

This is an example of a **perpetuity**, to which the **perpetuity formula** may be applied:

$$P = \frac{D}{1+r} + \frac{D}{(1+r)^2} + \frac{D}{(1+r)^3} + \cdots$$

The constant dividend model

The following example demonstrates how to use the constant dividend model to value stock.

Ex. One of the friends with 1,000 shares in the cake-baking business described in the last example decides to sell some of his shares.

If the buyer assumes the company will continue to pay $2 per share in dividends throughout perpetuity, requires a discount rate of 15%, the buyer will be willing to pay up to $13.33 per share:

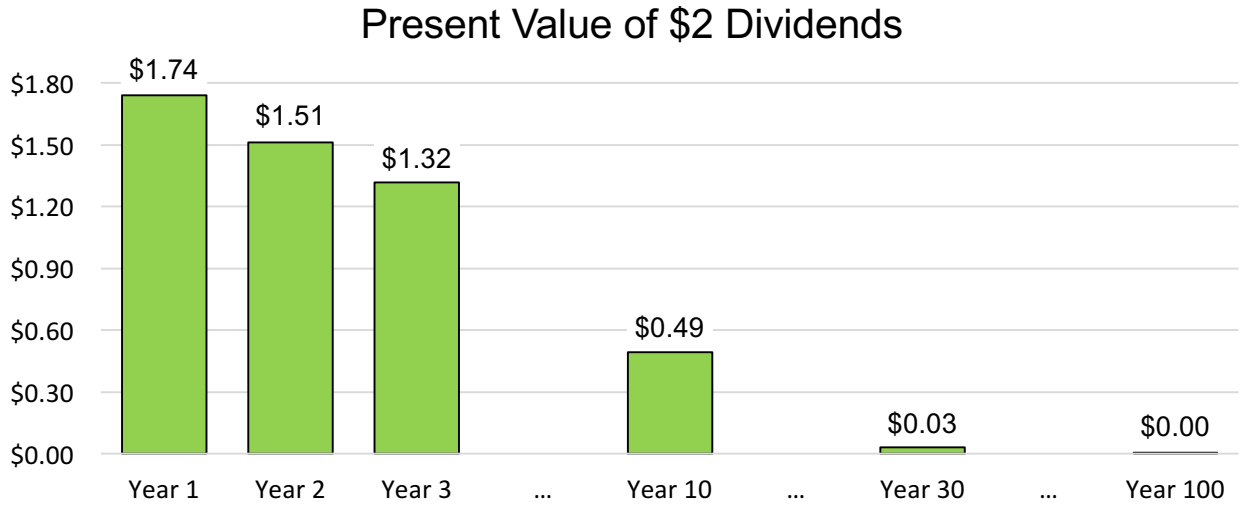
$$P = \frac{\$2}{0.15} = \$13.33$$

If the buyer pays $13.33 per share, and the company does in fact pay $2 per share in dividends through perpetuity, the return on the buyer's investment in the stock will be 15%.

Convergence of a perpetuity

The assumption that a company keeps paying dividends into eternity may appear unreasonable, but the time value of money makes it acceptable.

- Because of the time value of money, the distant dividend payments are worth very little. This allows the present value of an infinite number of cash flows to be finite.



- It makes the assumption that a corporation pays dividends forever acceptable. Even though corporations don't survive into eternity, the distant payments have little impact on the price.

The Gordon Growth Model

In practice, however, the constant dividend assumption may be inappropriate.

- The dividends paid by an expanding business may be expected to systematically grow over time.
- The **Gordon Growth Model** assumes dividends grow at a constant rate *g* each year.
- When this is the case, the present value of the growing dividends can be shown to be:

$$P = \frac{D_0(1+g)}{1+r} + \frac{D_0(1+g)^2}{(1+r)^2} + \cdots = \frac{D_0(1+g)}{r-g}$$

- Where D_0 is the most recently paid dividend. Note that this model only makes sense for r > g.

The Gordon Growth Model

This next example demonstrates how to use the Gordon Growth Model to value stock.

Ex. If the $2 dividend paid by the cake-baking business is expected to grow by 3% per year, the company should be valued at $17.67 per share with a discount rate of 15%:

$$P = \frac{D_0(1+g)}{r-g} = \frac{\$2\ (1.03)}{0.15-0.03} = \$17.17$$

Although still a simple model, the Gordon growth model communicates an important insight about the value of stock: **higher expected dividend growth leads to a higher price**.

Even corporations which pay small or even no dividends today may command a high price if investors expect that the company has positive business prospects and will be able to expand and pay out large dividends in the future.

If the Gordon Growth Model still does not accurately capture the expected evolution of a stock's dividends, an investor may use a more advanced or specific model…

Share sales and stock valuation

Even if the investor plans to sell the shares in the future, the formula for valuing a stock does not change.

Ex. If an investor plans to hold a stock for t years before selling it, the investor will receive t dividend payments and the proceeds from the sale of the stock at time t. In this case, the investor should value the stock at:

$$P_0 = \frac{D_1}{1+r} + \cdots + \frac{D_t}{(1+r)^t} + \frac{P_t}{(1+r)^t}$$

But the expected price at time t will simply be the expected present discounted value of the dividend payments after time :

$$P_t = \frac{D_{t+1}}{1+r} + \frac{D_{t+2}}{(1+r)^2} + \cdots$$

So, the price reduces to the familiar formula:

$$P_0 = \frac{D_1}{1+r} + \cdots + \frac{D_t}{(1+r)^t} + \frac{D_{t+1}}{(1+r)^{t+1}} + \frac{D_{t+2}}{(1+r)^{t+2}} + \cdots$$

Reinvested profits

Often, corporations do not pay out all of their profits as dividends. They may retain some or all of their earnings for reinvestment if they think it will be profitable.

- If the firm reinvests its earnings and achieves a return greater than that which its investors demand on the stock (the discount rate), the company creates value for its shareholders.
- This is why firms, such as some start-ups, with strong growth potential may not pay dividends and instead reinvest any profits.
- However, if the firms investments do not achieve a return greater than that which the investors demand, the firm destroys value. In this case, it would be better for the firm to return its profits to the shareholders so that they can reinvest the proceeds themselves.
- Sometimes, investors pressure firms to returning retained earnings to shareholders if they don't believe the firm has strong investment opportunities. (For example, the activist investor Carl Icahn recently pressured Apple into returning cash to shareholders.)

Reinvested profits

Ex. A company currently has profits of $10 per share. If the company pays out all of its profits as dividends, it will not grow, and it's dividends will be $10 per share into perpetuity. If investors demand a 10% return from this stock, it's share price will be:

$$P = \frac{D}{r} = \frac{\$10}{0.10} = \$100$$

However, if it reinvests all of its earnings, it will pay no dividends this year. Instead, it's future dividends will increase by the return on reinvested earnings. Where is the return on the reinvested earnings, the dividends will be:

$$D_1 = \$0$$

$$D_2 = \$10 + r^*\$10 = \$10(1 + r^*)$$

This decision will only increase value if the return on the reinvested earnings exceeds the 10% return demanded by investors.

We can generalize for longer time periods than 1.

Reinvested profits

Ex. (continued)

Case 1: Return of 20% on reinvested earnings

If the $10 of earnings per share are reinvested in a project with a return of 20% per year, **dividends will increase to $12 per year**, starting in the second year.

To find the price of the stock today, first consider the price of the stock one year from now. One year from now, the stock will pay constant dividends of $12 per share, so it's price will be:

$$P_1 = \frac{\$12}{0.10} = \$120$$

The price of the stock today is therefore:

$$P_0 = \frac{D_1}{1+r} + \frac{P_1}{1+r} = \frac{\$0}{1.10} + \frac{\$120}{1.10} = \$109.09$$

Reinvested profits

Ex. (continued)

Case 2: Return of 5% on reinvested earnings

If the $10 of earnings per share are reinvested in a project with a return of 5% per year, **dividends will increase to $10.50 per year**, starting in the second year.

The stock price in one year will be:

$$P_1 = \frac{\$10.50}{0.10} = \$105$$

The price of the stock today is therefore:

$$P_0 = \frac{D_1}{1+r} + \frac{P_1}{1+r} = \frac{\$0}{1.10} + \frac{\$105}{1.10} = \$95.45$$

Reinvested profits

Ex. (continued)

When earnings are reinvested at 20% instead of being paid out as dividends, the value of the stock today increases from $100 to $109, and **shareholders are wealthier**. This is because the 20% return on the company's investment is greater than the 10% return the investors demand from the company.

But **when earnings are only reinvested at 5%,** the value of the stock today decreases from $100 to $95, and **shareholders are poorer**. This is because the 5% return on the investment is less than the return investors demand from the company.

In the second case, the shareholders would prefer that the company pays them dividends so that they can reinvest the cash themselves.

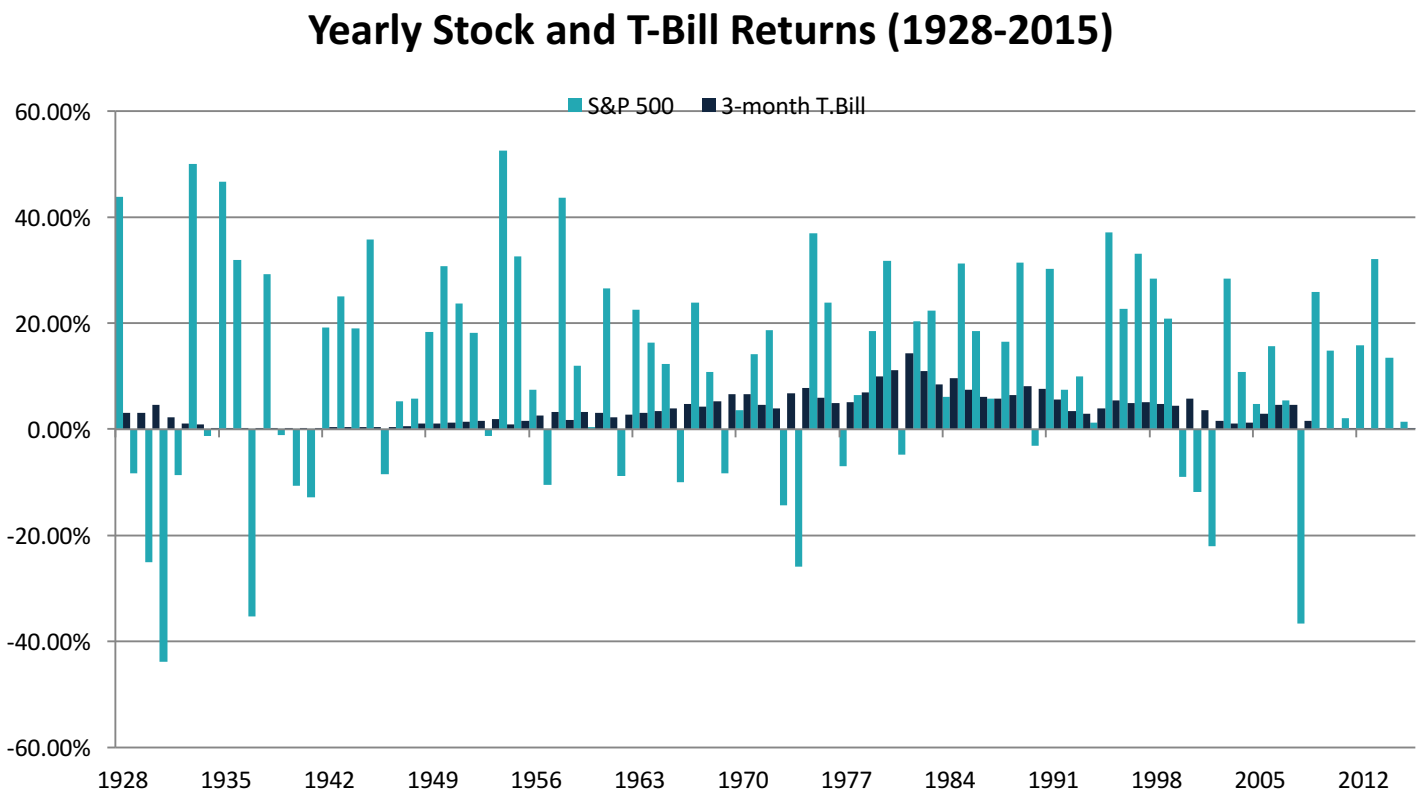
Common stock valuation

The following lessons should be taken from this stock valuation section.

- A stock should be valued at the present value of its future expected dividend payments. A company with high dividends nearer in the future should be worth more.
- This does not mean companies that are currently unprofitable or that don't pay dividends are worthless. If they are in a growing phase and can invest such that they will one day pay high dividends, they may be very valuable.
- It does not make sense to blindly invest "efficiently run" companies and shun "poorly run" companies. It depends on the price of the stock. If you can get low profits for a fair price, it is better than overpaying for high profits. What matters is whether a stock is a good or bad *value*.
- Dividends are uncertain. If the dividends are less than you expected when you purchased the stock, your return will be less than you planned on. The less certain you are about the dividends, the higher the risk, and the higher return you should demand, just in case.

Stocks vs. bonds in the short-term

The graph lists yearly returns. Although higher on average, **stock returns fluctuate wildly from year-to-year**:



Source: Federal Reserve of St. Louis Economic Data (FRED).
Damodaran, A. "Historical returns: Stocks, T.Bonds & T.Bills with premiums." NYU Stern, 2016.

Mutual Funds and Hedge Funds

Mutual funds

- **Mutual funds** are investment companies that **purchase stocks and bonds on behalf of their investors**.
- Mutual funds allow an investor to spread his or her wealth across a large number of stocks and bonds using a relatively modest investment (this is known as **risk diversification** and its benefits will be discussed in a future lecture).
- A mutual fund's investors **may also benefit from the expertise of the fund's managers.**
- Mutual funds, however, **may require large fees**. These fees cover the managers' salaries and expenses, and these fees will reduce the overall return the investors realize.
- **Index funds** are a special class of mutual funds that offer diversification benefits while attempting to **minimize fees**.
- Instead of spending resources trying to identify outperforming stocks, index fund managers **passively invest** in stocks to track some benchmark (ex. the **S&P 500 Stock Index**).

Mutual funds and fees

Mutual funds are investment companies that purchase stocks and bonds on behalf of their shareholders.

- Each share of a mutual fund is priced at the fund's **net asset value** (**NAV**), which is the sum of the prices of all the stocks and bonds held by the mutual fund, minus any debt owed by the fund, divided by the number of shares in the fund.
- Mutual fund investors receive the income from the fund's stock an bond holdings, and may also profit from changes in the fund's NAV.
- The **expense ratio** is the fund's annual operating expense, expressed as a proportion of the fund's assets, and reduces an investor's returns.
- A **front load** (or **front-end load**) is a fee charged to an investor upon purchasing shares in a mutual fund, and a **deferred load** (or **back-end load**) is a fee charged when an investor sells shares.

Mutual funds and fees

Always consider the fee structure of an mutual fund. High fees reduce your overall return.

- Imagine you invest in a mutual fund with a NAV of $24.50 and a front load of 5% and deferred load of 1%. A couple of months later you sell your shares when the NAV reaches $25.50.
- Without the fees, your return would be 4.08%. With the fees, this becomes a 1.87% *loss*!
- Next, imagine that you invest $50,000 in a mutual fund with a 1.5% expense ratio. If the assets in the fund return 10% per year, you will have $554,418 after 30 years.
- If the expense ratio was instead only 0.20%, you would have $821,612. This is about $267,000 more!
- The lesson is clear: **fees matter** because they reduce your returns. Try to invest in no-load mutual funds with low expense ratios.

Mutual funds and fees

Ex. An investor purchases 100 shares in a mutual fund with a **NAV of $24.50**. The fund has a **front load of 5%** and a **deferred load of 1%**. A couple of months later, the investor sells the 100 shares at a NAV of **$25.50**.

At the NAV of $24.50, the 100 shares will cost the investor $2,450. The investor must pay an additional 5%, or $0.05 * \$2{,}450 = \$122.50$, for the front-end load. The total cost is then $\$2{,}450 + \$122.50 = \$2{,}572.50$.

When the investor sells his shares at $25.50 a share, his $2,550 proceeds will be reduced by $25.50 because of the 1% deferred load. Thus, the investor will receive only $\$2{,}550 - \$25.50 = \$2{,}524.50$.

The investor lost 1.87% of his original investment:

$$F = P(1 + r)$$

$$\rightarrow r = \frac{F}{P} - 1 = \frac{\$2{,}524.50}{\$2572.50} - 1 = -1.87\%$$

Mutual funds and fees

Ex. (continued)

Without the front load, the shares would cost only $2,450. And without the deferred load, the investor would receive the full $2,550 in proceeds from the sale. If this were the case, the return would be:

$$r = \frac{F}{P} - 1 = \frac{\$2{,}550}{\$2450} - 1 = 4.08\%$$

Fees reduced the possible return from a 4.08% gain to a 1.87% *loss*!

Fees matter because they reduce returns. Investors may reduce the brunt of fees by investing in **no-load mutual funds**, so called because they don't charge front or deferred load fees. However, investors still need to be aware of the impact of the annual expense ratio on their returns…

Mutual funds and fees

Ex. An investor holds $50,000 in a mutual fund with a 1.50% expense ratio. If the assets held in the fund return an average of 10% per year for 30 years, how much will be in the investor's account at the end of 30 years? How much would be in the account if the expense ratio was only 0.20%?

Ans. Each year, the investor's balance will grow by 10% before being reduced by the 1.50% annual fee. After the first year, the ending balance will become:

$$\$50{,}000(1.10)(1-0.0150) = \$54{,}175$$

And over thirty years, the balance will grow to:

$$\$50{,}000(1.10)^{30}(1-0.0150)^{30} = \$554{,}418$$

If the expense ratio was only 0.20%, the ending balance would instead be:

$$\$50{,}000(1.10)^{30} * (1-0.0020)^{30} = \$821{,}612$$

This is a difference of about $267,000!

Hedge funds

- **Hedge funds** are similar to mutual funds in that they actively manage investments in different assets (including, but not limited to, stocks and bonds) on behalf of their investors.
- The primary difference is regulatory. Hedge funds face **fewer regulatory restrictions** than mutual funds in how they may invest their investors assets.
- Because they face less regulation, hedge funds are considered riskier than mutual funds and so, by law, are only available to **accredited investors** that exceed certain wealth and income thresholds.
- Because they are less regulated, hedge fund performance is **less transparent**. Past performance reported by the industry is likely to be biased and suggest higher returns than the asset class has experienced.
- Hedge funds often require **very high fees**.

Hedge funds and fees

Hedge fund fees often exceed those on mutual funds:

- Hedge funds often charge a management fee and an incentive fee.
- The management fee is a charged each year as a percentage of assets under management.
- The incentive fee is a percentage of profits.
- For example, “2 and 20” is a common hedge fund fee structure. Under such a structure, the hedge fund manager charge 2% of assets under management each year and 20% of returns.
- If you invest $50,000 in a hedge fund with a “2 and 20” structure and the underlying assets return 10% per year, your investment will grow to $274,451 after 30 years.

Hedge funds and fees

Ex. An investor invests $50,000 in a hedge fund with a "2 and 20" fee structure for 30 years. The assets managed by the hedge fund return an average 10% per year. How much will be in the investor's account after 30 years?

Ans. Each year, the invested assets increase by 10%. However, the investor gets only 80% of these returns, because the hedge fund gets 20% of all profits as an incentive fee. Therefore, the annual return (before management fees) is only 8%:

$$(1 - 0.20) * 10\% = 0.80 * 10\% = 8\%$$

Additionally, the hedge fund collects a 2% management fee, which reduces the account balance by 2% at the end of each year. After 30 years, the balance will grow to:

$$\$50{,}000(1 + 0.80 * 0.10)^{30}(1 - 0.02)^{30} = \$274{,}451$$

Index funds and fees

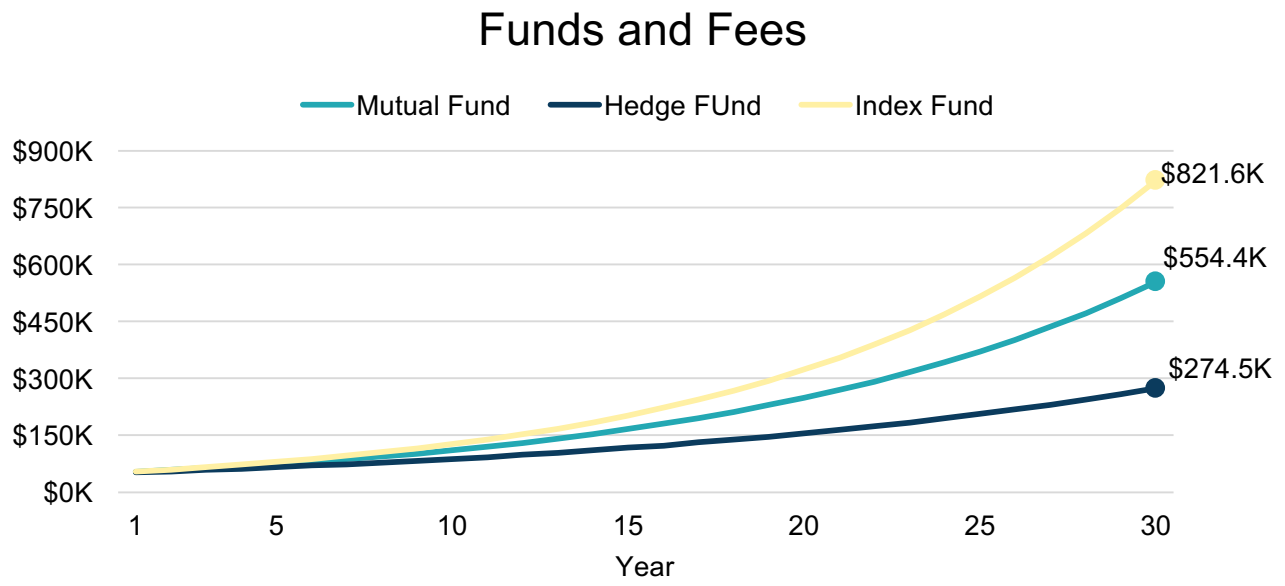
Mutual fund and hedge fund fees can make a large difference in an investor's returns:

- Front- and back-end loads on mutual funds are charged only once, but they fee can be large.
- Annual fees, measured by the expense ratio, may be smaller in percentage point terms, but this expense compounds over several years, so may have a dramatic effect on an investor's returns.
- Both management and incentive fees on hedge funds reduce your return each year and have a compounding effect over time.
- This explains the growing popularity of **index funds**, which generally have lower expense ratios than mutual funds (expense ratios of 1-2% are typical for traditional mutual funds, while popular index funds may charge an expense ratio of around 0.20%).

Funds and fees

The following chart plots the balance growth of $50,000 invested in:

a) A no-load mutual fund with a 1.5% expense ratio
b) A hedge fund with a “2 and 20” fee structure
c) An index fund with a 0.20% expense ratio.



As an early pioneer of index funds, **Jack Bogle**, once stated…

Jack Bogle on fund fees

Investors need to understand not only the magic of compounding long-term returns, but also the tyranny of compounding costs.

Jack Bogle, Founder and former CEO of The Vanguard Group

The Efficient Market Hypothesis

Efficient market hypothesis

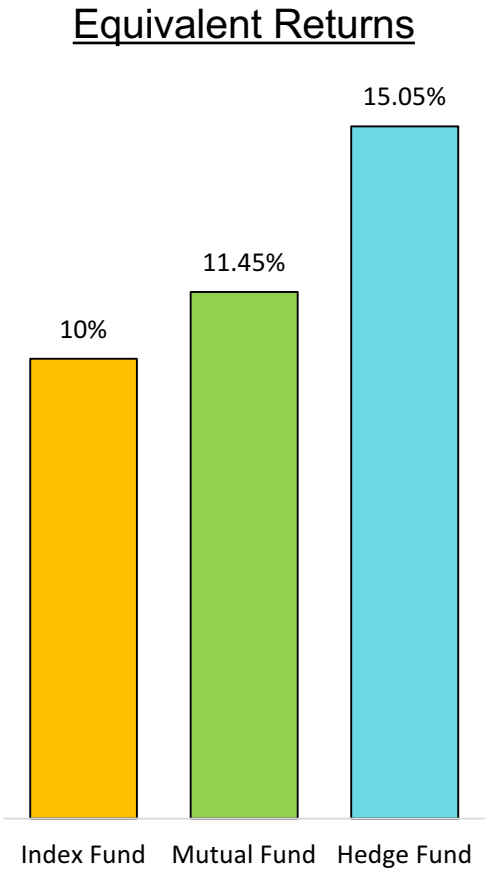
Although the fees on actively managed funds are higher than on index funds, they might be justified by higher returns:

- It could plausibly be the case that funds with higher fees generate higher returns: an especially **skilled fund manager may command a higher salary** and this would translate to higher returns and higher fees.
- Whether highly paid fund managers are able to generate higher returns, however, is a source of some controversy.
- Several studies find little evidence of skill among managers.
- This is related to an area of economic research known as the **Efficient Market Hypothesis (EMH)**.
- The **EMH** contends that markets are **efficient**: it's prohibitively difficult or costly to consistently outperform the market or to identify fund managers who can do so.

Efficient market hypothesis

To match the after-fee return of a index fund, a mutual fund or hedge fund would have to achieve a higher return on assets.

- If the market returns **10%**, an investment in an **index fund** that passively invests in the market and charges a 0.20% expense ratio will return 9.78% after fees.
- A no-load **mutual fund** with a 1.5% expense ratio would need to achieve a before-fee return of **11.45%** to match this after-fee return.
- A "2 and 20" **hedge fund** would need a before-fee return of **15.05%** to match this return. To justify the cost, such a hedge fund would need to consistently beat the market by five full percentage points!



Efficient market hypothesis

The evidence suggests that it is difficult for investors and fund managers to consistently outperform the market.

- Although some funds in a given year will certainly outperform the market, numerous studies have shown that, on average across funds and over time, mutual funds on not provide superior returns compared to a random selection of stocks.
- Some studies find that mutual funds do exhibit some stock picking ability, but that any excess return they might provide is outweighed by the additional fees they charge.
- Top performing funds in one year are no more likely to do well in the following year than that year's poorly performing funds (and in fact, many studies find they are likely to do worse…).

Efficient market hypothesis

Charles Wheelan, the author of Naked Economics, describes the EMH by comparing it to picking the shortest line in the grocery store:

Picking stocks is a lot like trying to pick the shortest checkout line at the grocery store. Do some lines move faster than others? Absolutely, just as some stocks outperform others. Are there things that you can look for that signal how fast one line will move relative to another? Yes. You don't want to be behind the guy with two full shopping carts or the old woman clutching a fistful of coupons. So why is it that we seldom end up in the shortest line at the grocery store (and most professional stock pickers don't beat the market average)? Because everyone else is looking at the same things we are and acting accordingly. They can see the guy with two shopping carts, the cashier in training at register three, the coupon queen lined up at register six. Everybody at the checkout tries to pick the fastest line. Sometimes you will be right; sometimes you will be wrong. Over time they will average out, so that if you go to the grocery store often enough, you'll probably spend about the same amount of time waiting in line as everyone else.

Naked Economics, Page 163

Return on different assets

The following table lists the historical nominal returns and standard deviations (a measure of risk) for some common asset classes from 1926-2005:

Asset Class	Geometric Mean	Arithmetic Mean	Standard Deviation
Large Company Stocks	10.4%	12.3%	20.2%
Small Company Stocks	12.6%	17.4%	32.9%
Long-term Corporate Bonds	5.9%	6.2%	8.5%
Long-term Government Bonds	5.3%	5.5%	5.7%
U.S. Treasury Bills	3.7%	3.8%	3.1%
Inflation	3.0%	3.1%	4.3%

Source: *A Random Walk Down Wall Street* - Burton Malkiel (2007), page 185; data from Ibbotson Associates.

This table is consistent with our intuition: stocks are riskier than bonds, with small company stock being the riskiest and short-term Treasuries the least risky.

Meeting a Savings Goal

Saving for a college education

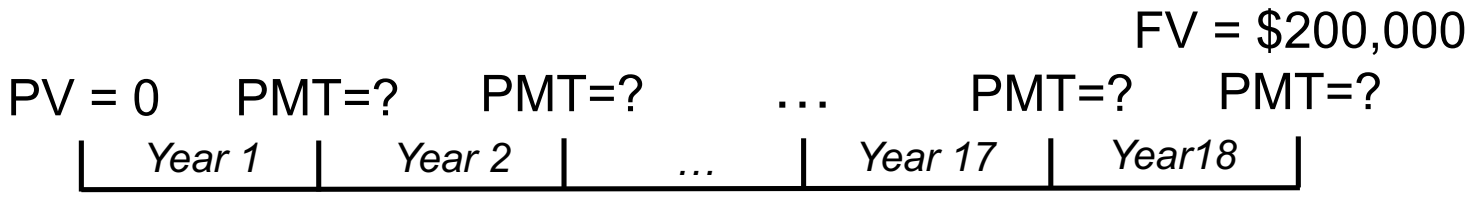
A child's college education can be a significant expense. To ensure that you're able to meet the expense, plan ahead.

- In the first lecture, we demonstrated the power of interest compounding. To save for your child's $200,000 Ivy League education, you can set aside about $80,000 when they are born.
- But for many, it is hard to come up with $80,000 at any given moment (especially with all the other expenses new children bring!). It is more manageable to save a little bit each year.
- If you invest in a combination of stock and bonds that you expect to earn 5% each year, you could save for your child's education by saving **$7,109 at the end of each year**.
- Or, if you'd prefer to start today, you can save **$6,771 at the beginning of each year**, starting today.

Saving for a college education

Let's see how to compute the necessary end-of-year contributions.

This problem has the following cash flow structure:



Interest Rate = 5%, Frequency = 1

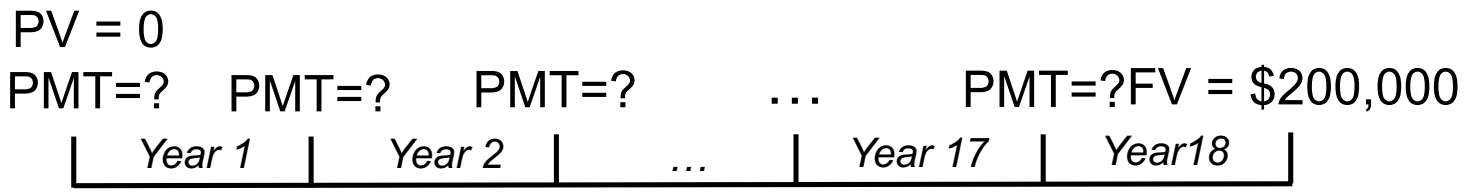
Where the payment can be solved for using a financial calculator:

Time Value of Money	
P/Y	1
PV	$0
N	18
FV	$200,000
I/Y	5%
PMT=	-$7,109.24

Saving for a college education

Now let's see how to the required contributions when they are made at the **beginning of the year**.

This problem has the following cash flow structure:



Interest Rate = 5%, Frequency = 1

This does not fit the TVM structure that we are used to! In order to use the TVM function as we have used it, the payments must occur at the *end* of each period.

Fortunately, there is a way to change the timing of the periodic payment on your financial calculator…

Saving for a college education

Now let's see how to calculate the required contributions when they are made at the **beginning of the year**.

With your financial calculator set to **beginning-of-period** payments, you can solve for the required annual contribution:

Time Value of Money	
BGN	BGN
P/Y	1
PV	$0
N	18
FV	$200,000
I/Y	5%
PMT=	-$6,770.71

It only costs $6,771 per year instead of $7,109 if you contribute at the beginning of each year. This is because, when you contribute earlier, each contribution gets an extra year's interest!

Saving for a down payment

Even with a mortgage, homebuyers may still need to accumulate savings to meet their down payment, and this may require several years worth of savings.

- To make a 20% down payment on a $400,000 house, a homebuyer will need $0.20 * \$400{,}000 = \$80{,}000$.
- If the homebuyer sets aside $1,250 each month in a savings account earning 3%, it will take about five years to accumulate the necessary savings.
- Or, if the homebuyer wants to have enough to make the down payment in 3 years, he must set aside $2,121 a month for three years.

Saving for a down payment

These values can be found using a financial calculator (remember to change back to end-of-period payments after the last problem):

Time Value of Money	
P/Y	12
FV	$80,000
PV	$0
PMT	-$1,250
I/Y	3%
N=	59.30
N	36
PMT=	-$2,121.19

Note that some planners might ignore the effect of interest and plan to set aside per month for 36 months. This is incorrect and we see that even with a small interest rate of 3% over a relatively short period of three years, our future home buyer can save $100 per month.

Today we learned…

- ✓ Savings accounts
- ✓ Corporate bonds and treasuries
- ✓ Common stock
- ✓ Mutual funds and hedge funds
- ✓ The efficient market hypothesis
- ✓ Meeting savings goals