UNIVERSITY OF MIAMI

BUS 640
Prof. Burch
Finance 1

Outline

This set of slides will cover important background material including

1. Areas in finance & the firm as an investment vehicle
2. Time value of money
   a. Required, expected, & realized returns
   b. Compound vs. simple interest
   c. Present & Future Value
   d. The financial calculator
   e. Multiple cash flows
   f. NPV
   g. Interest rate complexity
   h. Deferred annuity, irregular timing, mixed patterns
   i. Loans, special financing, buy or lease

<u>Optional reading in text</u>
Sections 1.1-1.2, 2.7, Chapters 3-4, & Sections 5.1-5.2

What is Finance in general?

Finance is concerned with:

Determining *value*.

Value = What something is worth now

= **present value of expected future cash flows**.

For decisions that involve money, we should use the Discounted Cash Flow (**DCF**) approach (about which we'll learn!) to make the best decision.

Three Areas of Finance

Corporate Financial Management

- The viewpoint is from that of an individual firm – the efficient use of resources, and the goal to "maximize shareholder wealth."

Investments

- The viewpoint is from that of an individual investor – what is a bond or share of stock worth? Is it a good investment based on risk/return tradeoff?

Financial Markets and Intermediaries

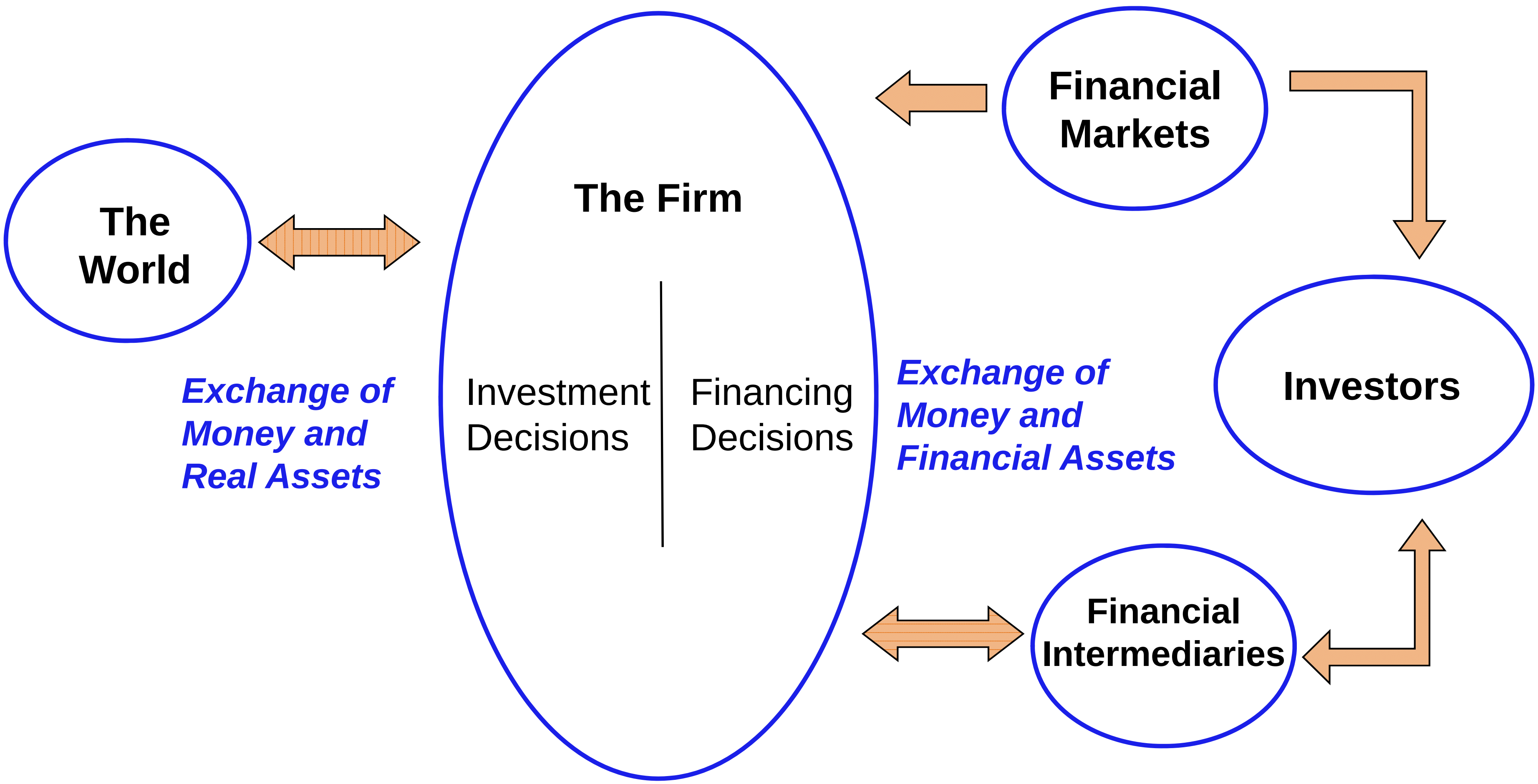
- The viewpoint is from that of a third party facilitating investor-firm interactions: banks, insurance companies, brokerage firms, financial securities markets.

These three interact to form the finance view of the firm

Three Types of Corporate Financial Decisions

1. Investment Decisions: Capital Budgeting
   - What kind of business should the firm run?
     - Electronic equipment, food product, multiple (conglomerate)?
2. Financing Decisions: Capital Structure
   - How should the firm be financed (how should it raise capital to fund the investments)?
     - Public vs. private sources
     - Equity vs. debt
3. Managerial Decisions
   - How should the firm conduct daily business? How much net working capital is needed?
     - NWC = Current assets – Current liabilities
   - How large should the firm be?
   - How fast should it grow?
   - Should the firm grant credit to a customer?
   - How should the managers be compensated?

The Firm as an investment vehicle



Three Main Areas of Finance: *Corporate Financial Management* *Financial Markets and Intermediaries* *Investments*

Time Value of Money

We now turn to arguably the most important concept in finance: The Time Value of Money

Money Has Time Value!

A dollar today is worth more than a dollar tomorrow.

The time value of money derives from the opportunity to earn interest on the money.

Required, Expected, and Realized Returns

Suppose I offer to you a simple security, in which I promise to pay you $110 one year from today.

How much would you be willing pay?

Here are some things you should consider:

- Inflation over the year will reduce the purchasing power of the $110
- Is the payoff risky? What if I have left the profession, moved to Australia to improve my tan, and don't respond to your attempts to contact me?
  - Even if I am ethical and don't do this, what if I am bankrupt?
- What are your alternative investment opportunities?

Required, Expected, and Realized Returns

Suppose that after contemplating the situation, you are willing to pay \$100 and no more.

Your ***<u>required rate of return</u>*** is 10%

- Paying \$100 is consistent with requiring 10% because \$100 + (10%)(\$100) = \$110
- In other words, note \$100 (1 + 0.10) = \$100(1.10) = \$110
- We can reverse this: Suppose your required rate of return is 10%
  - This implies you are willing to pay \$100 and no more
  - Note that \$110 / (1.10) = \$100

Required, Expected, and Realized Returns

We would say that based on your 10% required rate of return, the ***present value*** of the expected $110 cash flow is ______

- You "value" the expected $110 at t = 1 years at $100 (as of today, t = 0).

•Using the 10% rate of return we could also say that the ***future value*** of $100 today, invested at 10% for one year, is _____.

•The $100 today and the $110 in one year have the same ***time value of money***.

•We view them as having equivalent value.

Required, Expected, and Realized Returns

Suppose I do not know your required rate of return or minimum price, and suggests you pay $98 in return for the promise of $110 in one year.

- Obviously you will agree to this price, since your maximum is $100.
- Your ***expected rate of return*** = 12.245%, because note that $110/(1.122450) = $98
  - Another way: $98 (1.12245) = _______
- This is a good investment for you, because expected return > required return.

Required, Expected, and Realized Returns

A year later I might

- Pay you the full \$110
- Partially default and pay you \$90
- Default completely and pay you nothing

Under these three scenarios (keeping in mind you paid \$98) your ***realized rate of return*** would be one of

- (110 -98) / 98 = (110/98) - 1 = 0.12245 = 12.245%
  - In this case, your realized rate of return = the rate of return you had *expected*
- (90 – 98) / 98 = (90/98) – 1 = -0.081633 = -8.1633%
  - In this case, your realized rate of return < the rate you had expected
- (0 – 98) / 98 = (0/98) -1 = -1.00 = -100%
  - Ouch!

Required, Expected, and Realized Returns

The *required rate of return* is the return an investor demands that exactly reflects the riskiness (uncertainty) of the expected future cash flows, the opportunity cost of the investment (what else could be done with the money?), and expectations about inflation

The *expected rate of return* is that implied by what you pay for an investment and the future cash flow(s) you expect to receive

– A *profitable* investment, *ex ante,* has expected return > required return

The *realized* rates *of return* is the *ex post* actual rate of return earned based on money invested and received

– Only measurable after the fact, or *ex post,* and is disconnected from the expected and required returns

Compound vs. Simple Interest

Let's demonstrate the difference between compound and simple interest.

Suppose you deposit $1,000 today in a bank account that pays 10% interest per year. How much will you have one year from today?

$$FV_1 = PV + \text{Interest}$$
$$= 1{,}000 + (0.10)1{,}000 = \$1{,}100$$

$$FV_1 = PV + r(PV) = PV(1+r)$$

In two years?

$$FV_2 = FV_1 + \text{Interest} = 1{,}100 + (0.10)1{,}100 = \$1{,}210$$

Compound vs. Simple Interest

With *simple interest,* after two years we would only have $1,200.

– The calculation is $1000 + (2)(0.10)($1000)

Compound interest implies there is **interest on interest**

After 1 year: $1000 + (0.10)($1000)

$1000 + $100

After 2 years: $1000 + (0.10)($1000) + $100 + **(0.10)($100)**

= $1210

Note we have: $FV_2 = PV(1 + r)^2 = \$1000(1.10)^2 = \$1210$

FV & PV of a Single Cash Flow

Let's now consider the formulas for calculating future value and present value.

Future-value formula:

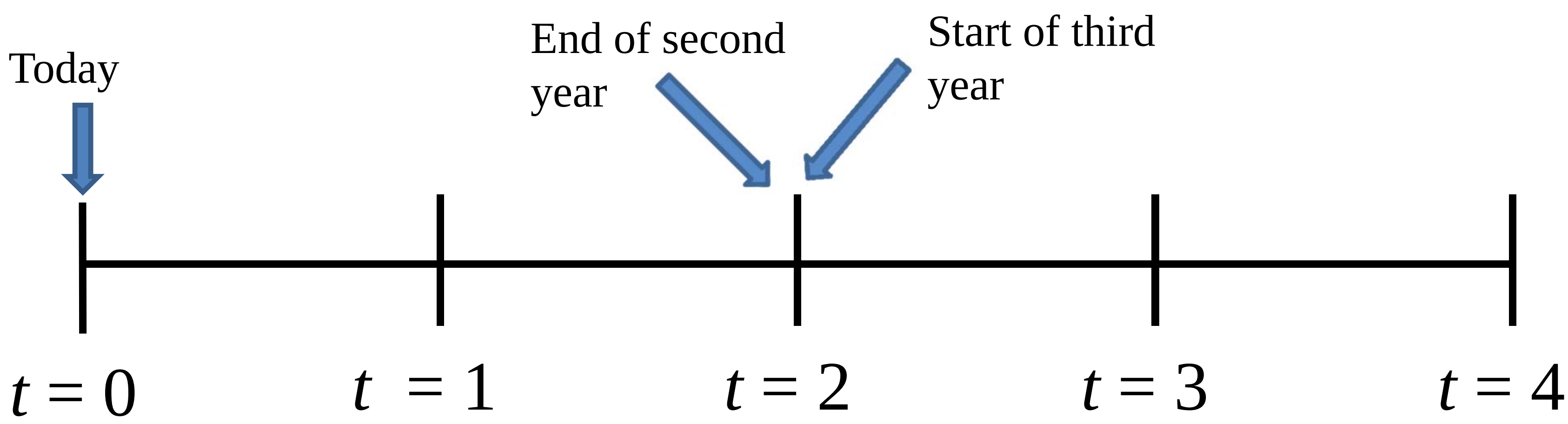
$$FV = PV(1+r)^n$$

Present-value formula:

$$PV = \frac{FV}{(1+r)^n}$$

The Time Line

Using timelines can help you decrease mistakes—please take the time to use them! On the timeline below, identify today, the end of the second year, and the start of the third year.



Note: The end of one year is the start of the next year. Be *very careful* to read problems carefully to understand the timing involved.

Key Requirements

Cash flows occur at the end of the time interval.

- If overly unrealistic, we can redefine the interval– we could even use days!

The compounding frequency is the same as the cash flow frequency.

- For example, for monthly payments we assume monthly compounding. In “real life” we have to be careful to ensure this requirement holds. For example, some car loans (car loans, home equity lines, etc.) may have monthly payments but monthly compounding! If this assumption is violated we need to adjust something to make it hold before proceeding!

Future Value Example

Suppose you invest $1,000 at an expected return of 10% per year. How much money do you expect to have at the end of the 5 years?

Year by year, the money accumulates as follows:

1,000; 1,100; 1,210; 1,331; 1,464.1; 1,610.51

$$1{,}000(1+.1)^5 = \$1{,}610.51$$

What if the expected return was 8% per year?

$$1{,}000\,(1+.08)^5 = \$1{,}469.33$$

Present Value Example

You expect to receive $10,000 6 years from today. If the required return is 9% per year, what is the money worth today?

Year by year (moving back in time), the discounted values are as follows:

10,000; 9,174.31; 8,416.80; 7,721.83; 7,084.25; 6,499.31; 5,962.67

$$PV = \$10,000 / (1.09)^6 = \$5,962.67$$

What if the required return is 7%?

$$PV = \$10,000 / (1.07)^6 = \$6,663.42$$

Using a Financial Calculator

Knowing how to use a financial calculator is an extremely important skill, and in this course you must become proficient in this skill.

- Can you imagine the impression you could make if you were to use a calculator in the board room, in front of a loan officer, for example, to check figures or do analysis without building a spreadsheet?

We will cover, and you will see solutions, using the five basic financial keys

- N, I (I/Y or I/YR some models), PV, PMT, FV
- You will be required to show your work using these keys when you complete exams.

Calculator Settings

Set number of payments in a period to be one:

- HP 10B: [1] [SHIFT] [P/YR]
- Texas Inst: [2nd] [I/Y] [1] [ENTER]

Set display to eight decimal places:

- HP 10B: [SHIFT] [DISP] [8]
- Texas Inst: [2nd] [.] [8] [ENTER]

You MUST *either* enter a zero for the extra variable, *or* reset TVM registers before making a calculation:

- **HP 10B: [SHIFT] [CLEAR ALL]**
- **TI: [2nd] [FV]**

For starters, when you <u>input</u> a PV, make it negative. (Later on, we will learn to be more flexible.)

Learn how to use change signs (CHS on some models, [+/-] on others), and also learn to use memory keys to store answers to intermediate steps!

A Warning on "Cash Flow" Keys and IRR

Important: You will NOT use "cash flow keys" (CF_0, CF_n, etc.) or "IRR" or any additional time value of money keys.

- If you have time to check your work using them, that is your choice—but these keys <u>are not allowed</u> in properly supporting your work on exams.
- These shortcuts are even more "black boxes" than your five main financial keys and they undermine your ability to truly learn both the intuition and mechanics of time value of money! Moreover, you will encounter problems where these tools are not sufficient or even useful.

Calculator Basics

You expect to receive $10,000 6 years from today. If the required return is 9% per year, what is the money worth today?

Solution:

N=6   i=9   PMT=0   FV=10,000   PV=-5,962.67

Final answer $5,962.67

(Note: The final answer is positive!!)

Calculator Basics

1. You can either put in a zero for an unused variable or reset the calculator by *clearing the TVM keys*.
2. Putting in a 0 (e.g., PMT=0) eliminates that term, so you use only the other two terms.
3. The sign convention in the calculator causes the PV and FV to have opposite signs in the problem you just encountered (more on this in a moment).
4. The rate is in percent. So, 10 for the interest rate in the financial calculator key "I" means 10%
5. On the TI, you first press "CPT" (top left, short for "compute") and then the unknown for which you are solving. On the HP, simply press the key for which you are solving.

Calculator Basics: The Sign Convention

The financial keys have a bit of economic intuition built in via the sign convention used. Consider a bank offering you $5000 CD (certificate of deposit) for one year that pays 1.5%. You give the bank $5000 today and they will return $5000(1.015) = $5075 in one year.

From the bank's perspective: They receive a *positive cash flow* of $5000 and later there is a *negative cash flow* as they pay $5075

N = 1, I = 1.5 , PMT = 0, PV = +5000 → solve FV = -5075

From your perspective: You pay (*a negative cash flow*) $5000 and they later receive (*a positive cash flow*) of $5075

N = 1, I = 1.5 , PMT = 0, PV = -5000 → solve FV = +5075

Calculator Basics: The Sign Convention

Obviously, in the preceding problem you can enter the PV of 5000 as EITHER a positive or negative in your calculator—that is up to you.

However, if you are asked "What is the future value of $5000 invested at 1.5% for one year?" then regardless of how you enter the PV and what sign the calculator returns for FV, we know the actual answer (and thus your final answer) must be **positive!**

Calculator Basics: The Sign Convention

Also, you will definitely encounter problems where you have to be careful. Consider: You invested \$5000 for one year and received \$5075. What was your realized rate of your return?"

Solution method 1: N = 1, PMT = 0, PV = +5000, FV = -5075 (and solve for I)

Solution method 2: N = 1, PMT = 0, PV = -5000, FV = +5075 (and solve for I)

On your own: try entering PV and FV with the same sign. What happens?

Solving for a Present Value

Assume you've just turned 25, and can earn 10% on your money. How much must you invest today in order to have $1 million when you are 65?

$$\frac{1{,}000{,}000}{(1+0.10)^{40}} = \text{PV or } \$\text{PV}(1.10)^{40} = \$1{,}000{,}000$$

N=40 i=10 PMT=0 FV=1,000,000 PV=

(So, "you must invest ")

(We' ve ignored taxes and also that the $1,000,000 in so many years will have considerably less purchasing power than it would have today. It won' t be "worth" as much as you think of it in terms of today' s dollars!)

Solving for an Interest Rate

BB&T offers a 5-yr certificate of deposit that pays $10,000. The CD costs $8,752.82 today. What interest rate is BB&T offering?

$$\frac{10{,}000}{(1+i)^5} = \$8{,}752.82$$

N=5 PV=-8,752.82 PMT=0 FV=10,000 i=

So BB&T is offering per year.

Solving for an Amount of Time

Suppose you invest money at 12% per year. How long would it take to double your money?

$$\frac{200}{(1+0.12)^n} = \$100 \text{ or } \$100(1.12)^n = \$200$$

(This could be solved by taking the natural log of both sides if you remember how to work with logs!)

i=12 PV=-100 PMT=0 FV=200 N=

So it would take years.

Multiple Cash Flows

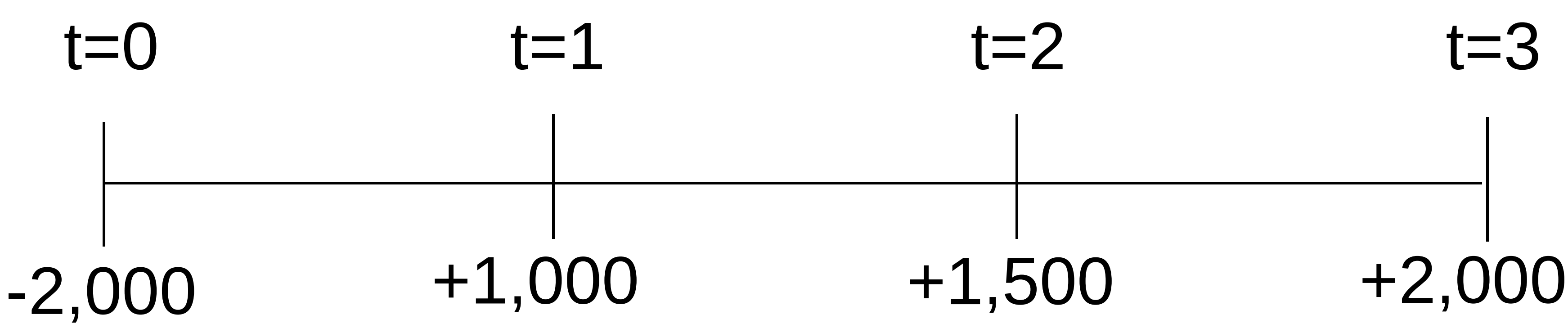
PV of multiple cash flows = the sum of the present values of the individual cash flows.

FV of multiple cash flows **at a common point** in time = the sum of the future values of the individual cash flows **at that point in time**.

Multiple Cash Flows

You have a chance to invest 2,000, and expect to receive back 1,000, 1,500, and 2,000 in years 1, 2, and 3, respectively. At 10% per year:

1. What is the combined value at t=0, i.e., the NPV?
2. What is the combined value at t=3, i.e., the FV?
3. What is the combined value at t=2?



Combined Present Value, NPV

Let's begin to address the solution to Question 1.

N=3 i=10 FV=2,000 PMT=0 PV=-1,502.63

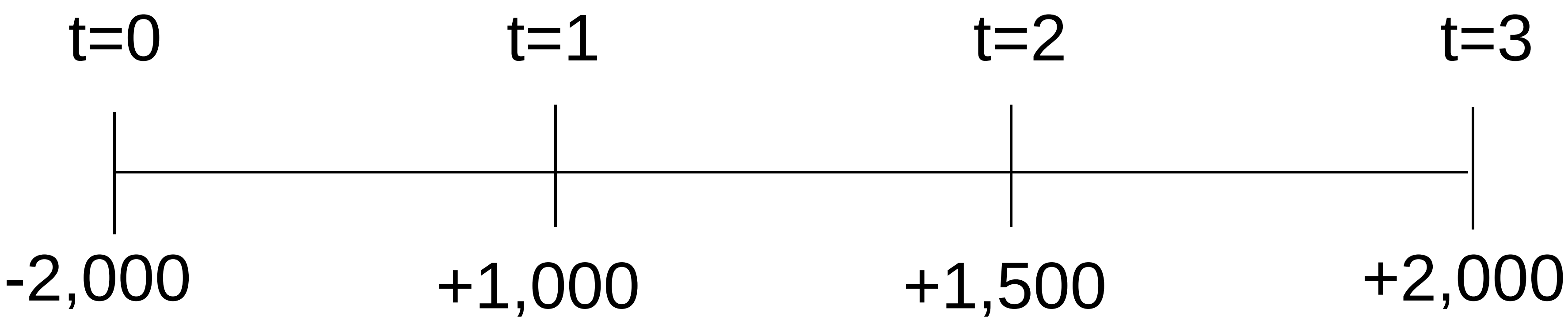
N=2 i=10 FV=1,500 PMT=0 PV=-1,239.67

N=1 i=10 FV=1,000 PMT=0 PV=-909.09

Note the answers are all negative simply because we plugged in *positive* numbers for each FV. The signs of the answers are a direct result of the sign choice we make when entering the inputs.

PV of the Cash Flows

Let's complete the solution to Question 1.



Present values (values at t = 0):

-2,000.000 +909.091 +1,239.669 +1,502.630

Note we were very careful with the signs in this step (we retained the signs of the original cash flows!). Total PV = Sum = +1,651.39

Combined Value at t = 3

Let's begin to address the solution to Question 2. What is combined value of the cash flows at t=3?

Values at t=3:

N=3	i=10	PV=2,000	PMT=0	FV=-2,662.000
N=2	i=10	PV=1,000	PMT=0	FV=-1,210.000
N=1	i=10	PV=1,500	PMT=0	FV=-1,650.000

Combined Value at t = 3

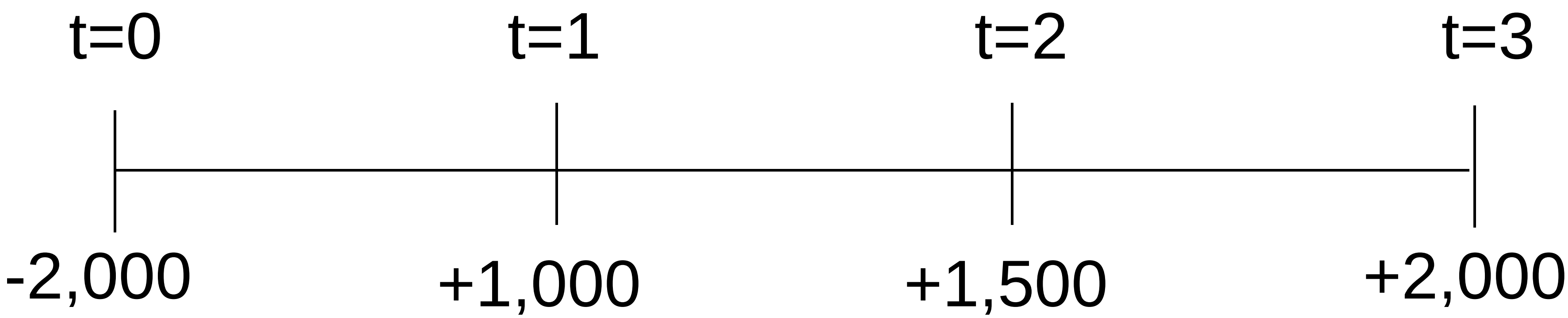
t=0	t=1	t=2	t=3
-2,000	+1,000	+1,500	+2,000

Values at t=3 (note again our care with the signs):

-2,662.000 +1,210.000 +1,650.000 +2,000.000

Total FV = Sum = +2,198

Combined Value at t = 3

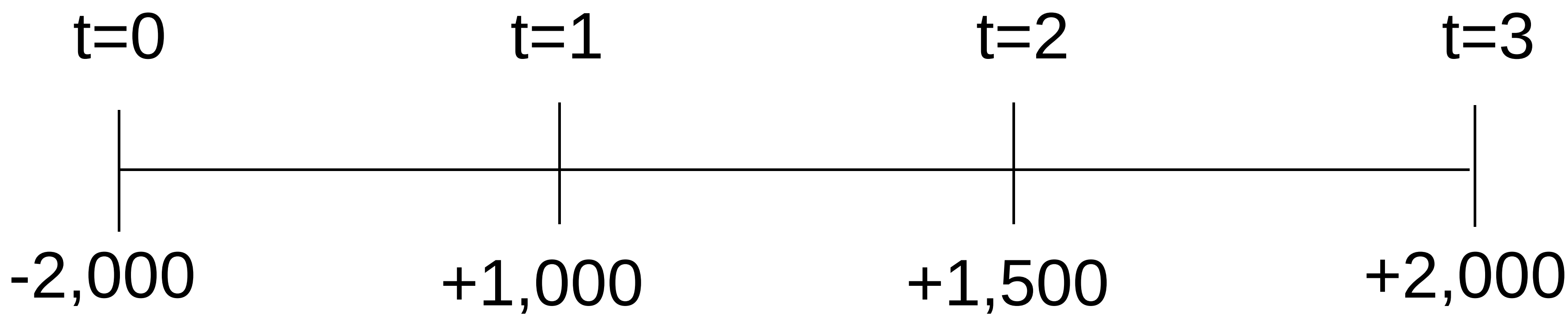


Alternatively, using the financial calculator:

N=3   i=10   PV=1,651.390   PMT=0   FV=-2,198.000

And, of course, you must express the final answer as a *positive number,* i.e., +2,198.00.

Combined Value at t = 2

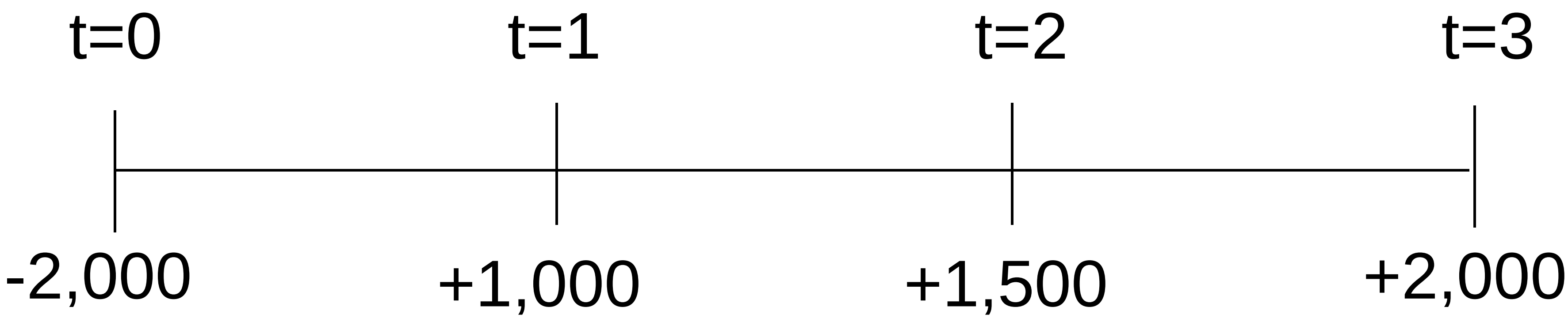


Values at t=2:

-2,420.000 +1,100.000 +1,500.000 +1,818.182

Total value at t=2 = Sum = +1,998.18

Combined Value at t = 2



Alternatively, using the financial calculator:

N=2 i=10 PV=1,651.390 PMT=0 FV=-1,998.18

N=1 i=10 FV=2,198.000 PMT=0 PV=-1,998.18

And, remember, the final answer needs to be **positive**.)

A Few Comments

Note the final answer should be expressed as a *positive number in this problem,* because the value as of t = 0 being positive implies that so too must be the value as of any other period in time!

Also, note how in the first alternative we entered input as a PV and solved for a FV, and in the second we entered input as a FV and solved for a PV.

- The "present" value versus the "future" value has to do with the *relative timing* of the two cash flows.
  - 1651.390 (which is as of t = 0) is in the "present" relative to our goal of finding the value at t = 2
  - 2198.000 (which is as of t = 3) is in the "future" relative to our goal of finding the value at t = 0

Annuities

An annuity is a series of identical cash flows that are expected to occur each period for a specified number of periods.

Thus, $CF_1 = CF_2 = CF_3 = CF_4 = \cdots = CF_N$

Examples of annuities:

- Installment loans (car loans, mortgages)
- Coupon payment on corporate bonds
- Rent payment on an apartment

Three Types of Annuities

Ordinary Annuity:

- An annuity with <u>end-of-period</u> cash flows, beginning one period from today
  – For example, a car loan

Annuity Due:

- An annuity with <u>beginning-of-period</u> cash flows
  – For example, an apartment lease

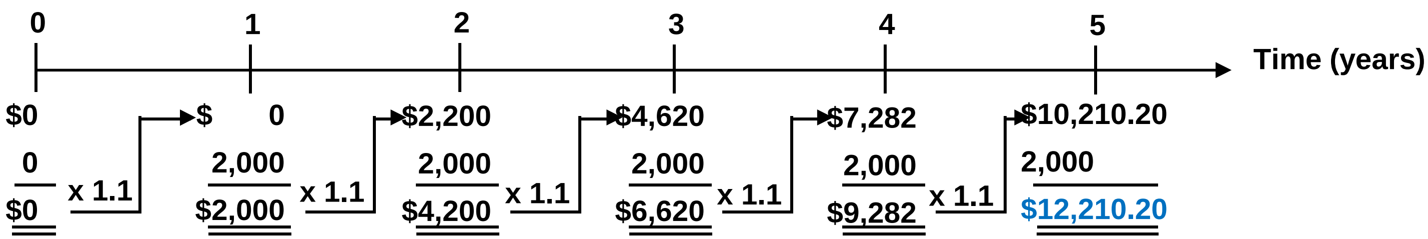
Deferred Annuity:

- An annuity that begins at a time different from today
  – For example, a student loan with a 1-year deferral

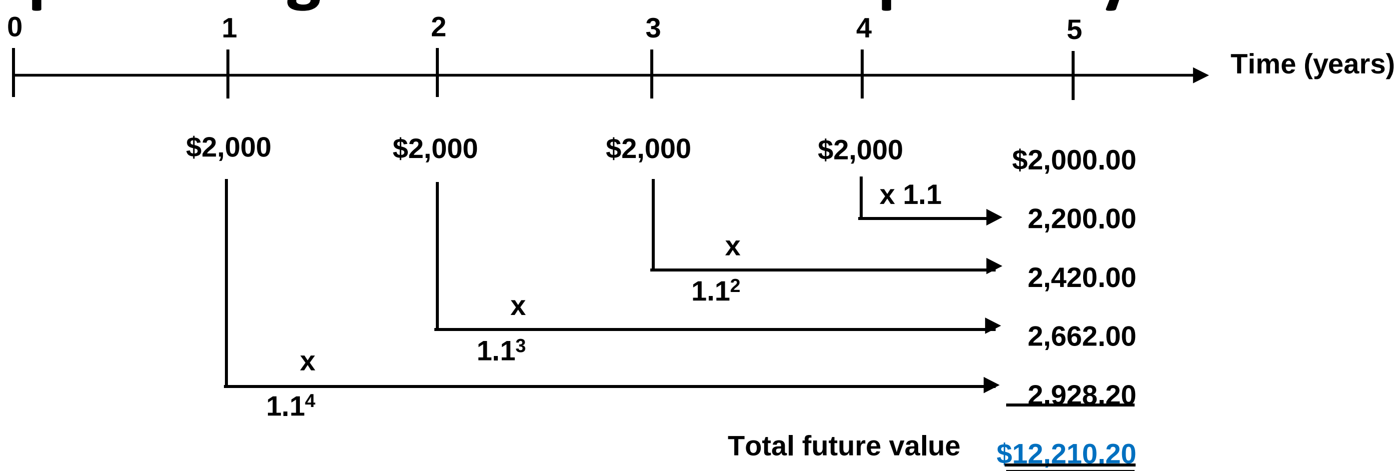
Future Value of an Ordinary Annuity

FV of $2,000 per year for 5 years, at 10% per year:

Compounding forward one period at a time:



Compounding each cash flow separately:



Future Value of an Ordinary Annuity

$$\mathrm{FVA_n} = \mathrm{PMT}\sum_{t=0}^{n-1}(1+r)^t = \mathrm{PMT}\left[\frac{(1+r)^n - 1}{r}\right]$$

N=5 i=10 PV=0 PMT=2,000 FV= -12,210.20

So, the future value is $12,210.20

Present Value of an Ordinary Annuity

Now that we have considered future value, let's consider present value.

$$\mathrm{PVA}_n = \mathrm{FVA}_n \left[\frac{1}{(1+r)^n} \right]$$

$$= \mathrm{PMT} \left[\frac{(1+r)^n - 1}{r} \right] \left[\frac{1}{(1+r)^n} \right] = \mathrm{PMT} \left[\frac{(1+r)^n - 1}{r(1+r)^n} \right]$$

Present Value of an Ordinary Annuity

Of course, you can use (& I highly recommend!) your financial calculator to calculate present value. Let' s revisit the $2,000 per year for 5 years, at 10% per year.

The FV was $12,210.20. What is the PV of that amount?

N=5 i=10 PMT=0 FV=12,210.20 PV=-7581.57

Well, then what is the PV of this $2,000 annuity?

N=5 i=10 PMT=2,000 FV=0 PV=-7581.57

Final answer = +$7581.57

Future Value of Your Savings

Let's consider another example.

Suppose you save $1,500 per year for 5 years, beginning one year from today. The savings bank pays you 6% interest per year. How much will you have at the end of 5 years?

N=5 i=6 PV=0 PMT= 1,500 FV= -8,455.64

So, you will have $8,455.64

Present Value of Your Savings

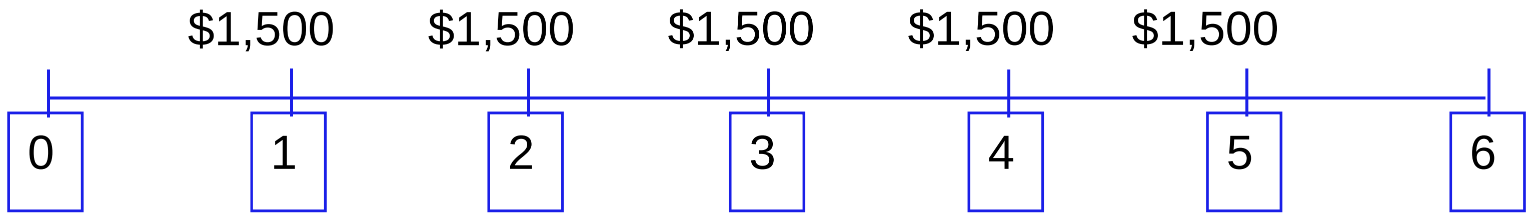
Equivalently, if you save 6,318.55 today, which is the PV as of today of the five $1500 payments (note: N=5 i=6 PMT=-1,500 FV=0 → PV=6,318.55),

Then you will have 8,455.64 in 5 years:

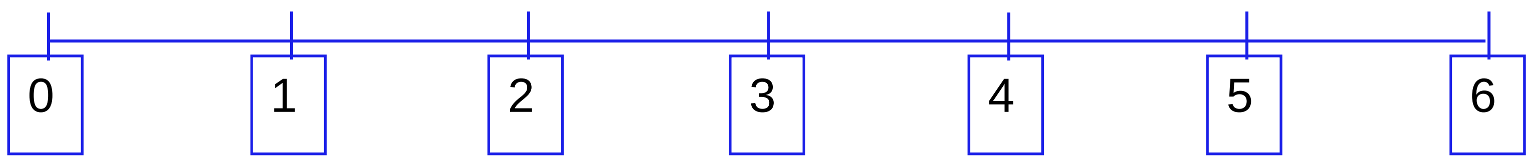
N=5 i=6 PV=-6,318.55 PMT=0 FV=8,455.64

Three Equal Values

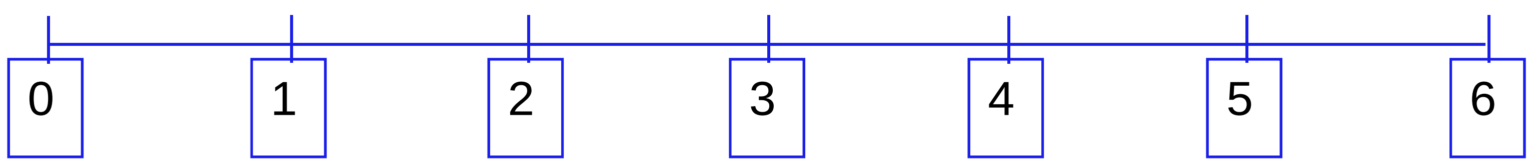
This annuity:



Has the same time value as $8,455.64 at t=5: $8,455.64



And the same time value as $6,318.55 now (t=0): $6,318.55



Future Value of Your Savings

Now, suppose you plan to leave the $8,455.64 in the savings account, and will not add any more to it. How much would you have at the end of five additional years (i.e., 10 years from today)?

N=5 i=6 PV=8,455.64 PMT=0 FV=-11,315.55

And also note the following calculation, starting with 46318.55 at t=0 value and compounding for *10* years:

N=10 i=6 PV=6,318.55 PMT=0 FV=-11,315.55

Final answer = +$11,315.55

Financial Calculator vs. Algebra

It is technically up to you whether to calculate present and future values with your financial calculator or algebra, as long as you support your work: either write out the algebraic expression before your final answer, or write all calculator input (N, I, etc.).

My advice is to use algebra when moving a single cash flow through time, simply because I find it faster and more intuitive, but I always use the financial calculator for annuities. Note that your formula sheet does not include the algebraic expressions – better and safer to use your financial calculator!

Timing of Payments and PV/FV in the Financial Calculator

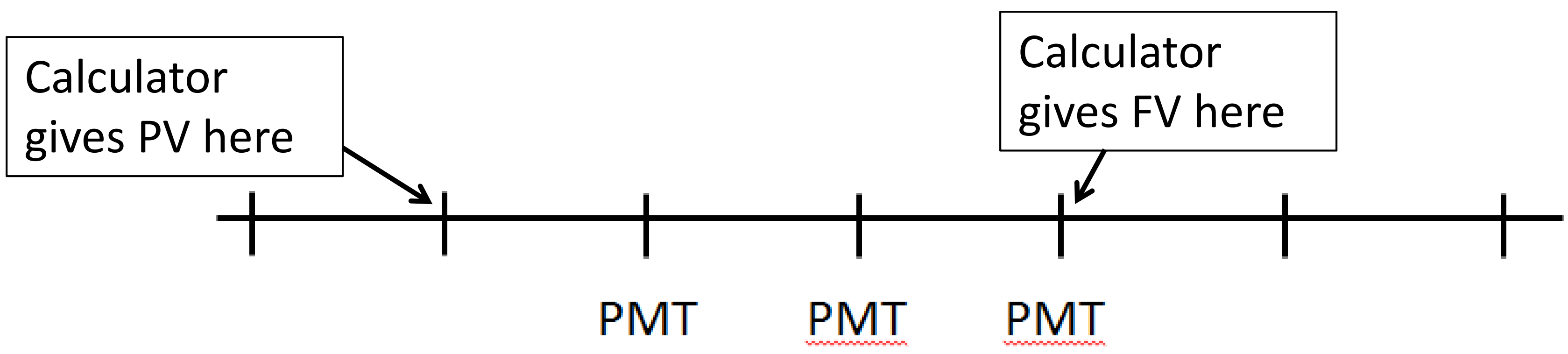
Your calculator assumes you are working with an <u>ordinary annuity</u> because this is the most common situation (e.g., you take out a loan. The first payment is not due the day you take out the loan, but instead is due one month later).

You could set your calculator to assume an annuity is due, but this is *not recommended*– having to switch back and forth is a recipe for mistakes, and, in any event, this will not accommodate all types of problems you will encounter.

Timing of Payments and PV/FV in the Financial Calculator

You should memorize:

- PV of an annuity is given one period before the first payment
- FV of an annuity is given at the time of the last payment (think of it as one second after)



Perpetuity

Let's derive the formula for the present value of a perpetuity.

A perpetuity is similar to an annuity but has an infinite number of cash flows.

The present value of cash flows occurring in the distant future is very close to zero.

- At 10% interest, the PV of $100 cash flow occurring 50 years from today is only $0.85!
- The PV of $100 cash flow occurring 100 years from today is less than one penny!

Present Value of a Perpetuity

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \frac{PMT}{(1+r)^3} + \cdots$$

Multiply both sides by (1+ *r*).

$$PV + r \times PV = PMT + \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \frac{PMT}{(1+r)^3} + \cdots$$

Substitute the first equation into the second.

$$\cancel{PV} + r \times PV = PMT + \cancel{PV}$$

$$r \times PV = PMT$$

$$\boxed{PV = \frac{PMT}{r}}$$

Present Value of a Perpetuity

Find the present value of a perpetuity of $25,000 per year if the interest rate is 8% per year.

$$PV = \frac{PMT}{r}$$

$$PV = \frac{\$25{,}000}{0.08} = \$312{,}500$$

Alternatively, treat this as an annuity in your calculator but use N = 99,999 (a large number) and solve for PV: (N=99,999, PMT = 25,000 and I = 8 and solve for PV)

Present Value of a Perpetuity

You are not expected to prove the formula, of course.

Another way to see it: Consider that the PV of a $100 perpetuity using 10% interest to value it is 100/0.10 = $1000.

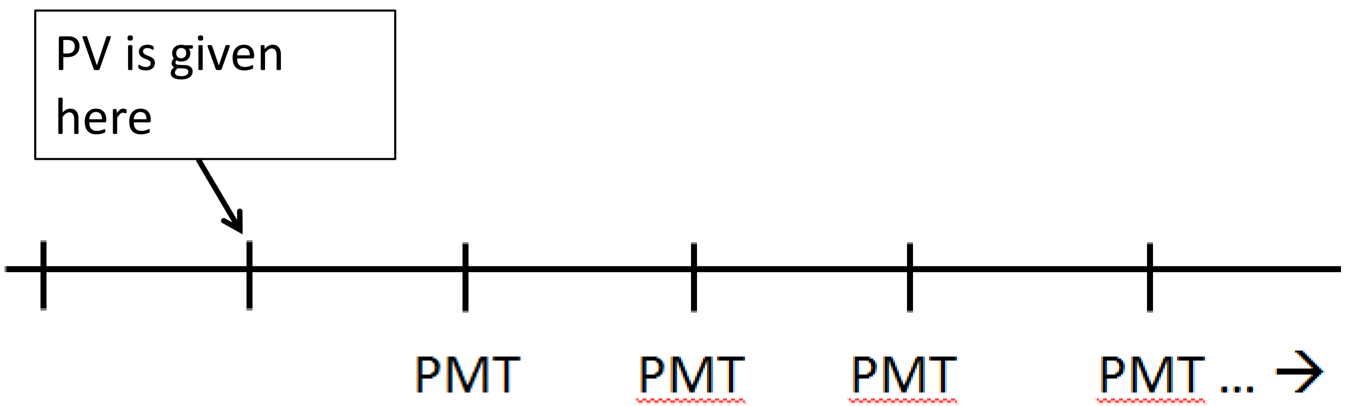
Imagine a bank account that paid 10% per year. You deposit $1000 today (which matches the PV of the perpetuity described above). In one year the balance has grown to $1000(1.10) = $1100. You withdraw $100 and the balance falls to $1000.

One year later the balance is $1100, you again withdraw $100, and the balance falls back to $1000.

An so on…you (and your heirs) could withdraw $100 annually *forever.*

Present Value of a Perpetuity

As with an annuity, the present value of a perpetuity is given <u>one period before the first payment</u>.



There is no FV with a perpetuity, because there is no point in time after its last payment is made (by definition payments continue forever).

NPV (Net Present Value)

In corporate finance, no single metric is more important or commonly used than NPV.

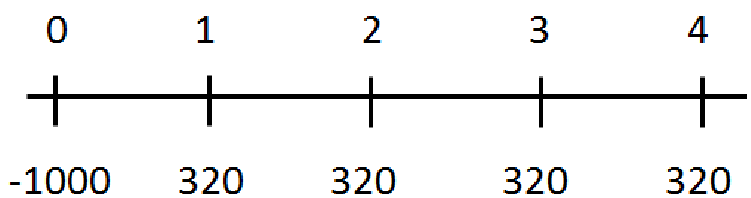
NPV measures the value created or destroyed by a decision.

- A zero NPV decision earns exactly a "fair" return in compensation for risk, expected inflation, and the opportunity cost of funds.
- A negative NPV decision destroys value, earning less than a fair rate of return.
- A positive NPV decision creates value, earning more than a fair rate of return.

NPV (Net Present Value)

NPV = PV (all benefits) – PV (all costs), assuming some discount rate to present value any future cash flow

For example: You have an opportunity to invest \$1000 today and starting in one year receive 4 annual payments of \$320. What is the NPV assuming a 10% discount rate?



Step 1: PV at t=0 of the \$320 annuity: n=4 i=10 pmt=-320 fv=0 ➔ PV= 1014.36

Step 2: Subtract PV of costs, which is \$1000 (already valued at t=0!)

NPV = \$1014.36 - \$1000.00 = \$14.36. Do it! It creates value (has positive NPV)!

- Notice the investment creates 4 x \$320 = \$1280 in benefits, yet the NPV is only \$14.36. This is due to the erosion in value caused by the discounting…TVM makes a large impact on the value of cash flows!

Algebraically:

$$NPV = -1000 + \frac{320}{(1.10)} + \frac{320}{(1.10)^2} + \frac{320}{(1.10)^3} + \frac{320}{(1.10)^4} = 14.36$$

APR: Annual Percentage Rate

The **Annual Percentage Rate (APR)** is the periodic rate times the number of periods per year. It does not take compounding into account (interest earned in one period earning interest in all future periods).

So 1% per month is an “APR of 12%, compounded monthly”

With monthly compounding, a 9% APR is 0.75% per month.

– With quarterly compounding, a 9% APR is 2.25% per quarter

Given an APR, we must know how it is compounded to know how to use it!

APR: Annual Percentage Rate

Here are a few examples:

What is the future value of $1000 in five years, at an APR of 6%, **compounded monthly**

– We have 5 x 12=60 periods & the *periodic rate* is 6%/12 = 0.50%

N = 60, I = 0.50, PV = -1000, PMT = 0 ➔ $1348.85

(Algebra: $1000\,(1.005)^{60} = 1348.85$)

What is the future value of $1000 in five years, at an APR of 6%, **compounded quarterly**

– We have 5 x 4=20 periods & the *periodic rate* is 6%/4 = 1.50%

N = 20, I = 1.50, PV = -1000, PMT = 0 ➔ $1346.86 = $1000(1.015)^{20}$

What is the future value of $1000 in five years, at an APR of 6%, **compounded annually**

– We have 5 x 1=5 periods and the *periodic rate* is 6%/1 = 6.00%

N = 5, I = 6, PV = -1000, PMT = 0 ➔ $1338.23 = $1000(1.06)^{5}$

How much does a car cost?

Maria has found a car she wants to buy. The used-car dealer says she can buy it for $298.62 per month for 48 months. If the interest rate on the loan is 9.0% APR compounded monthly, how much does the car cost? In other words, what is the present value of the loan payments?

The appropriate rate is 9%/12 = 0.75% per month.

N=48 i=9/12 PMT= -298.62 FV = 0 ➔ PV=11,999.98

Of course, they may offer a different "cash price" and Maria could choose to finance the purchase out of her savings, or a bank loan, etc.

Six Practice Problems

The next few slides will present six practice problems. Try to work out your own solution before clicking the slide to view the solution.

1. What is the present value of $2 million to be received 9 years from today, if the discount rate is 7% APR, compounded monthly?

Practice Problem 2

2. What annual interest rate, compounded, annually, is a lottery using if a winner of $2 million per year for each of the next 19 years (first payment one year from today) is offered a cash payment today of $16,729,840.18?

Remember that PV and PMT need to be inputted with opposite signs.

Practice Problem 3

3. How much do you need to save each year for 6 years at 6% per year, compounded annually, to have $25,000 at the end?

Practice Problem 4

4. What would be the monthly payments on a $30,000 10-year loan, if the interest rate is 6.0% APR, compounded monthly?

Practice Problem 5

5. Sally has 10.5 years left on her mortgage. Her payments are $1,800 per month. If her mortgage is at 7.2% APR (compounded monthly), how much does she still owe?

Practice Problem 6

6. What is the present value of $1,635 per month forever, at an APR of 6.24%, compounded monthly?

EAR = APY vs. APR

Let’s consider another way interest rates are expressed.

Recall that the APR (annual percentage rate) is the periodic rate times the number of periods in one year.

- The APR ignores the effect of compounding
- You *cannot* directly move money through time with an APR (unless it is compounded *annually,* which it almost never is).
- The APR is a *nominal* interest rate, not an “effective interest rate” as needed to move money through time

The **Effective annual Rate (EAR) or Annual Percentage Yield (APY) is** the effective rate at which money will grow in one year, if it grows at the given periodic rate.

- The EAR = APY is the “true” annual rate because it includes the effect of compounding.
- APY is common terminology in banks
- EAY (effective annual yield) is also sometimes used

1% Per Month vs. 12% Per Year

Consider an APR of 12%, compounded monthly

The EAR=APY for this is 12.6825%

- The periodic rate is 12%/12 = 1% per month, and there are 12 of these periods in the year
- N=12 I=1 PV=-100 PMT=0 FV=112.6825
- If $100 grows to $112.6825, the EAR must be 12.6825%

Faster/more efficient to use algebra: $(1.01)^{12} - 1 = 0.126825$ which, of course, is 12.6825%

- All we are doing is starting out with an implied $1 in *principal* at the start of the year, compounding it algebraically for 12 months at 1% per month, and then subtracting out the original $1 in principal

Using Algebra to Find an EAR

Financial keys are a bit of a "black box" and do not build intuition.

Algebra is intuitive in that we *explicitly* compound!

With a monthly rate of 0.75%,

- \$1 grows to \$1 x (1+ 0.0075) = \$1.0075 after 1 month
- After two months we have: \$1.0075 x (1 + 0.0075) = \$1.015056
  - More easily found by \$1 x (1.0075) x (1.0075) = $(1.0075)^2$

We simply wish to know how much we'll accumulate after a full year, which in our case is 12 periods

- Answer: we'll accumulate \$1$(1.0075)^{12}$ = \$1.093807

And now we simply subtract the original \$1 to find the *interest rate* instead of the amount of accumulated cash

Thus, EAR = APY for 0.75% per month is: $(1.0075)^{12} - 1 = 0.093807$ or 9.3807%

Simpler than using the financial calculator keys, and fewer key strokes (i.e., more efficient) as well!!

Finding a periodic rate from an APY

Please follow this example on your calculator. What is the monthly periodic rate that results in an APY of 12.682503%?

We wish to solve $0.12682503 = (1 + r_{pm})^{12} - 1$

Add 1 to both sides: $1.12682503 = (1 + r_{pm})^{12}$

Take each side to the power of (1/12): $1.12682503^{(1/12)} = (1+r_{pm})$

This results in $1.0100 = 1+r_{pm}$, & then subtracting 1 from both sides yields that $r_{pm} = 0.0100$ or 1.00%.

You need to be able to solve something like this. Most calculators have an exponent key such as y^x and also parentheses keys…the key strokes would be: 1.12682503 y^x (1 ÷ 12) – 1 =

APR and APY for an Installment Loan

Suppose you borrow $14,000 from the bank and promise to repay the loan over 4 years in equal monthly installments of $348.39 each, with the first payment to be made one month from today.

What monthly rate is the bank charging?

What is the APR?

What is the APY?

What is the EAR?

APR and APY

Calculate the APR.

N=48   PV=14,000   PMT= -348.39   FV=0   i=0.75

The monthly rate is 0.75% (or 0.0075)

APR = 12(0.75) = 9% per year

APR and APY

To calculate the APY, compound the periodic rate for the number of periods in one year.

In this case, 12 months to make one year:

$$APY = (1 + 0.0075)^{12} - 1 =$$

$$0.093807 \text{ (or } 9.3807\%\text{)}$$

Recall the EAR is just APY by another name…and this is also 0.093807 (or 9.3807%)

Using EAR for Calculations

Let's revisit our earlier examples but use EAR for the calculations (note we'll arrive at the same answers!)

What is the future value of $1000 in five years, at an APR of 6%, **compounded monthly**

- Periodic rate = 6%/12 = 0.50% per month, so EAR = $(1.005)^{12}$ -1 = 0.0616778
  We can use this rate with N=5 annual periods, algebraically: $1000(1.0616778)^5$

N = 5, I = 6.16778, PV = -1000, PMT = 0 ➔ $1348.85

What is the future value of $1000 in five years, at an APR of 6%, **compounded quarterly**

- Periodic rate = 6%/4 = 1.50% per quarter, so EAR = $(1.015)^4$ -1 = 0.0613636
  We can use this rate with N=5 annual periods, algebraically: $1000(1.0613636)^5$

N = 5, I = 6.13636, PV = -1000, PMT = 0 ➔ $1346.86

What is the future value of $1000 in five years, at an APR of 6%, **compounded annually**

- Periodic rate = 6%/1 = 6.00% per quarter, so EAR = $(1.06)^1$ -1 = 0.06
  As we had already seen, with annual compounding we have a special case:
  EAR = APR! Algebraically we have $1000(1.06)^5$

N = 5, I = 6, PV = -1000, PMT = 0 ➔ $1338.23

Effect of Compounding Frequency on Future Value

Find the future value at the end of one year if the present value is $1,000 and the APR is 16%. Use the following compounding frequencies:

- Annual Compounding
- Semiannual Compounding
- Quarterly Compounding
- Monthly Compounding
- Daily Compounding

Effect of Compounding Frequency on Future Value

The general formula to calculate an APY (= EAR) is:

$$APY = (1 + r_p)^k - 1$$

Where:

k = number of compounding periods in one year, and

r_p = APR / k = the "periodic" interest rate (i.e., the interest rate per compounding period)

Annual Compounding

This is the annual compounding formula.

With annual compounding, k = 1, and the periodic rate is 16%.

$$FV_1 = 1{,}000(1.16)^1 = \$1{,}160.00$$

This is the only case where the APR is a "true" rate:

EAR = APY = APR = 16%

Semi-Annual Compounding

With k = 2, the periodic rate APR/2 = 8%

$FV_2 = 1{,}000(1.08)^2 = \$1{,}166.40$

EAR = APY = $(1.08)^2 - 1 = 0.166400 = 16.64\%$

Monthly Compounding

With k = 12, the periodic rate is APR/12 = 1.3333%

$$FV_{12} = 1{,}000(1.013333)^{12} = \$1{,}172.27$$

$$EAR = APY = (1.013333)^{12} - 1 = 0.172271 = 17.2271\%$$

Effect of Compounding Frequency on Future Value

Compounding	k	FV	EAR=APY
Annual	1	$1,160.00	16.0000%
Semi-Annual	2	$1,166.40	16.6400%
Quarterly	4	$1,169.86	16.9859%
Monthly	12	$1,172.27	17.2271%
Daily	365	$1,173.47	17.3470%

- For all of these: APR = 16%

Does Frequent Compounding Help or Hurt?

Notice that if you are *saving/investing money,* then given an APR, more frequent compounding <u>helps you</u> because you are investing at a higher effective rate or interest.

Of course, if you are *borrowing* money, more frequent compounding hurts you. Believe it or not, I once had a branch loan officer at a well-known, national bank express the opposite to me--being an informed consumer certainly can pay off.

As a side note, here is some practical advice: Be aware that in order to charge higher interest, some financial institutions now compound *daily* even on loans with *monthly payments.* This allows them to quote a competitive APR on a loan with monthly payments, but actually charge a higher rate of interest than a competitor quoting the same APR but compounding it monthly. This is a bit sneaky, but I'm seeing more and more lately! When comparing loans you are always best off asking for the <u>APY</u>.

Practice Problem

What is the APY (or EAR) for a loan rate of 8.2% APR, with monthly compounding and monthly payments?

Monthly rate ("monthly periodic rate") = 0.082/12

$[1 + (0.082/12)\ ]^{12} – 1 = 0.085153 = 8.5153\%$

or

(1): $r_{pm} = 0.082/12=0.0068333$ per month, and then

(2): $(1.0068333)^{12} -1 = 0.085153 = 8.5153\%$

Deferred Annuity

The first cash flow in a deferred annuity is expected to occur other than at $t = 1$.

The PV of the deferred annuity can be computed as:

- The present value of the FV of the annuity
- The present value of the PV of the annuity, or
- The difference in the PVs of two annuities

Deferred Annuity

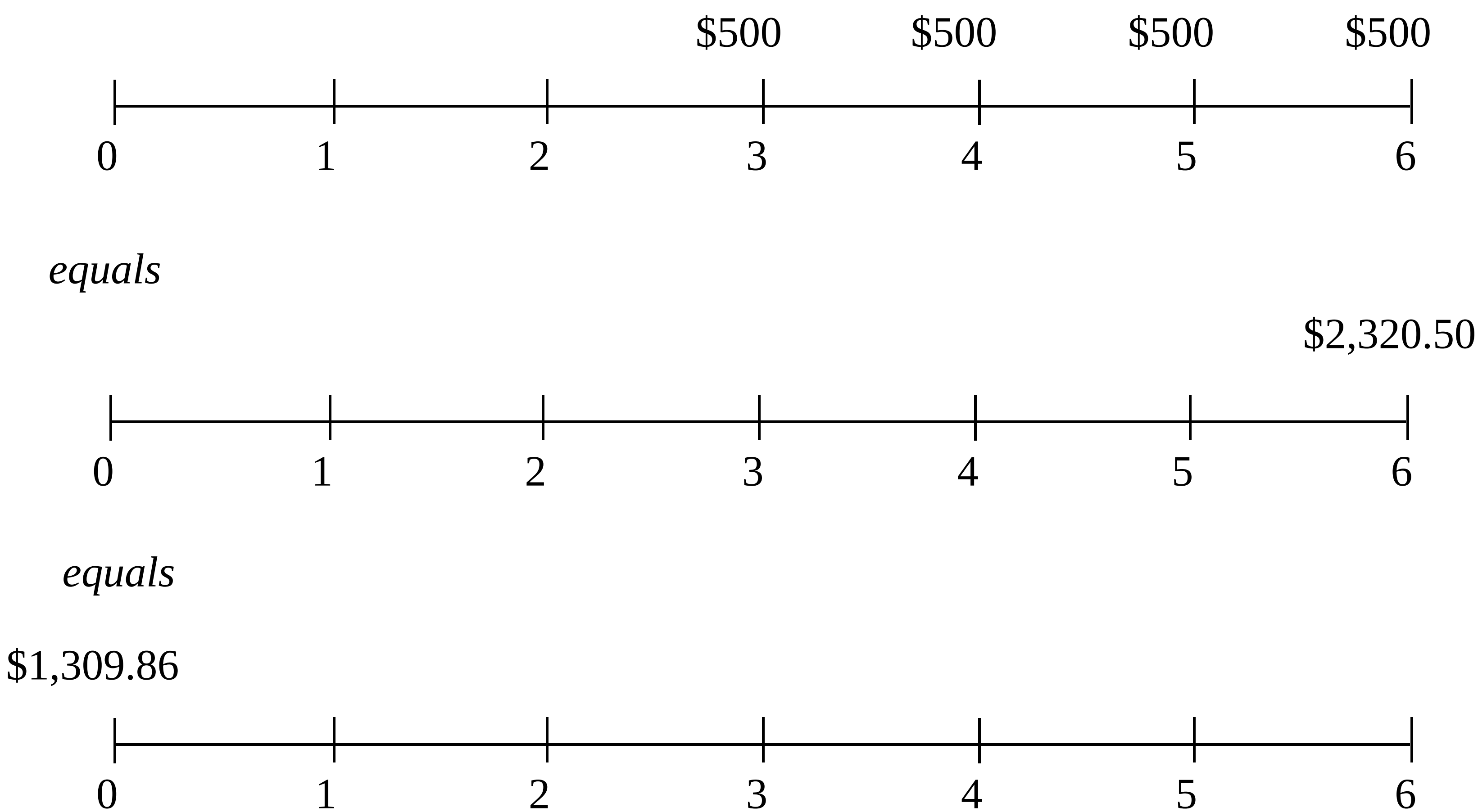
A furniture store is offering a “deal” for some furniture you want to buy. Pay nothing for 3 years, then at the start of the fourth year pay $500 per year for 4 years. If your opportunity interest rate is 10% per year, what would the furniture cost? In other words, what is the annuity’s present value?

Let’s find the PV of the FV…that is, first find the FV, then take the PV of that FV

N=4 i=10 PV=0 PMT=500 FV=-2,320.50

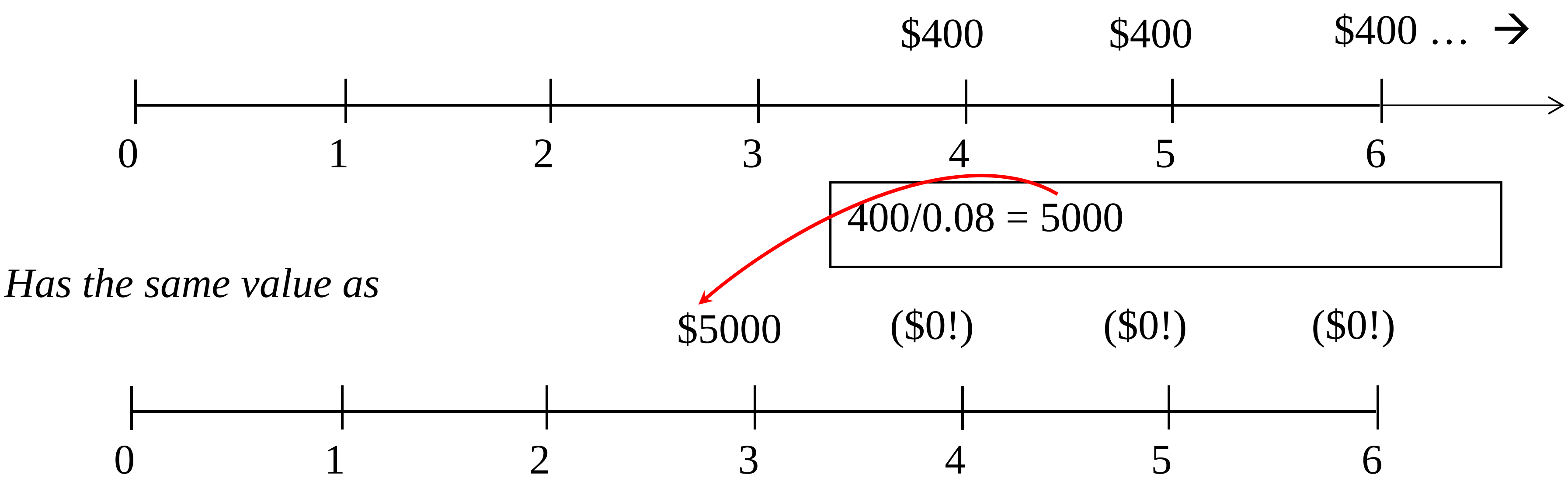
N=6 i=10 PMT=0 FV=-2,320.50 PV=1,309.86

Deferred Annuity



PV of Deferred Perpetuity

Using r = 8% per period, what is the PV of a perpetuity of $400 with the first payment beginning in 4 years?



Now we find the value at t = 0:

$$PV = \frac{5000}{(1.08)^3} = \$3{,}969.16$$

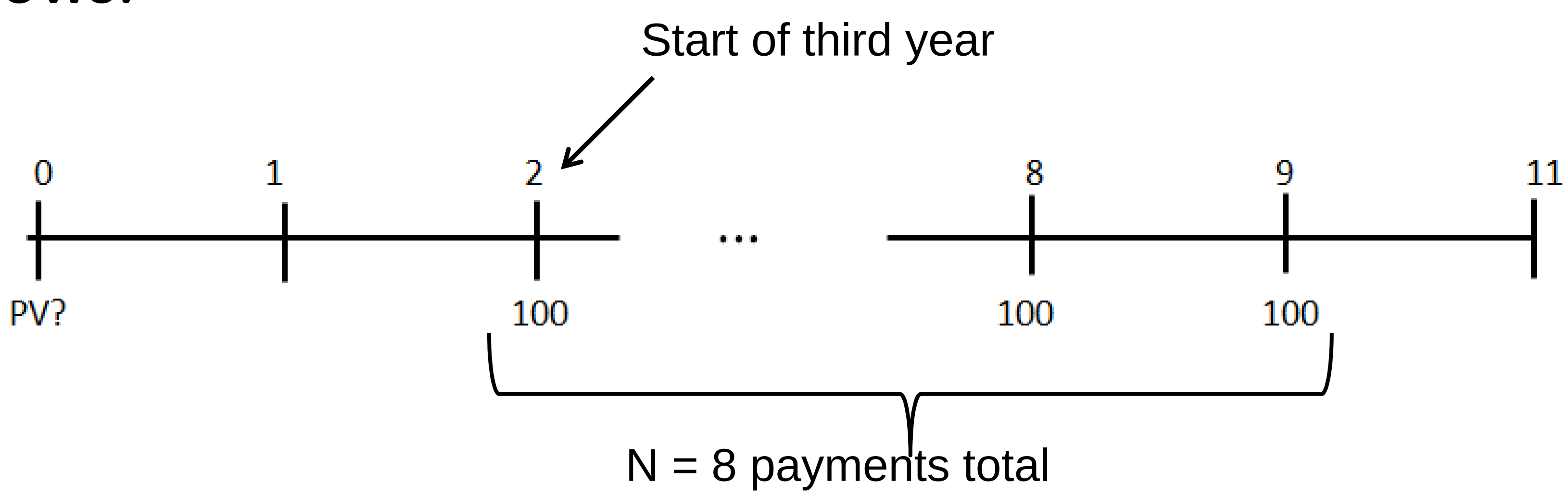
Deferred Annuity Practice Problem

What is the present value of an 8-payment annual annuity of $100 if the first payment begins at the beginning of the third year and the annual discount rate is 12%?

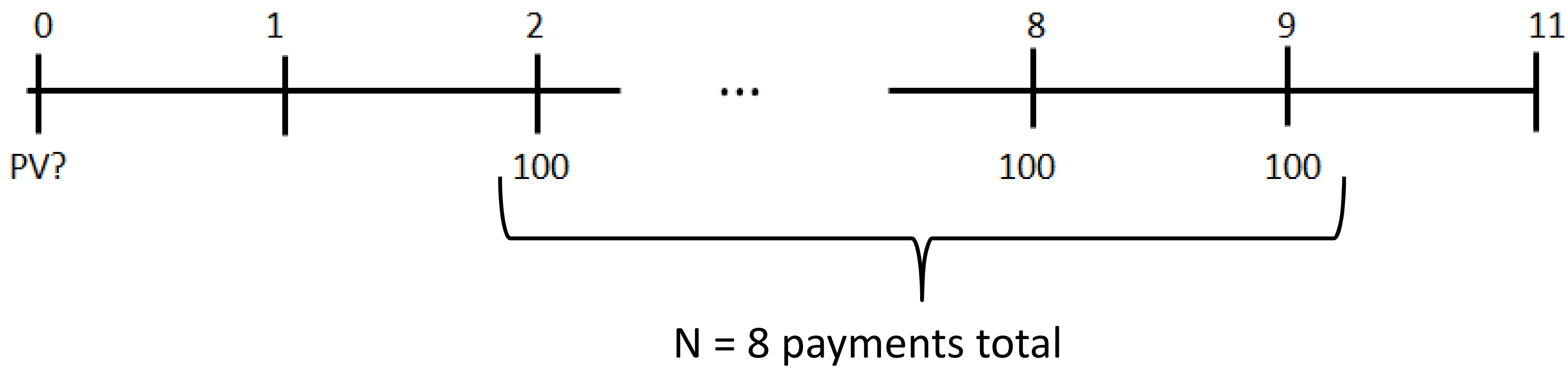
Deferred Annuity Practice Problem

What is the present value of an 8-payment annual annuity of $100 if the first payment begins at the beginning of the third year and the annual discount rate is 12%?

First, always be very careful with the timing of the cash flows.



Deferred Annuity Practice Problem



N = 8, I = 12, PMT = -100, FV = 0

➔PV = 496.76398 valued as of t = 1 (one period before the first payment

➔Thus, the PV at t = 0:

PV = 496.76398 / 1.12 = $443.54

Partial Time Periods

What is the future value 3.5 years from today of $5,000 at an APY of 12%?

N=3.5 i=12 PV=5,000 PMT=0 FV=-7,434.18

(Final answer is "$7,434.18")

Algebra: $5000(1.12)^{3.5} = 7,434.18$

Irregular Starting Time

Find the present value of an annual annuity where the first cash flow will be 7 months from today. There are 6 annual cash flows in all, each in the amount of $1,000. The APY is 10% per year.

- First, find the future value of a 6-year annuity at the end of its life.
- Then, find the present value of this future value.

Irregular Starting Time

Value at the end of the annuity = 7,715.61:

N=6   i=10   PV=0   PMT=1,000   FV=-7,715.61

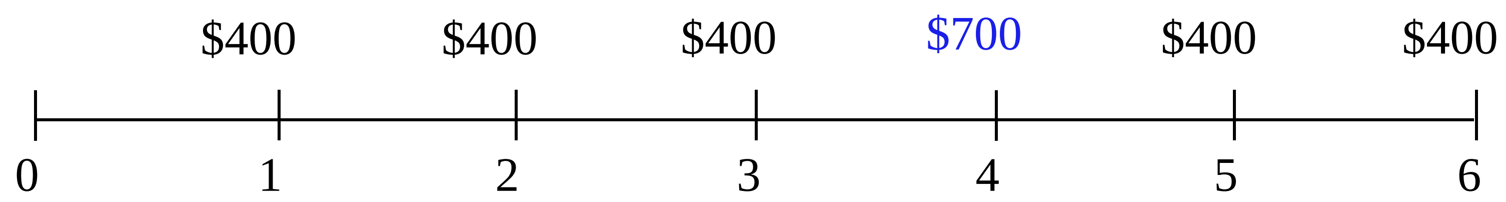
The 7,715.61 is valued as of 5 years and 7 months from now (i.e., at the time of the last payment!), so that is 5 + 7/12 = 5.5833 years. Therefore the value today = **$4,531.70**:

N=5.5833   i=10   PMT=0   FV=-7,715.61   PV=4,531.70

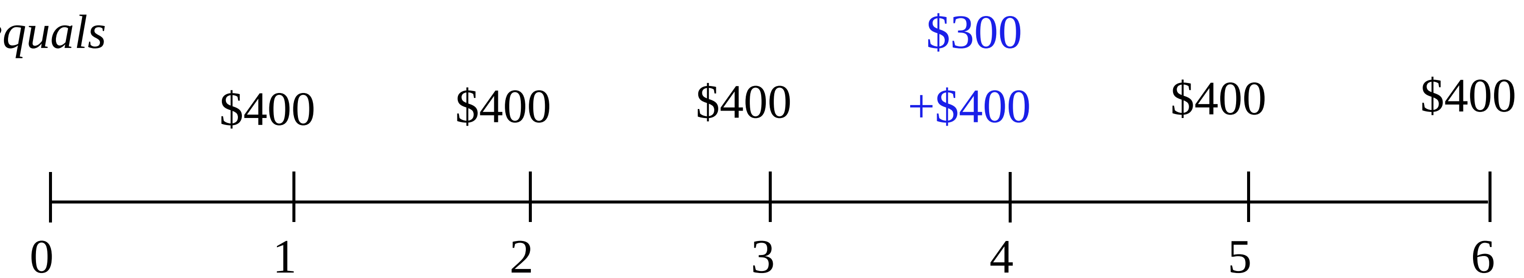
Algebra: $7{,}715.61 / (1.10)^{5.5833} = 4{,}531.70$

Mixed Patterns

How can we handle a mixed pattern? Creativity helps!



equals



Suppose i = 8%

Step 1 (the annuity) n=6, i =8, pmt=-400, fv=0 → pv= 1849.152

Step 2: (add in the pv of 300): 1849.152 + [$300/(1.08)^4$] = $2069.66

(Notice that we carried out the intermediate step an extra decimal place to preserve accuracy to the penny!)

Application 1: Loan Amortization

First let's find the payment on an installment loan.

Rob borrows $10,000 to be repaid in four equal annual installments, beginning one year from today. What is Rob's annual payment on this loan if the bank charges him 14% interest per year?

N=4   i=14   PV=10,000   FV=0   PMT= -3,432.05

Rob must pay $3,432.05 per year.

Loan Amortization

An *amortization schedule* shows how a loan is paid off over time.

It breaks down each payment into the interest component and the principal component.

Let's illustrate this using Rob's 4-year $10,000 loan which calls for annual payments of $3,432.05. Recall that the interest rate on this loan is 14% per year.

Loan Amortization Schedule

Period:	1	
Principal @ Start of Period	$10,000.00	
Interest for Period	$1,400.00	$=10,000 \times 0.14$
Balance	$11,400.00	
Payment	$3,432.05	
Principal @ End of Period	$7,967.95	
Principal Repaid	$2,032.05	$=\$3,432.05 - \$1,400$

Loan Amortization Schedule

Period:	1	**2**	
Principal @ Start of Period	$10,000.00	**$7,967.95**	
Interest for Period	$1,400.00	**$1,115.51**	**=7,967.95 × 0.14**
Balance	$11,400.00	**$9,083.47**	
Payment	$3,432.05	**$3,432.05**	
Principal @ End of Period	$7,967.95	**$5,651.41**	
Principal Repaid	$2,032.05	**$2,316.54**	**= $3,432.05 − $1,115.51**

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Loan Amortization Schedule

Period:	1	**2**	3	**4**
Principal @ Start of Period	$10,000.00	**$7,967.95**	$5,651.41	**$3,010.56**
Interest for Period	$1,400.00	**$1,115.51**	$791.20	**$421.49**
Balance	$11,400.00	**$9,083.46**	$6,442.61	**$3,432.05**
Payment	$3,432.05	**$3,432.05**	$3,432.05	**$3,432.05**
Principal @ End of Period	$7,967.95	**$5,651.41**	$3,010.56	**$0.00**
Principal Repaid	$2,032.05	**$2,316.54**	$2,640.85	**$3,010.56**

Finding a Loan’s Interest Rate

Erin borrows $10,000 from her bank, and agrees to repay the loan in 60 equal monthly installments of $220.63 each. The first payment will be made one month from today. What is the monthly interest rate and APR the bank is charging?

Finding a Loan's Interest Rate

N=60 PV=10,000   PMT= -220.63   FV=0   i=0.9700

So the bank is charging 0.97% per month. (This is the "monthly periodic rate")

One way to "annualize" this is to multiply by 12

$$12(0.9700) = 11.64\%$$

This means the bank is charging an "APR of 11.64%, compounded monthly" - this is a "nominal" conversion to an annualized rate. The APY (or EAR) is $(1.0097)^{12}-1 = 12.2815\%$ (this is the "effective rate" conversion).

Application 2: Special-Financing Offers

"Special Financing" offers are often used as part of a sales promotion.

- They lower the price—but leave it for you to figure out how much is has been lowered!

They take various forms, but all can be analyzed using the principles of time value of money.

Special Financing Offers

Miller Motors is offering the following alternatives on a Dodge Intrepid, which has a stated price of $24,000.

$1,500 "cash back," or

"Special" 36-month 3.5% APR financing (with monthly compounding)?

If you can borrow from M&T Bank at 9% APR, compounded monthly, which alternative is better?

Special Financing Offers

The general procedure is to measure the opportunity cost of the special financing, and compare this cost to the net “cash-back” price. That is, compare the PVs.

A more straight-forward comparison method is to compare the payments. But you MUST use the same number of payments for a loan for the “cash-back” price as you do for the special financing…if the bank loan and special financing would have a different number of payments, this method is inappropriate.

Special Financing Offers

First, compute the monthly payments for the special financing plan. 3.50% APR implies a monthly rate of 3.50%/12 per month.

N=36 i=3.5/12 PV=24,000 FV=0 PMT=-703.25

(The final answer would be the payment = $703.25)

Special Financing Offers

Next, find the monthly payments if you borrow the 'cash-back' price ($24,000 - $1,500 = $22,500) from the bank at an APR of 9% -- for the same 36 months.

The 9% APR bank loan implies a monthly interest rate is 9%/12, or 0.75% per month.

Special Financing Offers

So, the loan payments are:

N=36   i=0. 75   PV=22,500   FV=0   PMT=-715.49

So, your monthly payment to the bank = $715.49

Special Financing Offers

- The monthly payments under the cash back plan would be $715.49.
- Under the special financing plan, the monthly payments are $703.25.
- Thus, you save $12.24 per month (for 36 months) under the special financing plan.

Special Financing Offers

Alternatively, you can find the present value of the special financing payments at the bank's lending rate.

The present value is:

N=36 i=0.75 PMT=703.25 FV=0 PV=-22,114.96

So, compare this $22,114.96 to cash back price of $22,500

Special Financing Offers

So, which price would you prefer?

The difference of \$385.04 between the two amounts is the **Net Present Value (NPV)** of the special financing plan compared (instead of the cash back plan). That is, the \$385.04 is the value of savings (in today's dollars) you gain by using the special financing plan.

Note that the PV of the \$12.24 monthly savings at the bank's rate of 0.75% per month is exactly the NPV of the special financing plan! (= \$385.04)

Application 3: Buy or Lease?

You can buy a new Honda for \$20,308.41 plus 7% sales tax, which is \$21,730 with tax.

Your cost of borrowing is 7% APR, compounded monthly, before tax, and 5.25% after-tax. (25% income tax rate.)

– E.g., borrowing on your home equity line

You can have a 36-mo. lease for \$900 at signing, then \$329 per mo. + 7% sales tax, \$352.03 per mo. The lease has a 56% residual value, \$11,372.71, which is \$12,168.80 with tax included.

Scenario 1: Buy the car, sell it after 3 years for \$11,250, versus lease for 3 years and give back to dealership when the lease ends. Which is better?

Buy or Lease?

Monthly periodic rate is 5.25/12 = 0.4375% per mo. (your after-tax monthly cost of capital)

Scenario 1: PV(11,250) = $9,613.92 = PV of future sale [N=36 i=0.4375 PMT=0 FV=11,250 PV=-9,613.92]

21,730 – 9,613.92 = total cost to buy = $12,116.08

Vs. cost to lease = 11,701.85 + 900 = $12,601.85

N=36 i=0.4375 PMT= -352.03 FV=0 PV=11,701.85

So buying and reselling later is cheaper than leasing in Scenario 1.

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Buy or Lease?

Scenario 2: Buy the car and sell the car after 10 years for $1,500, versus lease the car, pay residual of 12,168.80 to keep car when lease expires, then sell after 10 years for $1,500. Which is better?

Note the sale price after 10 years is the same either way and can be ignored (because it's not *incremental* to which choice you make!).

Cost to lease is the PV(payments), including the residual.

N=36 i=0.4375 PMT= 352.03 FV= 12,168.80 PV= 22,100.95

So the cost to lease = 22,100.95 + 900 = $23,000.95

Vs. cost to buy = $21,730

So, buying is also cheaper in Scenario 2.

Ethical Issues in Finance

Corporate fraud was a large problem leading up to the Great Depression…firms selling shares in their companies that promised to develop what turned out to be swampland in Florida, for example. State laws at the time were not sufficiently effective in assuring corporate finance disclosure was accurate.

The Securities Acts of 1933 and 1934 were a response. in part a response to the failure or These Acts hold the company, the investment bank, and other parties liable for disclosing false information in its regulated financial disclosures. These ACTS, however, do not completely mitigate ethical problems in corporate finance.

Financial Regulation as a response

Securities Act of 1933

- Also known as “Trust in securities” law
- Requires that investors receive financial statements and other important information regarding securities offered for public sale, and prohibits deceit and misrepresentations

Securities Exchange Act of 1934

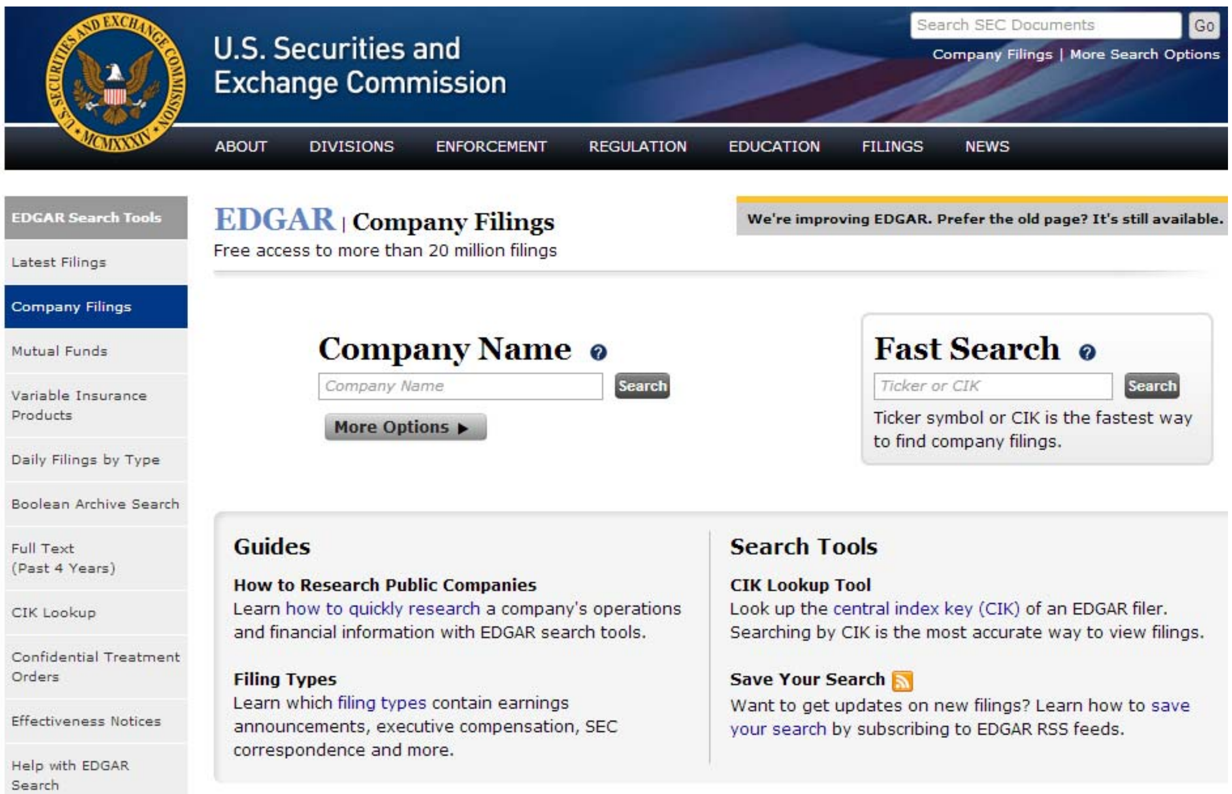
- Established the SEC, giving it broad regulatory authority over the securities industry
- Includes authority to register and regulate brokerage firms, transfer agents, etc. and self regulatory organizations such as the New York Stock Exchange, the NASDAQ stock market and the **Financial Industry Regulatory Authority (FINRA)**

Reference: U.S. Securities and Exchange Commission. (2014). Rules and regulations for the securities and exchange commission and major securities laws. Retrieved from http://www.sec.gov/about/laws/secrulesregs.htm

More on Financial Regulation

The SEC's online EDGAR site provides open access to financial statements

– "Electronic Data Gathering And Retrieval"
– Can search for a wide variety of filings from both firms and mutual funds at https://www.sec.gov/edgar/searchedgar/companysearch.html



These two SEC ACTS, of course, did not completely mitigate ethical problems in corporate finance.

Fraud in financial reporting

- Enron, MCI WorldCom, etc. (GOOGLE THEM!)
  - Enron's accounting fraud led to the demise of Arthur Anderson.
  - WorldCom has a small internal audit team that worked secretly to uncover $3.8b worth of fraud in the company's financial statements. The company filed for bankruptcy protection in 2002, and negotiated a $2.25b civil penalty with the SEC that was judicially approved in July 2003.
  - These two scandals were the main ones providing the impetus for SOX

Corporate earnings management—a grey area

- This is a strategy to manipulate reported earnings, usually by "smoothing income" through discretionary accounting for accruals and related **to** other related "cookie jar" techniques
- This is legal as long as it is not abusive, or a "material and intentional misrepresentation of results" -- which leaves a lot of room for interpretation!

Misappropriation of corporate funds by executives

- This is an abusive consumption of "perquisites" (google Tyco scandal or Dennis Kozlowksi for a great example).
- "Empire-building" motivation for acquisitions

FASB = Financial Accounting Standards Board

- Private organization that establishes accounting standards in the United States
- Establishes GAAP (*Generally Accepted Accounting Principles*)
- SEC designates FASB as responsible for establishing accounting standards for public companies in the U.S.

–Of course, U.S. firms are also transitioning to IFRS (International Financial Reporting Standards)

•In the wake of the Enron and Worldcom scandals (as well as Tyco, Adelphia, and others), the United States Congress established the Sarbanes-Oxley Act of 2002

- "SOX" establishes additional corporate board responsibilities, and created the **Public Company Accounting Oversight Board (PCAOB)** to oversee and regulate accounting firms in their auditing role for public companies
  - The Enron Scandal had led to the demise of Author Anderson

•There are 11 sections in SOX some of which improve financial reporting and fraud prevention

2010 brought the enactment of Dodd-Frank, which among other things,

- Exempts firms with market capitalizations < $75m from Section 404 of SOX, an internal financial control requirement that is considered the costliest (and most controversial) section
- Also provides stronger financial incentives for "whistle blowers" who discover and report violations of securities laws

• Critics of SOX and Dodd-Frank argue that

- SOX is too burdensome and complex, is a drag on the economy, and has reduced the country's competitive position with respect to financial service providers in other markets (e.g., some believe it has reduced the number of foreign firms listing shares in the United States stock exchanges).
  - One "finance" criticism is that although improving regulation seemed needed, SOX went too far and was to some extent an overreaction to the failure of some investors to be properly diversified
  - At the time it was created, a common motivation for SOX was the investor wealth loss associated with a relative handful of well-publicized corporate scandals.
- Dodd-Frank has also been criticized as going to far and there are calls to reform it

Spillover Effects of Corporate Fraud

Corporate fraud can not only result in regulation that some believe can overreach and provide a drag on the economy, but it can also reduce stock market participation.

- Many households avoid the stock market, which the evidence suggests is not wealth-maximizing behavior over the long run.
  - This can increase the demand for government services during retirement, for example.
- Recent research shows stock market participation is affected by a lack of financial education, fear of volatility, etc.
- A working paper by Mariassunta Giannetti and Tracy Wang shows stock market participation is also adversely affected by an awareness to corporate fraud!
  - http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2331588

Of course, ethical issues also affect the investments industry

Professional money management faces a number of ethical issues, largely centered around either

- Issues of trust, or
- Fair treatment of small, unsophisticated investors versus larger investors that provide a greater income source for the financial provider

Ponzi Schemes and Ethics

Ponzi schemes are obvious examples of ethical issues related to professional money management.

What is a Ponzi scheme?

- Pays earlier investors above-normal returns by using the deposits from new investors
- Preys on investors' lack of financial education, and describes strategies in vague, sophisticated-sounding terms
- Often builds a reputation in which it is very prestigious for investors to invest their money with the particular money management firm.

The term *Ponzi scheme* was named after a scam promising a 50% profit within 45 days or 100 percent return within 90 days by Charles Ponzi (Boston, 1920s)

- This scheme was said to exploit arbitrage using discounted postal reply coupons from other countries and redeeming them for face value in the U.S.

Ethical Issues with Financial Advisory Services

This issue relates to how financial advisors and similar investment professionals are compensated and the incentives created as a result.

- Two basic models:
  - Fee-based: most common is to charge a percent of assets under management -- $1m portfolio, based on "90 basis points per year" for example: 0.009 x $1,000,000 = $9,000 per year
    - Notice that the advisor will be paid more if the assets under management grow due to investment performance. This helps to align incentives properly.
  - Commission-based: the advisor is paid (at least in part) by other financial institutions
    - E.g., the mutual fund family pays a commission to the financial advisor when the client invests in one of the fund family's mutual funds.

Commission-Based Models and Ethics

- The commission-based model has increasingly been criticized as providing perverse incentives—i.e., incentives that work against protecting the client's best interest.
  - Do you as an investor want your financial advisor to only recommend funds in a certain mutual fund family because he or she has a more lucrative commission relationship with that fund family?
  - Or, maybe the financial advisor works for a financial institution that, itself, manages various mutual funds and other investment products. Is it surprising that the financial advisor would more often recommend products managed by his or her employer?
- A key legal threshold is whether the financial advisor is a *"fiduciary."*
  - If financial advisors sign statements that they ARE fiduciaries, then legally they have pledged that they will put their clients' best interests over their own interests. Dept. of Labor has considered requiring this.
  - Nonetheless, even "fiduciaries" can succumb to the conflicts of interest created by a commission-based model, and the industry claims requiring a fiduciary standard will make it unprofitable to help smaller clients

Fee-Based Model and Ethics

– One can argue that even the fee-based model has its shortcomings.
  - If you are a financial advisor, there can be "political" pressure to recommend your firm's investment products.

  After all, investment products charge fees, so your firm will benefit. Your firm may award bonuses, promotions, etc. based on your sale of these products, thus, potentially affecting how "valuable" you are overall to the firm.

– Consider two clients: one has $300,000 under investment, the other has $5m under investment. Suppose you provide the same investment recommendations, same level of service, etc.
  - The ethical question here is whether the higher net worth client should really pay five times as much for the same exact service and investment performance!
  - Some firms begin to reduce the fee charged as the assets under management increases.
  - E.g., 120 basis points up to $500k, then 100 basis points for additional assets up until a total of $1m, then 80 basis points thereafter

Conflicts of Interest

Conflicts of interest also extend to other financial services.

- E.g., insurance industry
  - Insurance agents may offer investment products and be compensated very well for doing so.
  - Also, life insurance agents have an incentive to recommend insurance products that have an "investment" component to them—i.e., products that build "cash value" over time.
    - The life insurance agents argue that the cash value that builds up will eventually pay for the annual insurance premium. (Let's think—an alternative way to handle this is to separately invest on your own to eventually handle the premiums!)
    - Often, 100% of the first year's premium is paid to the agent as a commission in such products, and implicit fees can be very high (but difficult for the client to actually know).
  - Many financial advisors with no ties to an insurance policy will simply recommend simple "term" policies and suggest that clients keep insurance and investment separate (a lower cost approach if done properly).

Ethical Issues with Managed Investment Companies

The "market timing" scandal that came to light in 2003 is an example of an ethical shortcoming in the mutual fund industry.

- It was discovered that the mutual fund industry had allowed sophisticated fund investors to exploit stale NAVs, particularly in funds holding global assets.
- To illustrate the strategy some sophisticated investors used, consider a US fund holding a foreign country's stocks (and suppose the average price of the stocks owned by the fund = $100.)
- On Wednesday, the overseas stock market closes at 4 pm local time (3 am US time).
- At midnight local time (11 am US time), GOOD NEWS is observed that is expected to positively affect the foreign country's stocks once the foreign market reopens.
  - E.g., perhaps the US market is having a strong day (a contagion effect could thus positively affect the foreign market) or there is good worldwide macroeconomic news.
  - The US-based investor believes the "true" average price of fund holdings should now be $110.
- At 4 pm US time, the fund calculates a NAV per share using the **stale $100 average stock price** (based on latest available prices in the foreign market, which has not yet reopened).
- The US investor buys into fund at the **Wednesday** 4 pm US NAV.
- The foreign market then reopens, and subsequently closes at the average weighted price of $110.
- By **Thursday** 4 pm, the NAV is significantly adjusted upward (reflecting the new, higher overseas closing prices)
- The US investor redeems (sells) fund shares, closing out at a substantial 1-day gain.

Ethical Issues with Managed Investment Companies

The profitability of this strategy was documented in academic studies, and was realized by hedge funds and other sophisticated investors

WHO SUFFERS?

- Answer: Long-term investors who trade infrequently . They tend to be smaller, less sophisticated investors. As a result, their wealth is diluted

Market timing <u>was not illegal by regulation</u>, however

- The prospectus of some funds stated that the fund would not allow investors to engage in this sort of activity.
- Ethical question: How do you feel about allowing sophisticated investors to profit by taking advantage of less sophisticated investors?
- Are *ethical* and *legal* the same thing?

Ethical Issues with Managed Investment Companies

Another scandal:

"Late trading"—funds allowed favored investors to submit orders AFTER 4 pm but still obtain that day's NAV.

- Unlike market timing, this was explicitly illegal.
- Eliot Spitzer, then NY Attorney General, issued a complaint against Canary Capital Partners charging that they had "late traded" in collusion with Nations Funds (of Bank of America).
- SEC launched its own investigation.
- It also uncovered "front running."
  - Some funds would alert favored clients they were going to make a large trade that may move the price of a stock. Favored clients would then trade in advance.
- Fines and settlements were issued.
  - E.g., Bear Sterns paid $250 million. In total, there were fines of $1.4 billion!

Scandals and the SEC

Response by the SEC (Securities & Exchange Commission) to these scandals:

- Proposed rule changes aimed at improving the governance of funds and protecting unsophisticated investors
- Proposed procedures to guard against late trading must be in place
- Funds *must* combat market timing
  - Allowed (not required) to charge up to 2% redemption fee for short-term redemptions (investor selling within 5 days of purchase)
  - Fund boards must take steps to protect long-term investors against market timers, and must disclose those steps
- Funds must have compliance policies and procedures
- Chief compliance officer is now required. The officer must report to the board and help fund interact with the SEC on any compliance issues that may arise.

Not all proposals have been adopted.

- E.g., later, SEC proposed 75% of fund directors must be independent and that the “chair” of the board be an independent director, but this has not been implemented