Announcements

- If you missed class on Tuesday, please fill out an index card with your name, where you're from and something unique about yourself

- Don't worry if you don't have a team yet. We will form teams (of 3!) in class at a later date.

Market News

MARKETS | MONEYBEAT

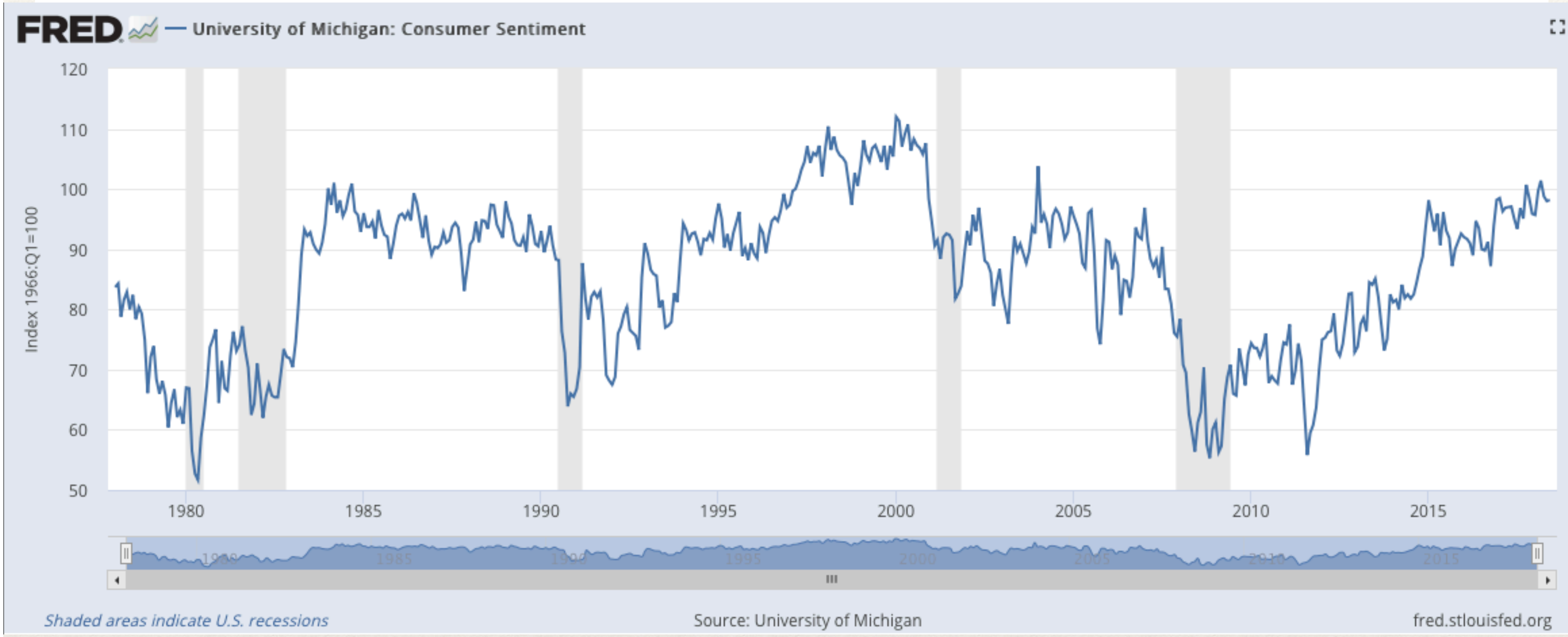
Strong Consumption Is Breathing New Life Into Retail Stocks

U.S. retailers haven't neutralized Amazon, but consumer spending is reinvigorating their stock prices all the same

WSJ

- Target Corp. 's stock jumped 3.2% on Wednesday to its first record high since 2015, after the company reported that comparable-store sales rose at the fastest pace in more than a decade.
- Target up 32% this year
- Macy's up 49%
- Kohl's up 46%

Market News



FRED
University of Michigan: Consumer Sentiment
120
110
100
90
80
70
60
50
Index 1966:Q1=100
1980
1985
1990
1995
2000
2005
2010
2015
Shaded areas indicate U.S. recessions
Source: University of Michigan
fred.stlouisfed.org

Time Value of Money

Time Value of Money

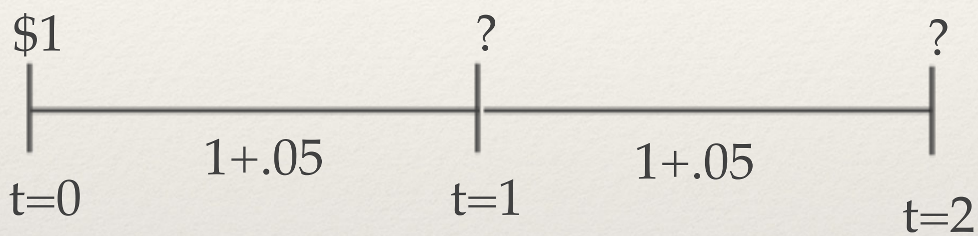
- The difference in value between money today and money in the future
  - Typically, $1 today is better than $1 tomorrow
  - Present vs. future values

Why do we need to study?

- Critical concept in finance
- We’ll be finding the “true” or “fundamental” value of a security
    - Equals the present value of a security’s future cash flows

Future Value (Compounding)

- Convert cash flows into their future value by **compounding** the cash flows by the interest rate



- Example: If we invest $1 today and earn interest at a rate of 5%, what will be the value of our investment in one year?
    - FV= $1 x (1.05) = $1.05

- What will be the value in two years?
    - FV= $1 x (1.05) x (1.05) = $1.1025

FV Example

- What's the value in 5 years of $154.43 invested today, r=10%?

$$FV = \$154.43 * (1.1)^5 = \$248.71$$

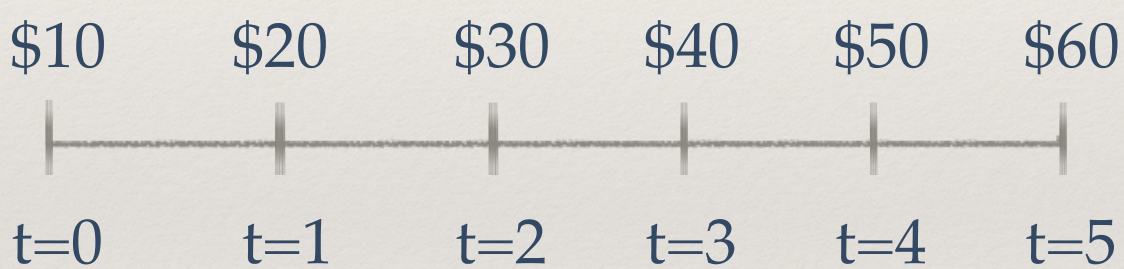
Future Value (Compounding)

- Future Value Equation:
- Where: $$FV_T = \sum_{t=0}^{T} CF_t \times (1+r)^{T-t}$$

FV$_T$ is the future value at time T
CF$_t$ is the cash flow at time t
r is the interest rate

FV Example

- What is the future value of this stream of cash flows in 5 years? r=10%.



$$FV = \$10 * 1.1^5 + \$20 * 1.1^4 + \$30 * 1.1^3 + \$40 * 1.1^2 + \$50 * 1.1 + \$60 * 1.1^0$$
$$= \$16.11 + \$29.28 + \$39.93 + \$48.40 + \$55.00 + \$60.00$$
$$= \$248.72$$

Problem 1 Solution

Present Value (Discounting)

- Convert future cash flows into their present value by **discounting** cash flows by the discount rate
  - Required return
  - Expected return
  - Opportunity cost of capital
  - r

$$PV = \sum_{t=0}^{\infty} \frac{E[CF_t]}{(1+r)^t}$$

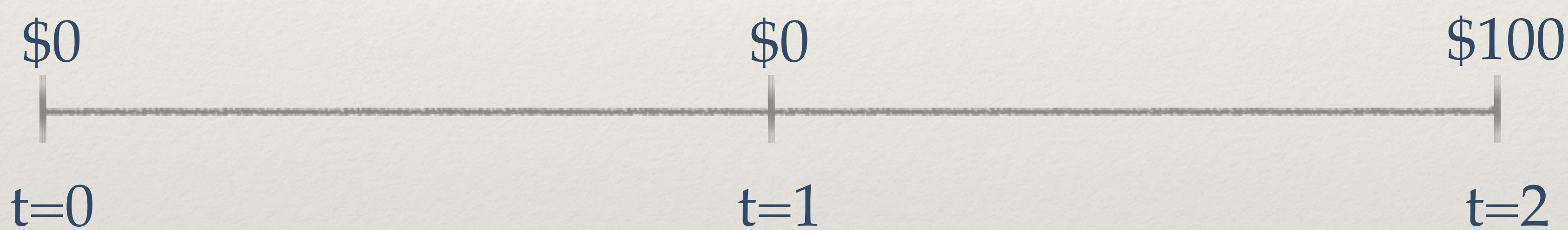
Present Value (Discounting)

- What's the present value of receiving \$100 in one year, $r = 2\%$?
  - Answer: $PV = \$100/(1+.02) = \$98.04$

- What's the value in one year of \$98.04 invested today with an interest rate of 2%?
  - Answer: $FV = \$98.04 \times (1+.02) = \$100$

Present Value (Discounting)

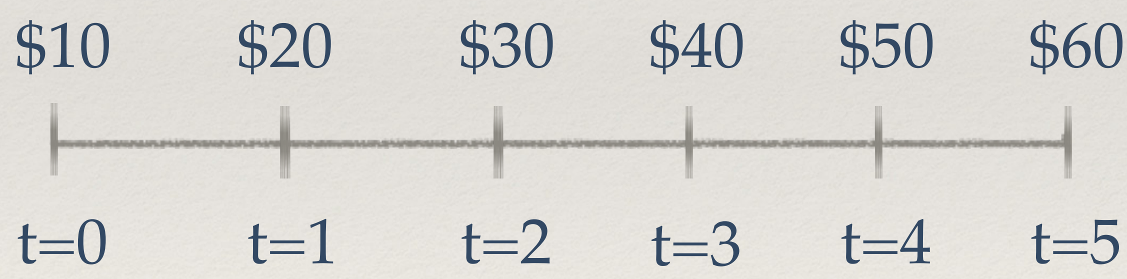
- What’s the present value of receiving $100 in TWO years (r = 2%)?



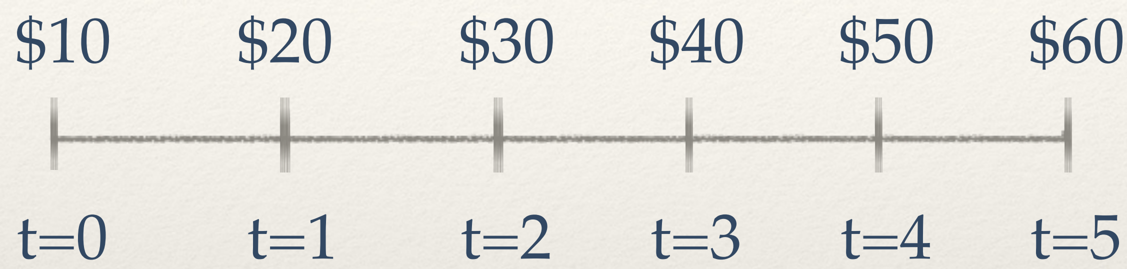
- Answer: $100/(1.02)2 = $96.12

PV Example

- What's the present value of this cash flow stream if the interest rate is 10%?



PV Example



$$PV = \frac{\$10}{1.1^0} + \frac{\$20}{1.1^1} + \frac{\$30}{1.1^2} + \frac{\$40}{1.1^3} + \frac{\$50}{1.1^4} + \frac{\$60}{1.1^5}$$

$$= \$10 + \$18.18 + \$24.79 + \$30.05 + \$34.15 + \$37.26$$

$$= \$154.43$$

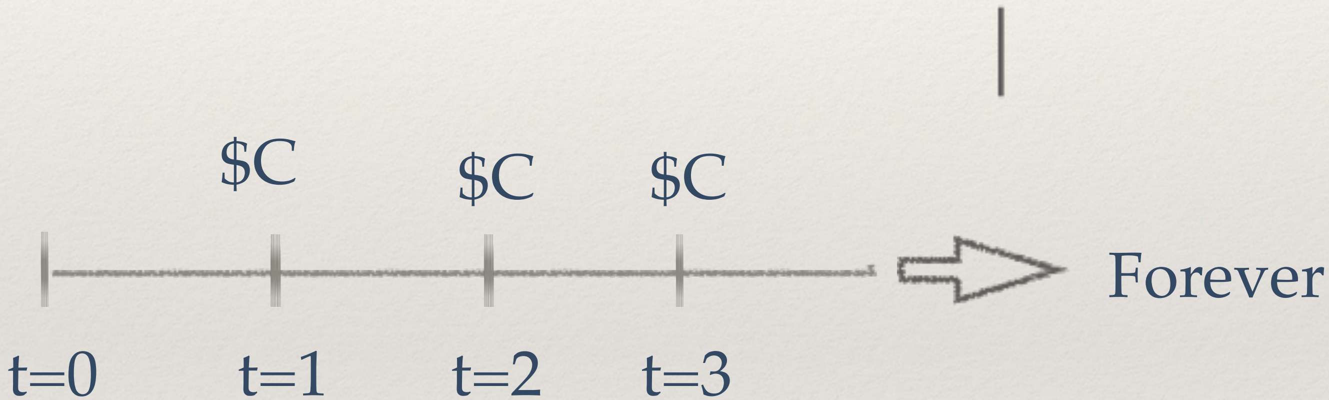
Problem 2 Solution

Special Cash Flow Streams

- Perpetuities
- Annuities
- Growing perpetuities

Perpetuities

- Perpetuity: a stream of equal cash flows that occur at regular intervals and last forever



- **First payment arrives at the end of the first period** [this always confuses people]

Perpetuities

- Value of a perpetuity: $PV = \frac{C_1}{r}$

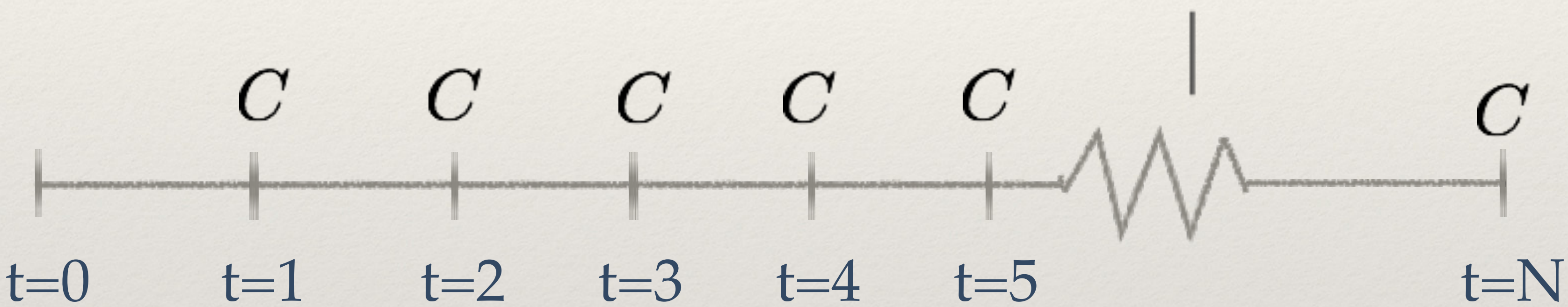
- What's the present value of a stream of payments that pays $600 every year starting at the end of the first year and lasting forever, r=5%?
  - Answer: $600 / .05 = $12,000

- What if the first payment is today?
  - Answer: $600 + ($600 / .05) = $12,600

Problem 3 Solution

Annuities

- Annuity: is a stream of N equal cash flows paid at regular intervals



- First cash flow at the end of the first period

Annuities

- Value of an annuity:

$$PV = \frac{C_1}{r}(1 - \frac{1}{(1+r)^N})$$

Annuities

- What's the present value of a stream of payments that pays \$100 every year starting at the end of the first year and lasts for 5 years, r=3%?

$$PV = \frac{C_1}{r}(1 - \frac{1}{(1+r)^N})$$

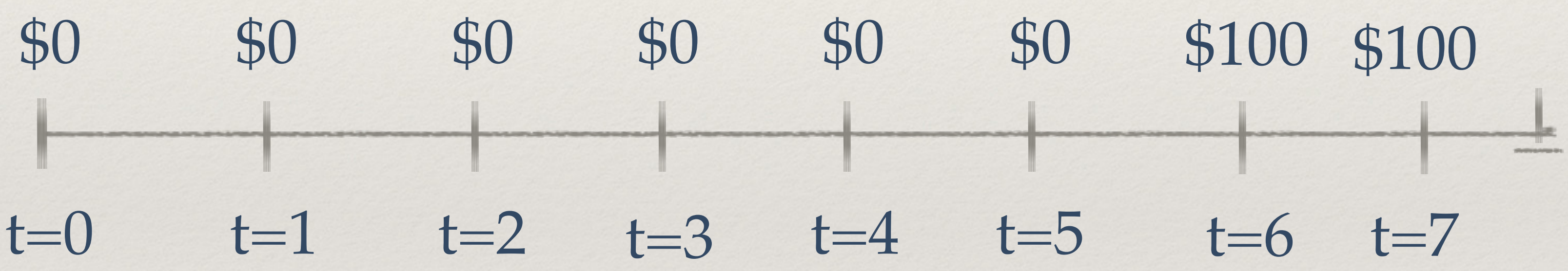
$$PV = \$100 \times \frac{1}{.03}(1 - \frac{1}{(1+.03)^5})$$

$$PV = \$457.97$$

Problem 4 Solution

Challenge Problem

- What is the present value of a stock that pays zero dividends for 5 years, then pays a $100 dividend forever? Assume a discount rate of 10%.



$$\text{Value at Year 5 of Perpetuity} = \frac{CF}{r} = \frac{\$100}{.10} = \$1,000$$

$$\text{Value at Year 0 of Perpetuity} = \frac{\$1,000}{(1+.10)^5} = \$620.92$$

Growing Perpetuity

- Sometimes, we'll assume cash flows will grow at a constant rate forever
    - E.g., we may assume a firm's dividends may grow at 3% per year forever
        - $1 this year, $1.03 next year, $1.06 in two years, etc.

- This is a **growing perpetuity**

$$\text{PV of Growing Perpetuity} = \frac{C_1}{r - g}$$

where r is the discount rate and g is the growth rate

Example

- What is the present value of a growing perpetuity that pays \$10 in one year and the payments grow each year by 5%? The appropriate discount rate is 10%.

$$\text{PV of Growing Perpetuity} = \frac{C_1}{r-g}$$

$$\text{PV of Growing Perpetuity} = \frac{\$10}{.10-.05} = \$200$$

- What if the growth rate is 9%?

$$\text{PV of Growing Perpetuity} = \frac{\$10}{.10-.09} = \$1,000$$

Example

- You are debating investing in a start-up company. The company will have \$0 cash flow for the first 3 years. At the end of year 4, the firm will have a cash flow of \$1M. Each year after, the cash flow is expected to grow at a rate of 3%. What is the present value of the firm if the appropriate discount rate is 5%?

$$\text{Value of Firm at t=3} = \frac{\$1M}{.05 - .03} = \$50M$$

$$\text{Value of Firm at t=0} = \frac{\$50M}{(1.05)^3} = \$43.19M$$

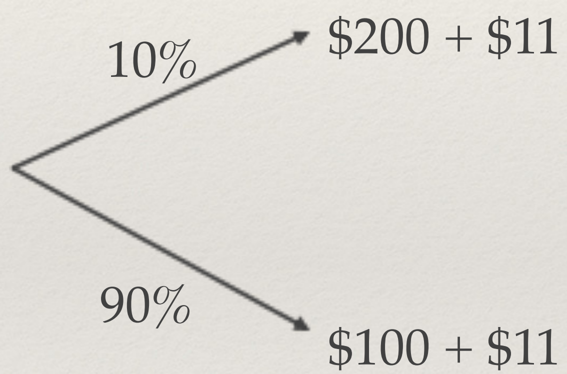
Risky Cash Flows

- Discount **expected** cash flows by r
- r determined by riskiness of cash flows

$$PV_T = \sum_{t=0}^{T} \frac{E[CF_t]}{(1+r)^t}$$

Risky Cash Flows

- PV of a stock that pays a $11 dividend in one year and the price will be $100 in one year with probability 90% and $200 with probability 10%. Discount rate is 10%



- Answer:
  - PV of dividend = $11/1.1 = $10
  - PV of price = E[Price]/1.1 =(.9 x $100 + .1 x $200)/1.1 = $100

Next Class

- Financial Statement Analysis (FSA)
- Watch FSA videos and do the homework on Canvas