Class 3:
Value Systems

logistics

TA office hours start today

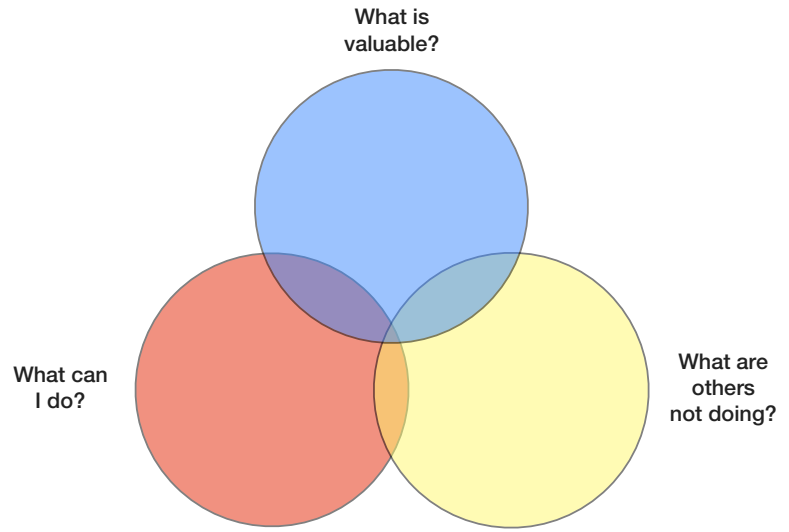
See Coursekit for supplementary materials

Assignment 1 posted later this week

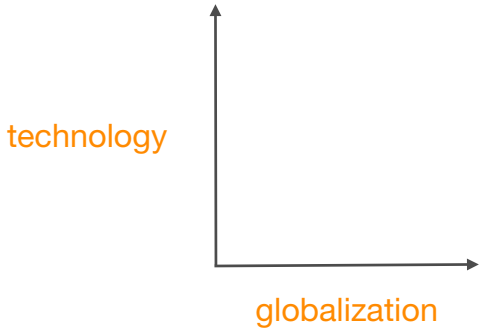
outline

1. great technology companies
2. valuation
3. durability
4. capturing value
5. the ideology of competition

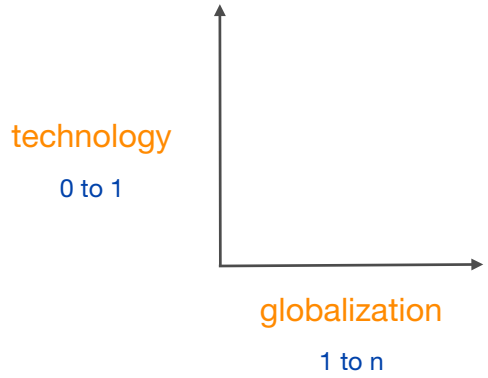
value



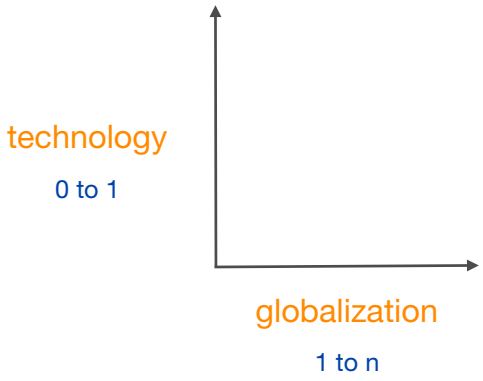
the challenge of 0 to 1



the challenge of 0 to 1



the challenge of 0 to 1



"what valuable company is nobody building?"

great companies

great companies

create value

great companies

create value

are durable

great companies

create value

are durable

capture value

outline

1. great technology companies
2. valuation
3. durability
4. capturing value
5. the ideology of competition

valuation methods

valuation methods

multiples & comparables

valuation methods

multiples & comparables

P/E and PEG ratios

valuation methods

multiples & comparables

P/E and PEG ratios

discounted cash flows

multiples & comparables

multiples & comparables

Incubator exit?
standard $10M cap

multiples & comparables

Incubator exit?
standard $10M cap

($1M)*(n_engineers)
- ($500K)*(n_MBAs)
---
pre-money valuation

multiples & comparables

Incubator exit?
standard $10M cap

($1M)*(n_engineers)
- ($500K)*(n_MBAs)
---
pre-money valuation

($X)*(monthly page views)
($Y)*(active users)

multiples & comparables

Incubator exit?
standard $10M cap

($1M)*(n_engineers)
- ($500K)*(n_MBAs)

pre-money valuation

($X)*(monthly page views)
($Y)*(active users)

Revenue multiple

P/E and PEG ratios

P/E and PEG ratios

$$\text{P/E ratio} = \frac{\text{Market value (per share)}}{\text{Earnings (per share)}}$$

P/E and PEG ratios

$$\text{P/E ratio} = \frac{\text{Market value (per share)}}{\text{Earnings (per share)}}$$

adjust for growth

P/E and PEG ratios

$$\text{P/E ratio} = \frac{\text{Market value (per share)}}{\text{Earnings (per share)}}$$

adjust for growth

$$\text{PEG ratio} = \frac{\text{Market value / Earnings}}{\text{Annual earnings growth}}$$

P/E and PEG ratios

$$\text{P/E ratio} = \frac{\text{Market value (per share)}}{\text{Earnings (per share)}}$$

adjust for growth

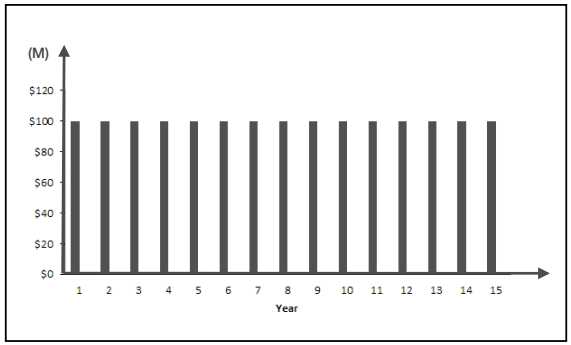
$$\text{PEG ratio} = \frac{\text{Market value / Earnings}}{\text{Annual earnings growth}}$$

Lower PEG ratio: cheaper

Higher PEG ratio: more expensive

steady cash flows

Free cash flows



the time value of money

the time value of money

$r = discount\ rate$

the time value of money

$r = discount\ rate$

$CF_t = free\ cash\ flow\ in\ year\ t$

the time value of money

$r = discount\ rate$

$CF_t = free\ cash\ flow\ in\ year\ t$

$DPV = discounted\ present\ value$

the time value of money

$r = discount\ rate$

$CF_t = free\ cash\ flow\ in\ year\ t$

$DPV = discounted\ present\ value$

$$DPV_0 = \frac{CF_t}{(1+r)^t}$$

the time value of money

$$r = discount\ rate$$

$$CF_t = free\ cash\ flow\ in\ year\ t$$

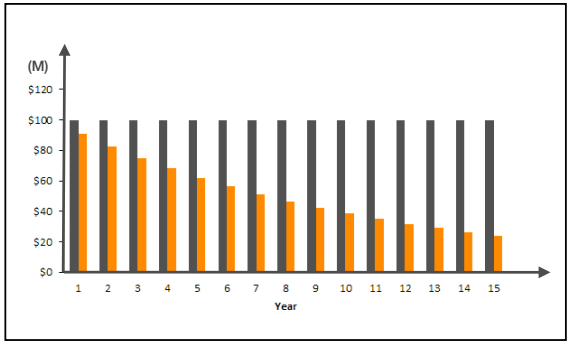
$$DPV = discounted\ present\ value$$

$$DPV_0 = \frac{CF_t}{(1+r)^t}$$

$$DPV = \sum_{t=0}^{N} \frac{CF_t}{(1+r)^t}$$

discounted cash flows

Present value



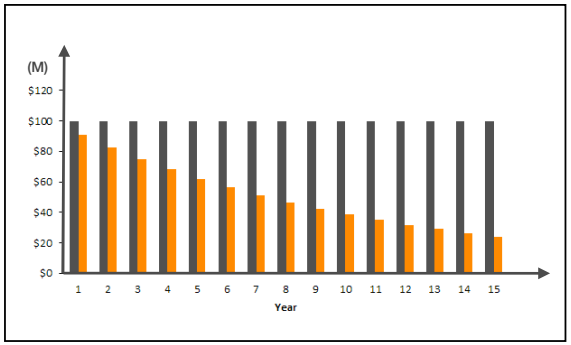
r = 10%

$$DPV_{1-15} = \sum_{t=1}^{15} \frac{\$100\ \text{M}}{(1+0.10)^t} = \$761\ \text{M}$$

$$DPV_{1-\infty} = \sum_{t=1}^{\infty} \frac{\$100\ \text{M}}{(1+0.10)^t} = \$1{,}000\ \text{M}$$

discounted cash flows

Present value



r = 10%

$$CF_{1-15} = \sum_{t=1}^{15} \$100\ \text{M} = \$1{,}500\ \text{M}$$

$$DPV_{1-15} = \sum_{t=1}^{15} \frac{\$100\ \text{M}}{(1+0.10)^t} = \$761\ \text{M}$$

$$DPV_{1-\infty} = \sum_{t=1}^{\infty} \frac{\$100\ \text{M}}{(1+0.10)^t} = \$1{,}000\ \text{M}$$

unsteady cash flows

unsteady cash flows

g = *growth rate*

unsteady cash flows

g = *growth rate*

$$DPV = \sum_{t=0}^{N} \frac{CF_0(1+g)^t}{(1+r)^t}$$

unsteady cash flows

g = *growth rate*

$$DPV = \sum_{t=0}^{N} \frac{CF_0(1+g)^t}{(1+r)^t}$$

TV = *terminal value*

unsteady cash flows

g = *growth rate*

$$DPV = \sum_{t=0}^{N} \frac{CF_0(1+g)^t}{(1+r)^t}$$

TV = *terminal value*

$$TV_t = \frac{CF_{t+1}}{(r-g)}$$

unsteady cash flows

g = *growth rate*

$$DPV = \sum_{t=0}^{N} \frac{CF_0(1+g)^t}{(1+r)^t}$$

TV = terminal value

$$TV_t = \frac{CF_{t+1}}{(r-g)}$$

$$TV = \frac{CF_{t+1}}{(r-g)(1+r)^t}$$

unsteady cash flows

g = *growth rate*

$$DPV = \sum_{t=0}^{N} \frac{CF_0(1+g)^t}{(1+r)^t}$$

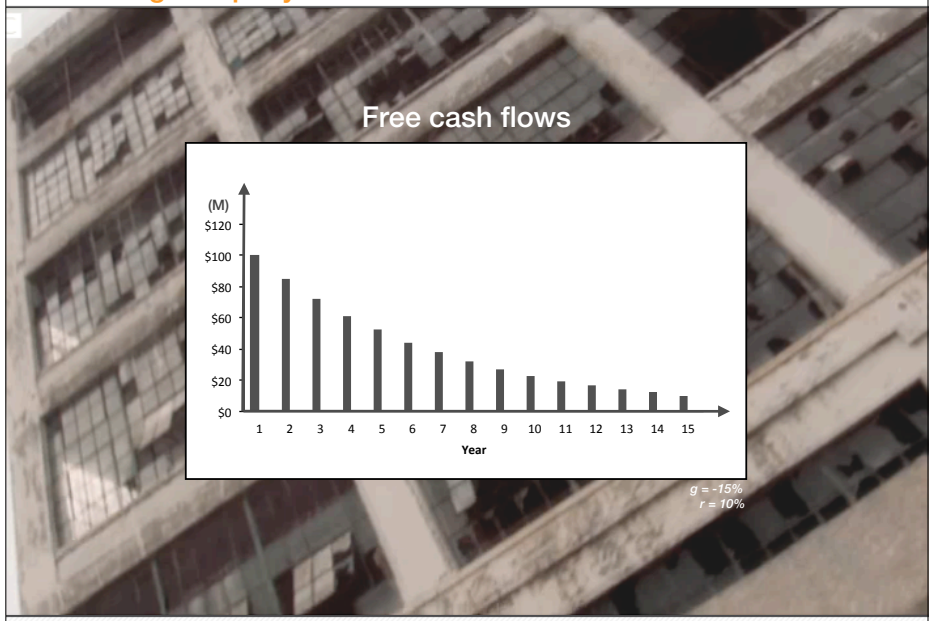
TV = terminal value

$$TV_t = \frac{CF_{t+1}}{(r-g)}$$

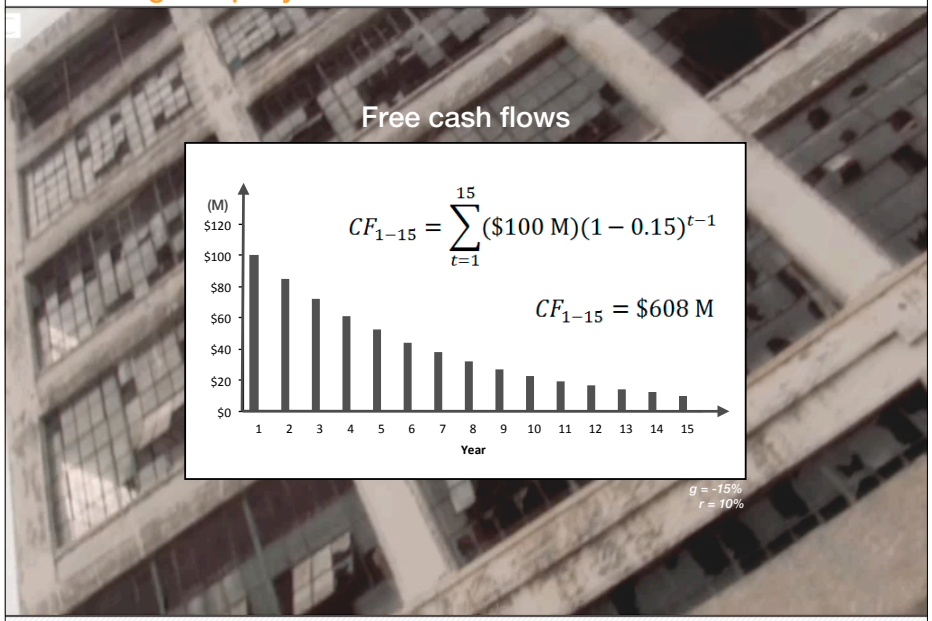
$$TV = \frac{CF_{t+1}}{(r-g)(1+r)^t}$$

$$NPV = DPV + TV$$

declining company



declining company

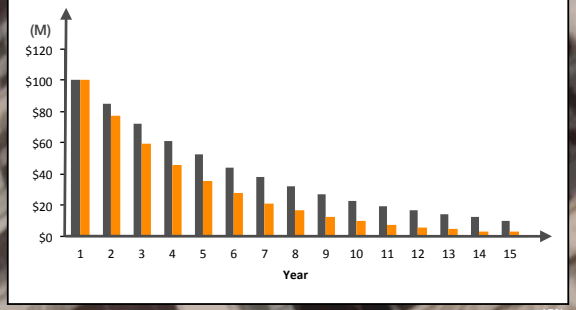


$$CF_{1-15} = \sum_{t=1}^{15} (\$100\text{ M})(1-0.15)^{t-1}$$

$$CF_{1-15} = \$608\text{ M}$$

declining company

Present value



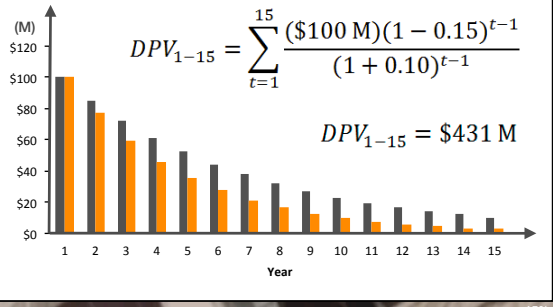
g = -15%
r = 10%

declining company

Present value

$$DPV_{1-15} = \sum_{t=1}^{15} \frac{(\$100\ \text{M})(1-0.15)^{t-1}}{(1+0.10)^{t-1}}$$

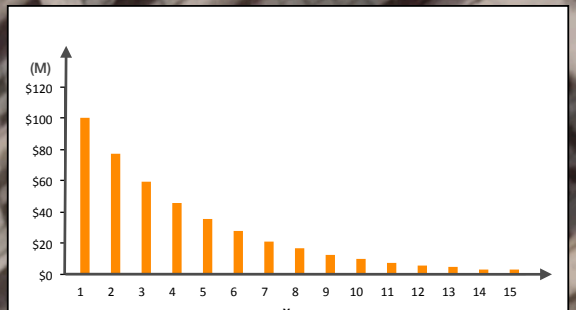
$$DPV_{1-15} = \$431\ \text{M}$$



g = -15%
r = 10%

declining company

Present value

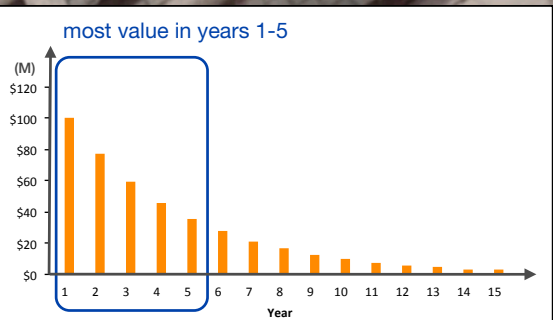


g = -15%
r = 10%

declining company

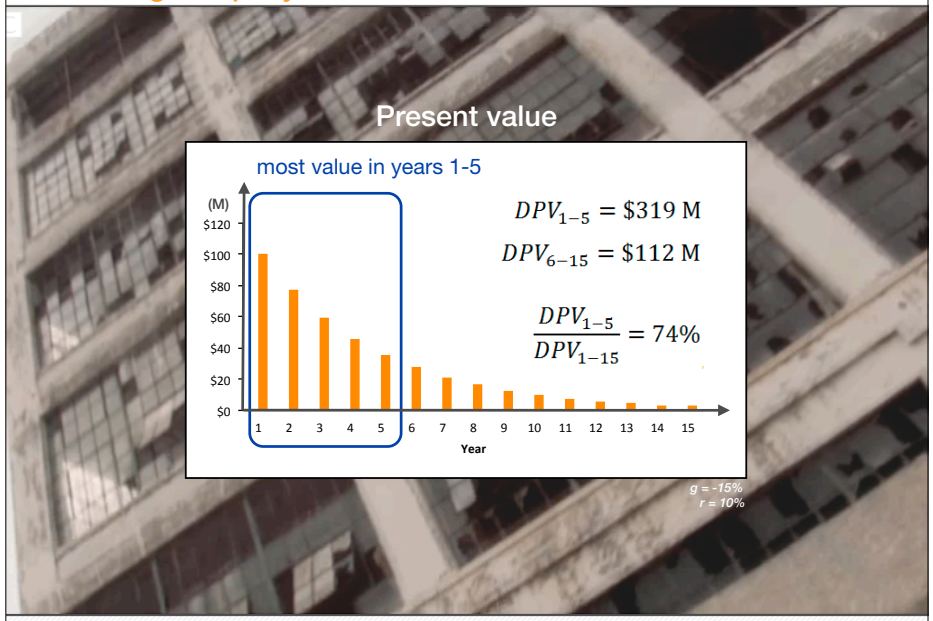
Present value

most value in years 1-5

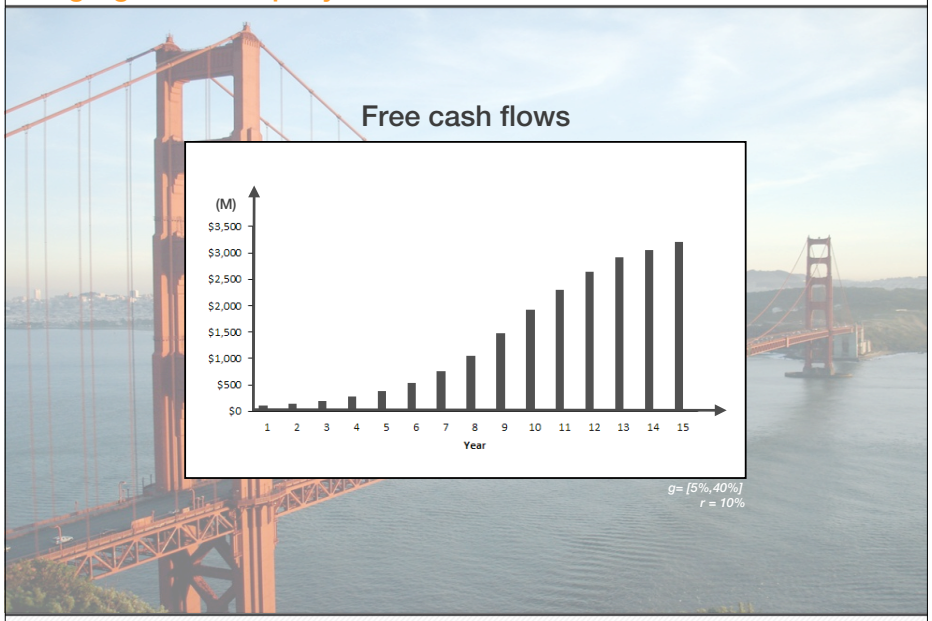


g = -15%
r = 10%

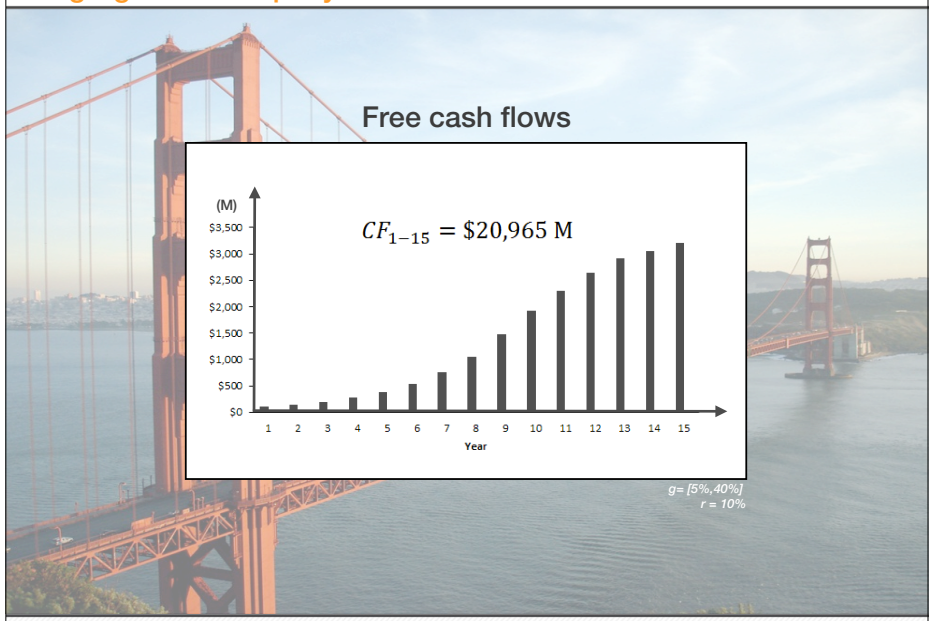
declining company



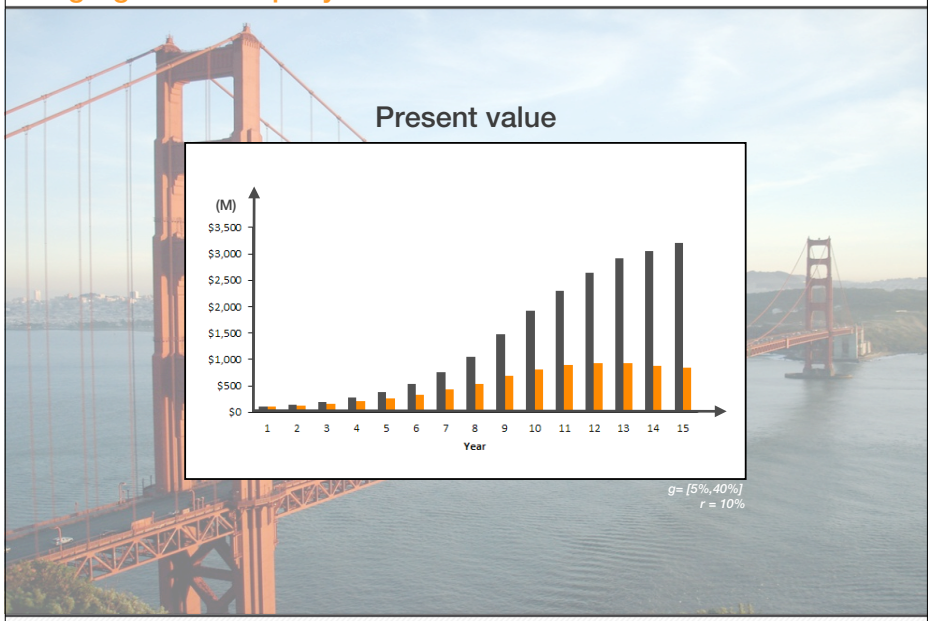
high-growth company



high-growth company

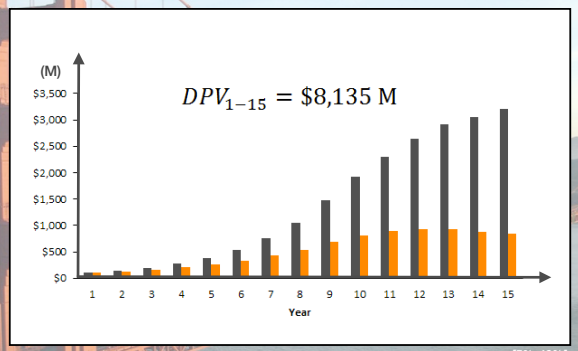


high-growth company



high-growth company

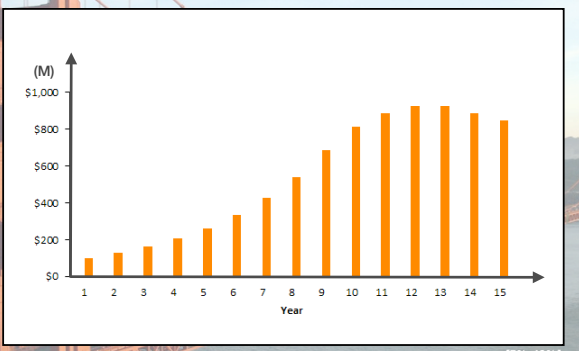
Present value



g= [5%,40%]
r = 10%

high-growth company

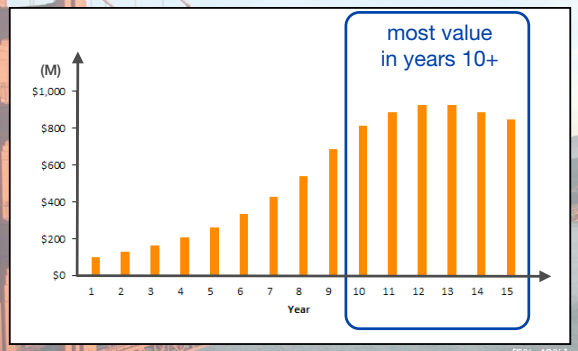
Present value



g= [5%,40%]
r = 10%

high-growth company

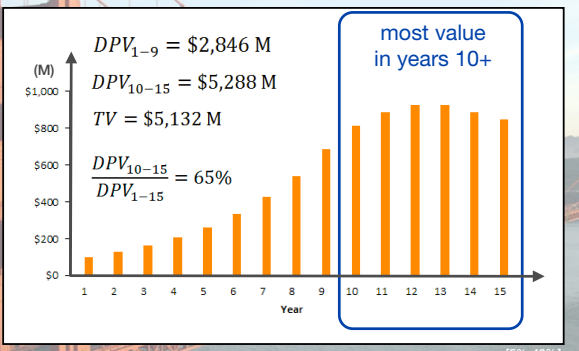
Present value



g= [5%,40%]
r = 10%

high-growth company

Present value



g= [5%,40%]
r = 10%

example: LinkedIn

Income statement

	Year Ended December 31,				
	2011	2010	2009	2008	2007
	(in thousands, except per share data)				
Consolidated Statements of Operations Data:					
Net revenue	$522,189	$243,099	$120,127	$78,773	$32,486
Costs and expenses:					
Cost of revenue (exclusive of depreciation and amortization shown separately below)	81,448	44,826	25,857	18,589	7,384
Sales and marketing	164,703	58,978	26,847	16,986	5,037
Product development	132,222	65,104	39,444	29,366	11,578
General and administrative	74,871	35,064	19,480	12,976	6,812
Depreciation and amortization	43,100	19,551	11,854	6,365	2,107
Total costs and expenses	496,344	223,523	123,482	84,282	32,918
Income (loss) from operations	25,845	19,576	(3,355)	(5,509)	(432)
Other income (expense), net	(2,903)	(610)	230	1,277	773
Income (loss) before income taxes	22,942	18,966	(3,125)	(4,232)	341
Provision for income taxes	11,030	3,581	848	290	13
Net income (loss)	$ 11,912	$ 15,385	$ (3,973)	$ (4,522)	$ 328
Net income (loss) attributable to common stockholders	$ 11,912	$ 3,429	$ (3,973)	$ (4,522)	$ —
Net income (loss) per share attributable to common stockholders:					
Basic	$ 0.15	$ 0.08	$ (0.10)	$ (0.11)	$ 0.00
Diluted	$ 0.11	$ 0.07	$ (0.10)	$ (0.11)	$ 0.00
Weighted-average shares used to compute net income (loss) per share attributable to common stockholders:					
Basic	77,185	42,446	41,184	42,389	38,092
Diluted	104,118	46,459	41,184	42,389	38,961
Other Financial and Operational Data:					
Adjusted EBITDA (1)	$ 98,713	$ 47,959	$ 14,651	$ 5,461	$ 3,480
Number of registered members (at period end)	144,974	90,437	55,111	32,307	16,712

example: LinkedIn

Income statement

Year Ended December 31,
2011 2010 2009 2008 2007
(in thousands, except per share data)
Consolidated Statements of Operations Data:
Net revenue $522,189 $243,099 $120,127 $78,773 $32,486
Costs and expenses:
Cost of revenue (exclusive of depreciation and amortization shown separately below) 81,448 44,826 25,857 18,589 7,384
Sales and marketing 164,703 58,978 26,847 16,986 5,037
Product development 132,222 65,104 39,444 29,366 11,578
General and administrative 74,871 35,064 19,480 12,976 6,812
Depreciation and amortization 43,100 19,551 11,854 6,365 2,107
Total costs and expenses 496,344 223,523 123,482 84,282 32,918
Income (loss) from operations 25,845 19,576 (3,355) (5,509) (432)
Other income (expense), net (2,903) (610) 230 1,277 773
Income (loss) before income taxes 22,942 18,966 (3,125) (4,232) 341
Provision for income taxes 11,030 3,581 848 290 13
Net income (loss) $ 11,912 $ 15,385 $ (3,973) $ (4,522) $ 328
Net income (loss) attributable to common stockholders $ 11,912 $ 3,429 $ (3,973) $ (4,522) $ —
Net income (loss) per share attributable to common stockholders:
Basic $ 0.15 $ 0.08 $ (0.10) $ (0.11) $ 0.00
Diluted $ 0.11 $ 0.07 $ (0.10) $ (0.11) $ 0.00
Weighted-average shares used to compute net income (loss) per share attributable to common stockholders:
Basic 77,185 42,446 41,184 42,389 38,092
Diluted 104,118 46,459 41,184 42,389 38,961
Other Financial and Operational Data:
Adjusted EBITDA (1) $ 98,713 $ 47,959 $ 14,651 $ 5,461 $ 3,480
Number of registered members (at period end) 144,974 90,437 55,111 32,307 16,712

Class 3 Value Systems CS183Startup

example: LinkedIn

Income statement

Year Ended December 31,
2011 2010 2009 2008 2007
(in thousands, except per share data)
Consolidated Statements of Operations Data:
Net revenue $522,189 $243,099 $120,127 $78,773 $32,486
Costs and expenses:
Cost of revenue (exclusive of depreciation and amortization shown separately below) 81,448 44,826 25,857 18,589 7,384
Sales and marketing 164,703 58,978 26,847 16,986 5,037
Product development 132,222 65,104 39,444 29,366 11,578
General and administrative 74,871 35,064 19,480 12,976 6,812
Depreciation and amortization 43,100 19,551 11,854 6,365 2,107
Total costs and expenses 496,344 223,523 123,482 84,282 32,918
Income (loss) from operations 25,845 19,576 (3,355) (5,509) (432)
Other income (expense), net (2,903) (610) 230 1,277 773
Income (loss) before income taxes 22,942 18,966 (3,125) (4,232) 341
Provision for income taxes 11,030 3,581 848 290 13
Net income (loss) $ 11,912 $ 15,385 $ (3,973) $ (4,522) $ 328
Net income (loss) attributable to common stockholders $ 11,912 $ 3,429 $ (3,973) $ (4,522) $ —
Net income (loss) per share attributable to common stockholders:
Basic $ 0.15 $ 0.08 $ (0.10) $ (0.11) $ 0.00
Diluted $ 0.11 $ 0.07 $ (0.10) $ (0.11) $ 0.00
Weighted-average shares used to compute net income (loss) per share attributable to common stockholders:
Basic 77,185 42,446 41,184 42,389 38,092
Diluted 104,118 46,459 41,184 42,389 38,961
Other Financial and Operational Data:
Adjusted EBITDA (1) $ 98,713 $ 47,959 $ 14,651 $ 5,461 $ 3,480
Number of registered members (at period end) 144,974 90,437 55,111 32,307 16,712

Class 3 Value Systems CS183Startup

example: LinkedIn

Income statement

Year Ended December 31,
2011 2010 2009 2008 2007
(in thousands, except per share data)
Consolidated Statements of Operations Data:
Net revenue $522,189 $243,099 $120,127 $78,773 $32,486
Costs and expenses:
Cost of revenue (exclusive of depreciation and amortization shown separately below) 81,448 44,826 25,857 18,589 7,384
Sales and marketing 164,703 58,978 26,847 16,986 5,037
Product development 132,222 65,104 39,444 29,366 11,578
General and administrative 74,871 35,064 19,480 12,976 6,812
Depreciation and amortization 43,100 19,551 11,854 6,365 2,107
Total costs and expenses 496,344 223,523 123,482 84,282 32,918
Income (loss) from operations 25,845 19,576 (3,355) (5,509) (432)
Other income (expense), net (2,903) (610) 230 1,277 773
Income (loss) before income taxes 22,942 18,966 (3,125) (4,232) 341
Provision for income taxes 11,030 3,581 848 290 13
Net income (loss) $ 11,912 $ 15,385 $ (3,973) $ (4,522) $ 328
Net income (loss) attributable to common stockholders $ 11,912 $ 3,429 $ (3,973) $ (4,522) $ —
Net income (loss) per share attributable to common stockholders:
Basic $ 0.15 $ 0.08 $ (0.10) $ (0.11) $ 0.00
Diluted $ 0.11 $ 0.07 $ (0.10) $ (0.11) $ 0.00
Weighted-average shares used to compute net income (loss) per share attributable to common stockholders:
Basic 77,185 42,446 41,184 42,389 38,092
Diluted 104,118 46,459 41,184 42,389 38,961
Other Financial and Operational Data:
Adjusted EBITDA (1) $ 98,713 $ 47,959 $ 14,651 $ 5,461 $ 3,480
Number of registered members (at period end) 144,974 90,437 55,111 32,307 16,712

Class 3 Value Systems CS183Startup

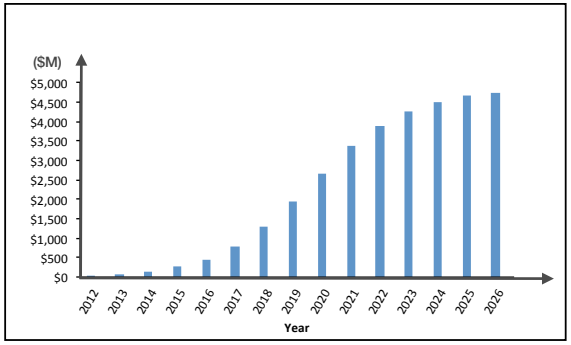
example: LinkedIn

Income statement

	Year Ended December 31,				
	2011	2010	2009	2008	2007
	(in thousands, except per share data)				
Consolidated Statements of Operations Data:					
Net revenue	$522,189	$243,099	$120,127	$78,773	$32,486
Costs and expenses:					
Cost of revenue (exclusive of depreciation and amortization shown separately below)	81,448	44,826	25,857	18,589	7,384
Sales and marketing	164,703	58,978	26,847	16,986	5,037
Product development	132,222	65,104	39,444	29,366	11,578
General and administrative	74,871	35,064	19,480	12,976	6,812
Depreciation and amortization	43,100	19,551	11,854	6,365	2,107
Total costs and expenses	496,344	223,523	123,482	84,282	32,918
Income (loss) from operations	25,845	19,576	(3,355)	(5,509)	(432)
Other income (expense), net	(2,903)	(610)	230	1,277	773
Income (loss) before income taxes	22,942	18,966	(3,125)	(4,232)	341
Provision for income taxes	11,030	3,581	848	290	13
Net income (loss)	$ 11,912	$ 15,385	$ (3,973)	$ (4,522)	$ 328
Net income (loss) attributable to common stockholders	$ 11,912	$ 3,429	$ (3,973)	$ (4,522)	$ —
Net income (loss) per share attributable to common stockholders:					
Basic	$ 0.15	$ 0.08	$ (0.10)	$ (0.11)	$ 0.00
Diluted	$ 0.11	$ 0.07	$ (0.10)	$ (0.11)	$ 0.00
Weighted-average shares used to compute net income (loss) per share attributable to common stockholders:					
Basic	77,185	42,446	41,184	42,389	38,092
Diluted	104,118	46,459	41,184	42,389	38,961
Other Financial and Operational Data:					
Adjusted EBITDA (1)	$ 98,713	$ 47,959	$ 14,651	$ 5,461	$ 3,480
Number of registered members (at period end)	144,974	90,437	55,111	32,307	16,712

example: LinkedIn

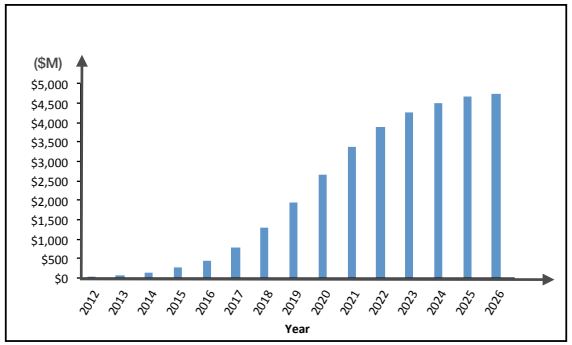
Free cash flows



source: analyst forecasts

example: LinkedIn

Free cash flows

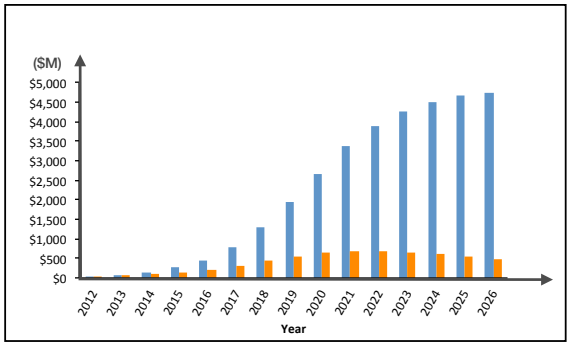


source: analyst forecasts

$$CF_{1-15} = \$42.5\ \text{B}$$

example: LinkedIn

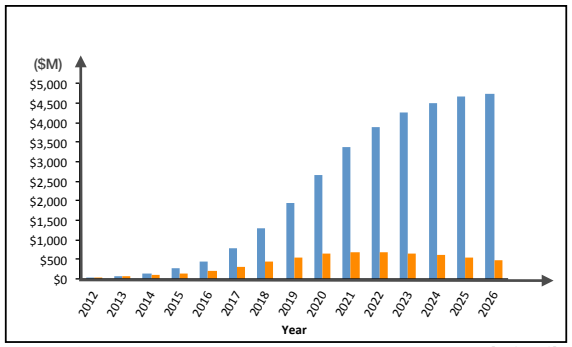
Discounted cash flows



source: analyst forecasts *r = [12%, 20%]*

example: LinkedIn

Discounted cash flows



source: analyst forecasts *r = [12%, 20%]*

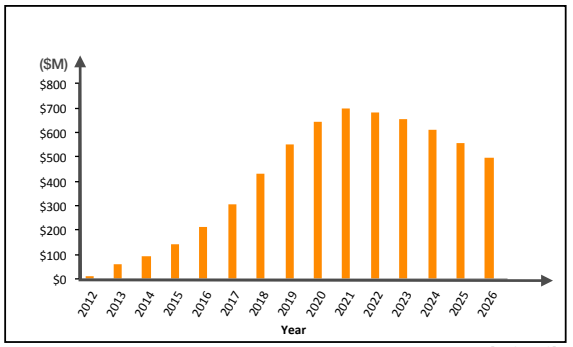
$DPV_{1-15} = \$6.2$ B

$TV = \$3.3$ B

$Cash \sim \$0.5$ B

example: LinkedIn

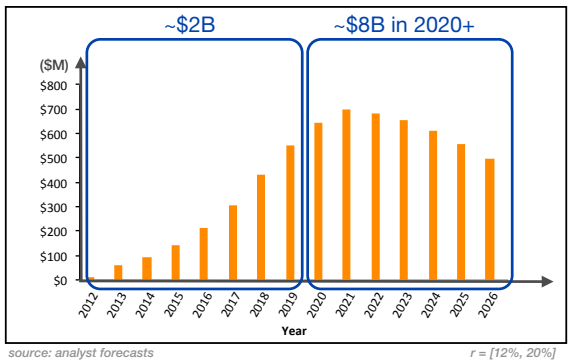
Discounted cash flows



source: analyst forecasts *r = [12%, 20%]*

example: LinkedIn

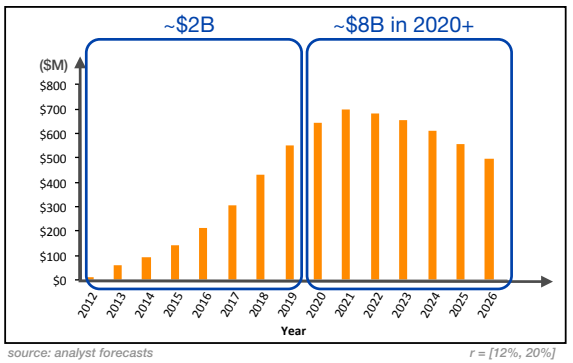
Discounted cash flows



source: analyst forecasts *r = [12%, 20%]*

example: LinkedIn

Discounted cash flows



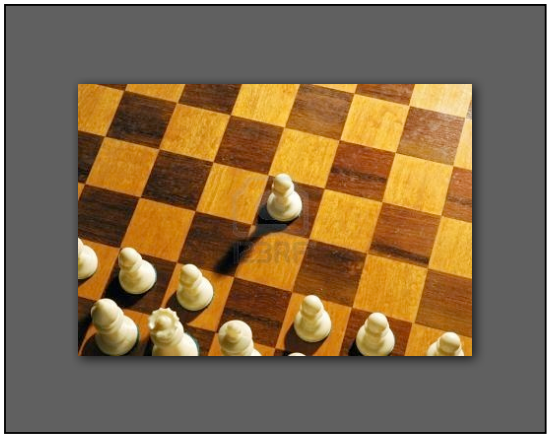
source: analyst forecasts *r = [12%, 20%]*

~$10B valuation reasonable only if
LinkedIn is extremely durable

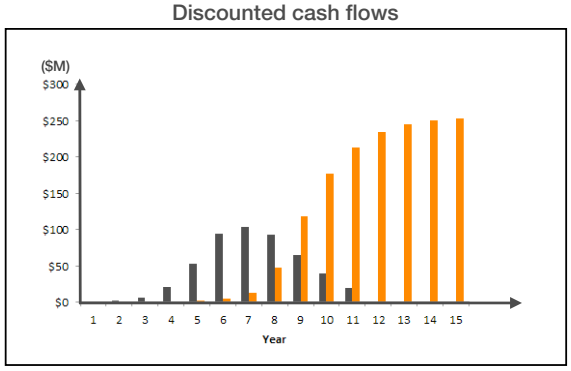
outline

1. great technology companies
2. valuation
3. durability
4. capturing value
5. the ideology of competition

first mover advantage?



last mover advantage



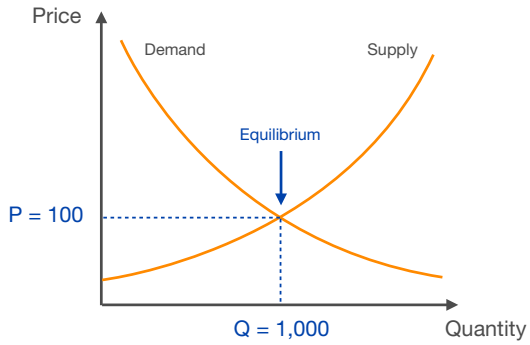
last mover

must also capture value

outline

1. great technology companies
2. valuation
3. durability
4. capturing value
5. the ideology of competition

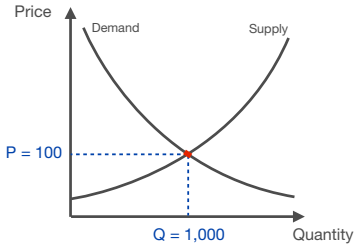
market: supply and demand



different scales

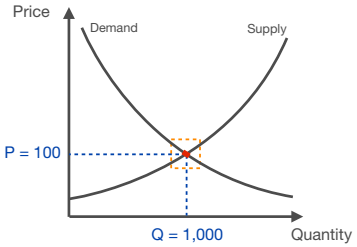
different scales

Perfect competition



different scales

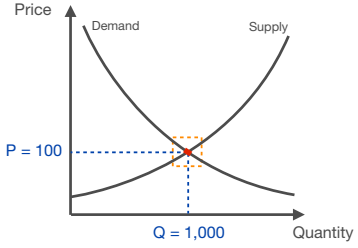
Perfect competition



Negligible on market scale

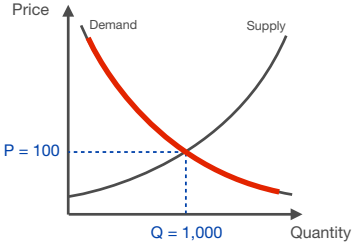
different scales

Perfect competition



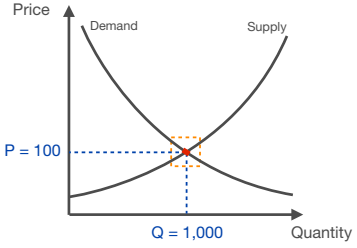
Negligible on market scale

Monopoly



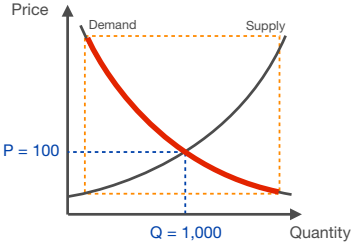
different scales

Perfect competition



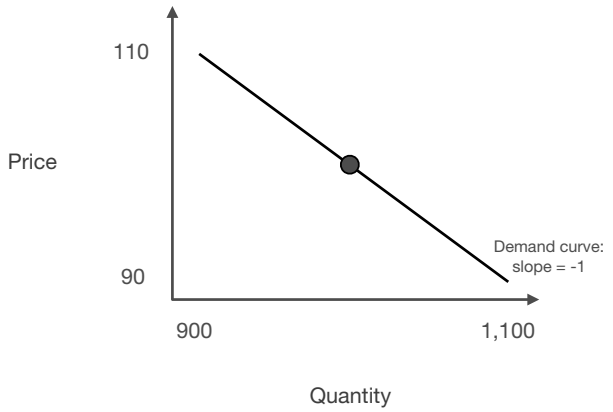
Negligible on market scale

Monopoly

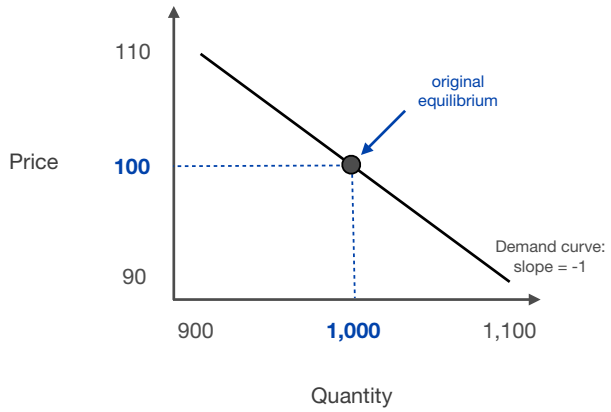


Essentially entire market

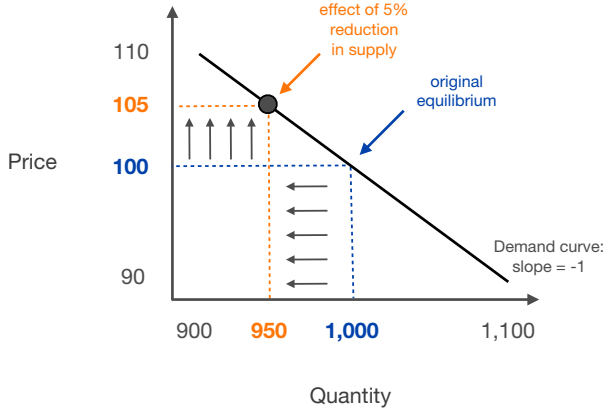
5% reduction in supply



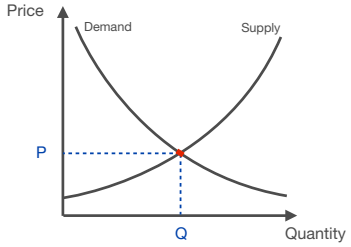
5% reduction in supply



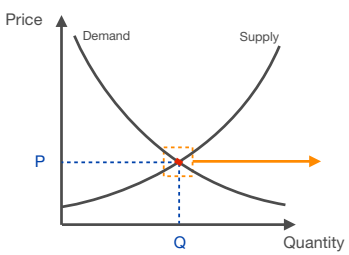
5% reduction in supply



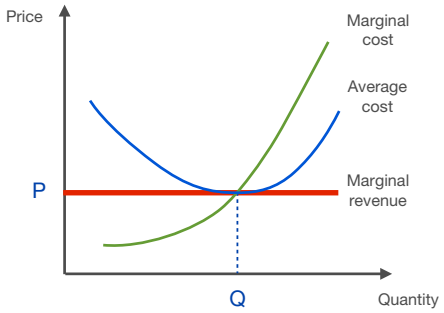
perfect competition



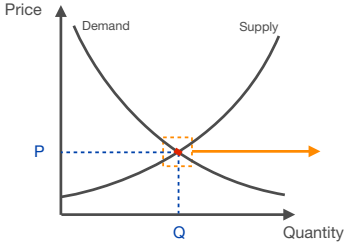
perfect competition



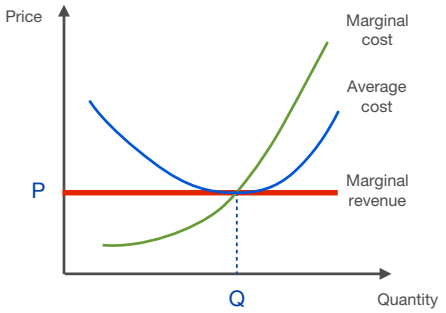
Price taker



perfect competition

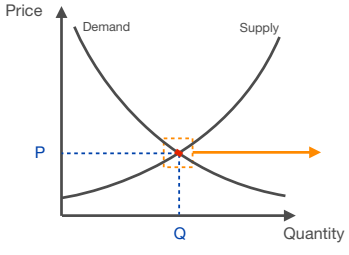


Price taker

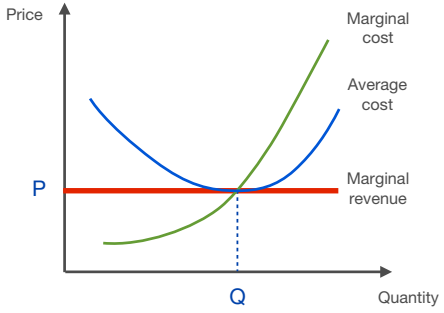


price at minimum average total cost

perfect competition



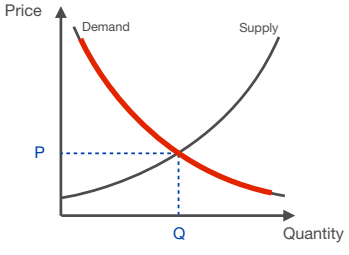
Price taker



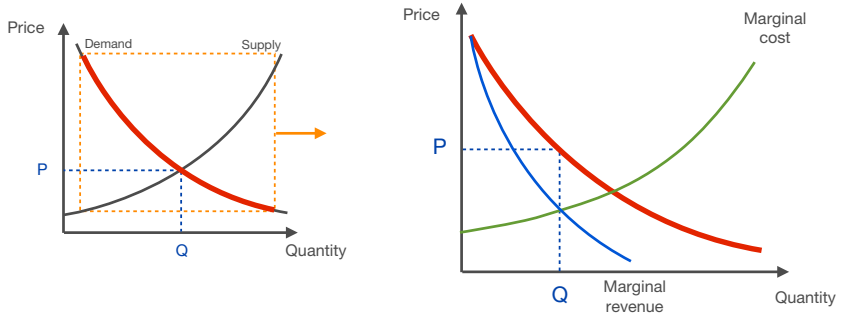
price at minimum average total cost

no economic profits

monopoly

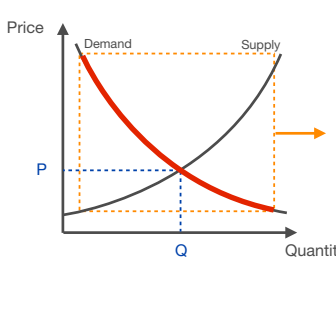


monopoly

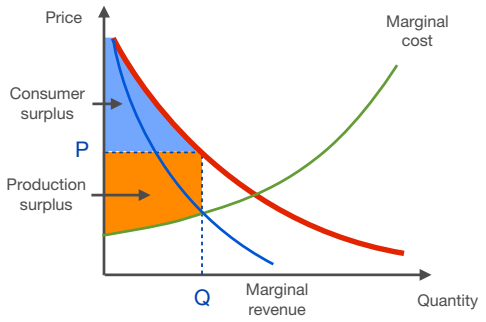


Price maker

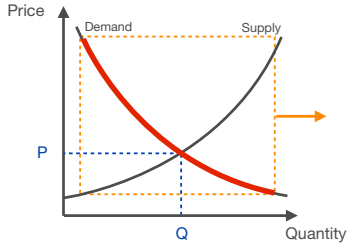
monopoly



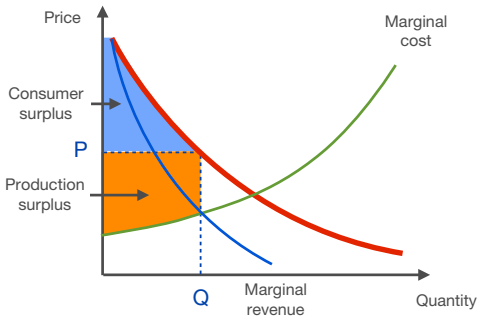
Price maker



monopoly

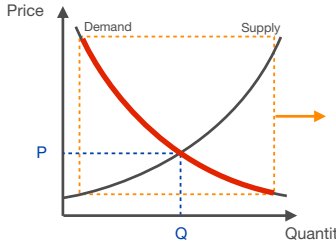


Price maker

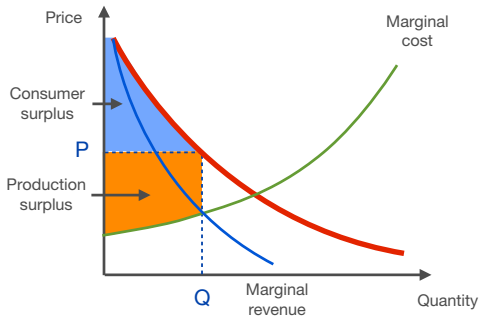


production defines equilibrium price

monopoly



Price maker



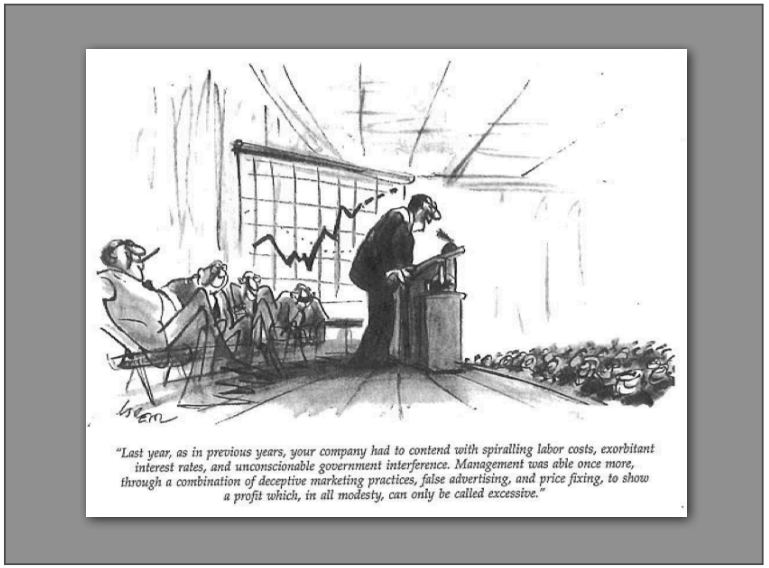
production defines equilibrium price

price selected to maximize profits

outline

1. great technology companies
2. valuation
3. durability
4. capturing value
5. the ideology of competition

worth considering



perception

"People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices."

- Adam Smith, *The Wealth of Nations*

regulation

"The possession of monopoly power will not be found unlawful unless it is accompanied by an element of anticompetitive conduct"

- The Sherman Act

DOJ tests

Lerner index $L = \frac{P - MC}{P}$

Herfindahl-Hirschman Index $HHI = \sum_{i=0}^{N} s_i^2$

m-firm concentration ratio $CR_m = \sum_{i=1}^{m} s_i$

monopoly

monopoly

cons

monopoly

cons

lower output, higher prices

monopoly

cons

lower output, higher prices

price discrimination

monopoly

cons

lower output, higher prices

price discrimination

stifle innovation

monopoly

cons

lower output, higher prices

price discrimination

stifle innovation

tying

monopoly

pros

cons

lower output, higher prices

price discrimination

stifle innovation

tying

monopoly

pros

incentive to innovate

cons

lower output, higher prices

price discrimination

stifle innovation

tying

monopoly

pros

incentive to innovate

cons

lower output, higher prices

price discrimination

stifle innovation

tying

Class 3 Value Systems CS183Startup

monopoly

pros

incentive to innovate

stable, long-term planning

deeper project financing

cons

lower output, higher prices

price discrimination

stifle innovation

tying

Class 3 Value Systems CS183Startup

monopoly

pros

incentive to innovate

stable, long-term planning

deeper project financing

symptomatic of creation

cons

lower output, higher prices

price discrimination

stifle innovation

tying

Class 3 Value Systems CS183Startup

perfect competition

perfect competition

cons

perfect competition

cons

psychologically unhealthy

perfect competition

cons

psychologically unhealthy

irrelevant in a dynamic world

perfect competition

cons

psychologically unhealthy

irrelevant in a dynamic world

preempts question of value

perfect competition

pros

cons

psychologically unhealthy

irrelevant in a dynamic world

preempts question of value

perfect competition

pros

easy to model

cons

psychologically unhealthy

irrelevant in a dynamic world

preempts question of value

perfect competition

pros

easy to model

efficient in a static world

cons

psychologically unhealthy

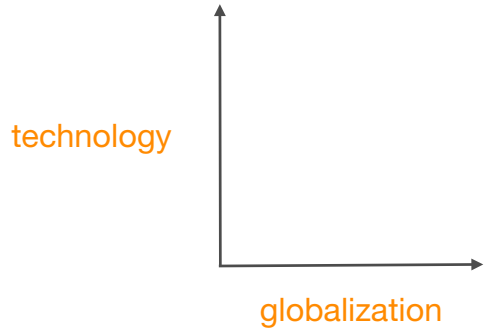
irrelevant in a dynamic world

preempts question of value

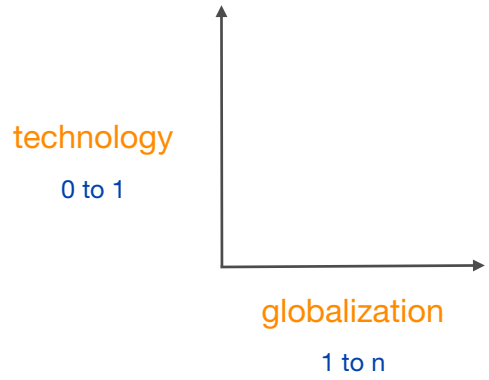
perfect competition

pros	cons
easy to model	psychologically unhealthy
efficient in a static world	irrelevant in a dynamic world
politically salable	preempts question of value

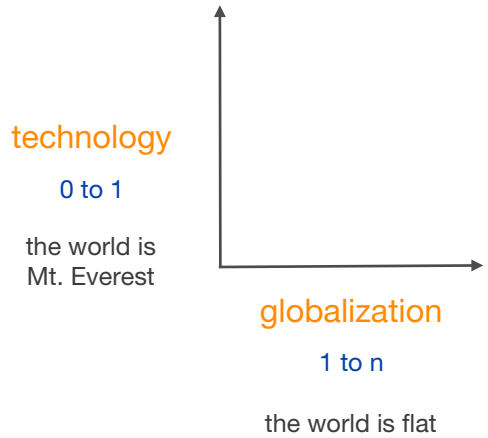
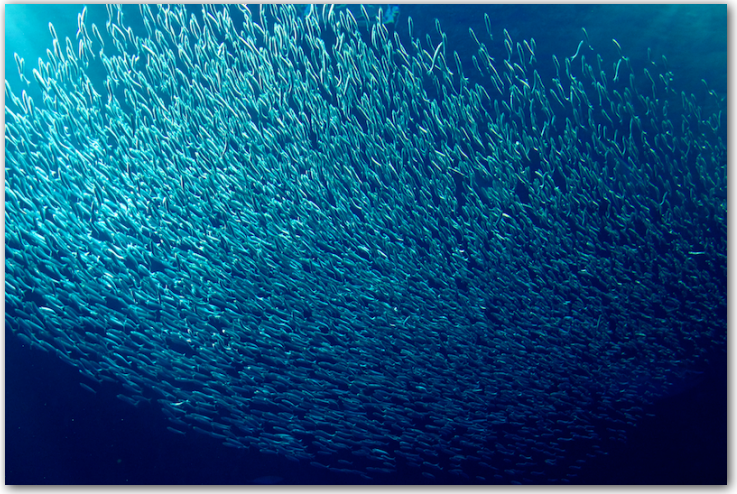
the world is flat



the world is flat



the world is flat



the personal application