III. Private company for initial public offering

- In an initial public offering, the private business is opened up to investors who clearly are diversified (or at least have the option to be diversified).
- There are control implications as well. When a private firm goes public, it opens itself up to monitoring by investors, analysts and market.
- The reporting and information disclosure requirements shift to reflect a publicly traded firm.

Starting numbers

Twitter Pre-IPO Valuation: October 5, 2013

	2012	Trailing 2013
Revenues	$316.9	$448.2
Operating Income	-$77.1	-$92.9
Adj Op Inc		$4.3
Invested Capital		$549.1
Operating Margin		0.96%
Sales/Capital		0.82

Revenue growth of 55% a year for 5 years, tapering down to 2.7% in year 10

Pre-tax operating margin increases to 25% over the next 10 years

Sales to capital ratio of **1.50** for incremental sales

Stable Growth
g = 2.7%; Beta = 1.00;
Cost of capital = 8%
ROC= **12**%;
Reinvestment Rate=2.7%/12% = 22.5%

Terminal Value$_{10}$= 1433/(.08-.027) = $27.036

	1	2	3	4	5	6	7	8	9	10
Revenues	$ 694.7	$ 1,076.8	$ 1,669.1	$ 2,587.1	$ 4,010.0	$ 5,796.0	$ 7,771.3	$ 9,606.8	$10,871.1	$11,164.6
Operating Income	$ 23.3	$ 62.0	$ 136.3	$ 273.5	$ 520.3	$ 891.5	$ 1,382.2	$ 1,939.7	$ 2,456.3	$ 2,791.2
Operating Income after taxes	$ 23.3	$ 62.0	$ 136.3	$ 265.3	$ 364.2	$ 614.2	$ 937.1	$ 1,293.8	$ 1,611.4	$ 1,800.3
Reinvestment	$ 164.3	$ 254.7	$ 394.8	$ 612.0	$ 948.6	$ 1,190.7	$ 1,316.8	$ 1,223.7	$ 842.8	$ 195.7
FCFF	$ (141.0)	$ (192.7)	$ (258.5)	$ (346.6)	$ (584.4)	$ (576.5)	$ (379.7)	$ 70.0	$ 768.5	$ 1,604.6

Terminal year (11)

EBIT (1-t)	$1,849
- Reinvestment	$ 416
FCFF	$1,433

Operating assets	$9,611
+ Cash	375
+ IPO Proceeds	1000
- Debt	207
Value of equity	10,779
- Options	805
Value in stock	9,974
/ # of shares	574.44
Value/share	$17.36

Cost of capital = 11.32% (.983) + 5.16% (.017) = 11.22%

Cost of capital decreases to 8% from years 6-10

Cost of Equity
11.32%

Cost of Debt
(2.7%+5.3%)(1-.40)
= 5.16%

Weights
E = 98.31% D = 1.69%

Riskfree Rate:
Riskfree rate = 2.7%

+

Beta
1.40

90% advertising (1.44) + 10% info svcs (1.05)

D/E=1.71%

x

Risk Premium
6.15%

75% from US(5.75%) + 25% from rest of world (7.23%)

The twists in an initial public offering

- Valuation issues:
  - Use of the proceeds from the offering: The proceeds from the offering can be held as cash by the firm to cover future investment needs, paid to existing equity investors who want to cash out or used to pay down debt.
  - Warrants/ Special deals with prior equity investors: If venture capitalists and other equity investors from earlier iterations of fund raising have rights to buy or sell their equity at pre-specified prices, it can affect the value per share offered to the public.
- Pricing issues:
  - Institutional set-up: Most IPOs are backed by investment banking guarantees on the price, which can affect how they are priced.
  - Follow-up offerings: The proportion of equity being offered at initial offering and subsequent offering plans can affect pricing.

A. Use of the Proceeds

- The proceeds from an initial public offering can be
  - Taken out of the firm by the existing owners
  - Used to pay down debt and other obligations
  - Held as cash by the company to cover future reinvestment needs
- How you deal with the issuance will depend upon how the proceeds are used.
  - If taken out of the firm -> Ignore in valuation
  - If used to pay down debt -> Change the debt ratio, which may change the cost of capital and the value of the firm
  - If held as cash to cover future reinvestment needs -> Add the cash proceeds from the IPO to the DCF valuation of the company.

The IPO Proceeds: Twitter

- **How much?** News stories suggest that the company is planning on raising about $1 billion from the offering.
- **Use**: In the Twitter prospectus filing, the company specifies that it plans to keep the proceeds in the company to meet future investment needs.
  - In the valuation, I have added a billion to the estimated value of the operating assets because that cash infusion will augment the cash balance.
- How would the valuation have been different if the owners announced that they planned to withdraw half of the offering proceeds?

B. Claims from prior equity investors

- When a private firm goes public, there are already equity investors in the firm, including the founder(s), venture capitalists and other equity investors. In some cases, these equity investors can have warrants, options or other special claims on the equity of the firm.
- If existing equity investors have special claims on the equity, the value of equity per share has to be affected by these claims. Specifically, these options need to be valued at the time of the offering and the value of equity reduced by the option value before determining the value per share.

The claims on Twitter's equity

- The overall value that we estimate for Twitter's equity is $10,779 million. There are multiple claims on this equity.
  - The owners of the company own the common shares in the company
  - Twitter has seven classes of convertible, preferred stock on the company (from different VCs).
  - Twitter has 86 million restricted stock units that it has used in employee compensation.
  - Twitter has 44.16 million units of employee options, also used in compensation contracts. (Strike price=$1.82, life = 6.94 years)
  - Twitter has agreed to pay MoPub stockholders with 14.791 million shares.
- The convertible preferred shares will be converted at the time of the offering and the common shares outstanding will be 472.61 million, not counting RSUs and options. In the valuation:
  - Number of commons shares= 574.44 million (all but options)
  - Option value = $805 million (with maturity set to 3.47 years)

C. The Investment Banking guarantee…

- Almost all IPOs are managed by investment banks and are backed by a pricing guarantee, where the investment banker guarantees the offering price to the issuer.
- If the price at which the issuance is made is lower than the guaranteed price, the investment banker will buy the shares at the guaranteed price and potentially bear the loss.

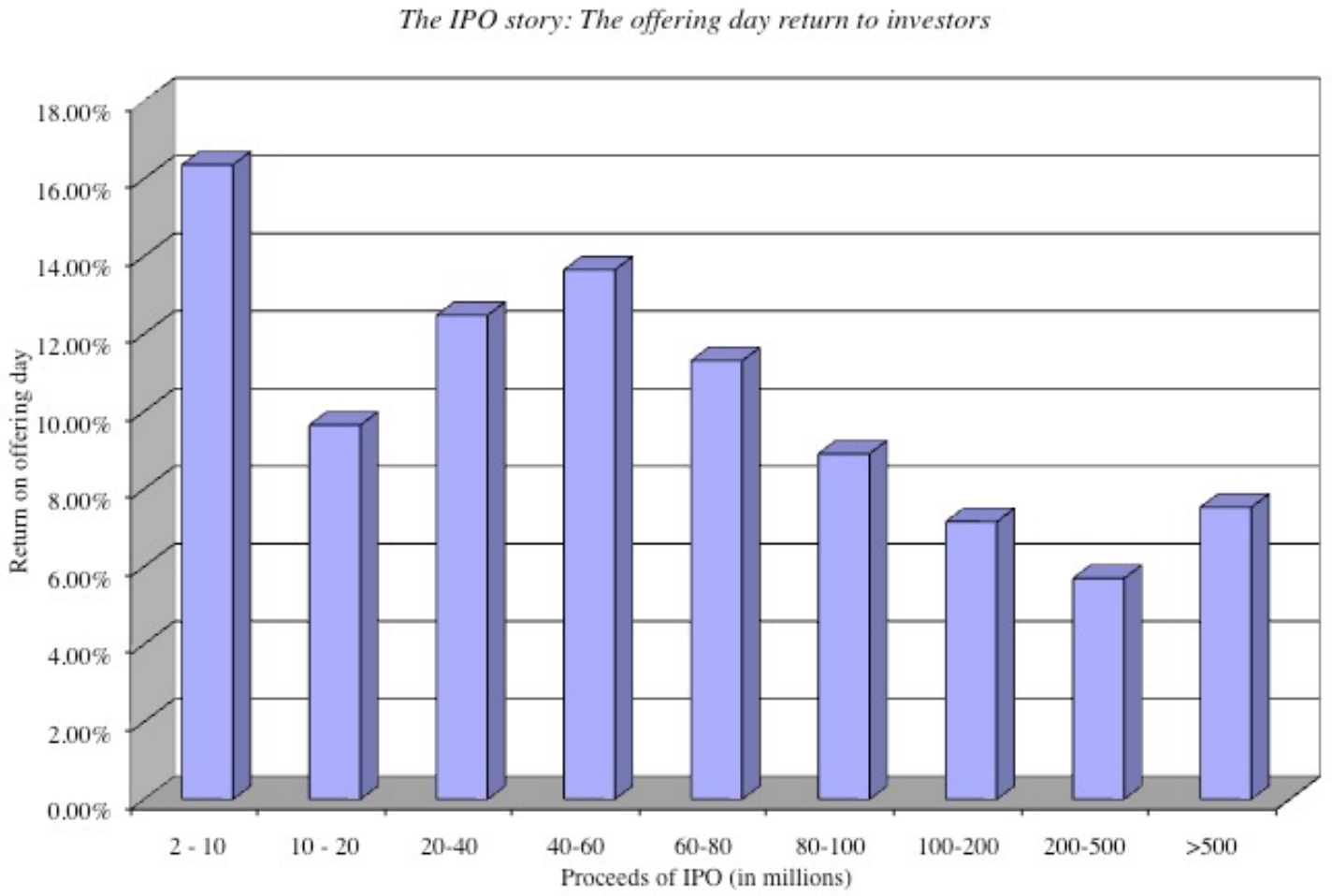
Pricing versus Value

- Earlier I assessed the value of equity at Twitter to be $9.97 billion (with a value per share of $17.36/share).
- Assume, however, that the market appetite for social media stocks is high and that you pull up the valuations of other publicly traded stocks in the market:

Company	*EV*	*Market Cap*	*Sales*	*Users*	*EV/Sales*	*Market Cap/User*
Facebook	$100,017.00	$107,909.00	$6,118.00	1110	16.35	$97.22
LinkedIn	$28,448.50	$29,321.90	$1,244.00	225	22.87	$130.32
FB+LNKD	$128,465.50	$137,230.90	$7,362.00	1335	17.45	$102.79
Twitter	?	?	$483.00	215		

- What would you base your offer price on? How would you sell it?

The evidence on IPO pricing



An investment opportunity?

- Assume that investment banks try to under price initial public offerings by approximately 10-15%. As an investor, what strategy would you adopt to take advantage of this behavior?

- Why might it not work?

D. The offering quantity

- Assume now that you are the owner of Twitter and were offering 100% of the shares in company in the offering to the public? If investors are willing to pay $20 billion for the common stock, how much do you lose because of the under pricing (15%)?

- Assume that you were offering only 10% of the shares in the initial offering and plan to sell a large portion of your remaining stake over the following two years? Would your views of the under pricing and its effect on your wealth change as a consequence?

Alternatives to IPOs

- The traditional IPO model, with banks operating as intermediaries and setting offering prices, has come under assault for two reasons:
  - Banking failures on the services (pricing & selling0 that they offer in return for the fees.
  - Loss of the credibility effect of a banking guarantee, as bankers have fallen in public standing.
- There have been two alternatives offered:
  - In a direct listing, the listing company lists its shares directly on the exchange, and let's demand and supply set the price.
  - In a SPAC, a publicly traded entity collects money for a future (but unspecified) IPO, and uses the funds to buy out a private company (which now takes on the standing of the public company).

IV. An Intermediate Problem Private to VC to Public offering…

- Assume that you have a private business operating in a sector, where publicly traded companies have an average beta of 1 and where the average correlation of firms with the market is 0.25. Consider the cost of equity at three stages (Riskfree rate = 4%; ERP = 5%):
- Stage 1: The nascent business, with a private owner, who is fully invested in that business.

  Perceived Beta = 1/ 0.25 = 4

  Cost of Equity = 4% + 4 (5%) = 24%
- Stage 2: Angel financing provided by specialized venture capitalist, who holds multiple investments, in high technology companies. (Correlation of portfolio with market is 0.5)

  Perceived Beta = 1/0.5 = 2

  Cost of Equity = 4% + 2 (5%) = 14%
- Stage 3: Public offering, where investors are retail and institutional investors, with diversified portfolios:

  Perceived Beta = 1

  Cost of Equity = 4% + 1 (5%) = 9%

To value this company…

Assume that this company will be fully owned by its current owner for two years, will access the technology venture capitalist at the start of year 3 and that is expected to either go public or be sold to a publicly traded firm at the end of year 5.

	1	2	3	4	5	Terminal year
E(Cash flow)	$100	$125	$150	$165	$170	$175
Market beta	1	1	1	1	1	1
Correlation	0.25	0.25	0.5	0.5	0.5	1
Beta used	4	4	2	2	2	1
Cost of equity	24.00%	24.00%	14.00%	14.00%	14.00%	9.00%
Terminal value					$2,500	
Cumulated COE	1.2400	1.5376	1.7529	1.9983	2.2780	2.4830
PV	$80.65	$81.30	$85.57	$82.57	$1,172.07	

Growth rate 2% forever after year 5

175/ (.09-.02)

Value of firm	$1,502	(Correct value, using changing costs of equity)
Value of firm	$1,221	(using 24% as cost of equity forever. You will undervalue firm)
Value of firm	$2,165	(Using 9% as cost of equity forever. You will overvalue firm)

Implications

- Proposition 1: The value of a private business that is expected to transition to a publicly traded company will be higher than the value of an otherwise similar private business that does not expect to make this transition.
  - Private businesses in sectors that are "hot" in terms of going public (social media in 2014) will be worth more than private businesses in less sexy sectors.
  - As IPOs boom (bust) private company valuations will increase (decrease).
  - Private companies in countries that have easy access to public markets will have higher value than companies in countries without that access.
- Proposition 2: The value of a private business that expects to make the transition to a public company sooner will be higher than the value of an otherwise similar company that will take longer.
  - Private businesses will be worth more if companies are able to go public earlier in their life cycle.

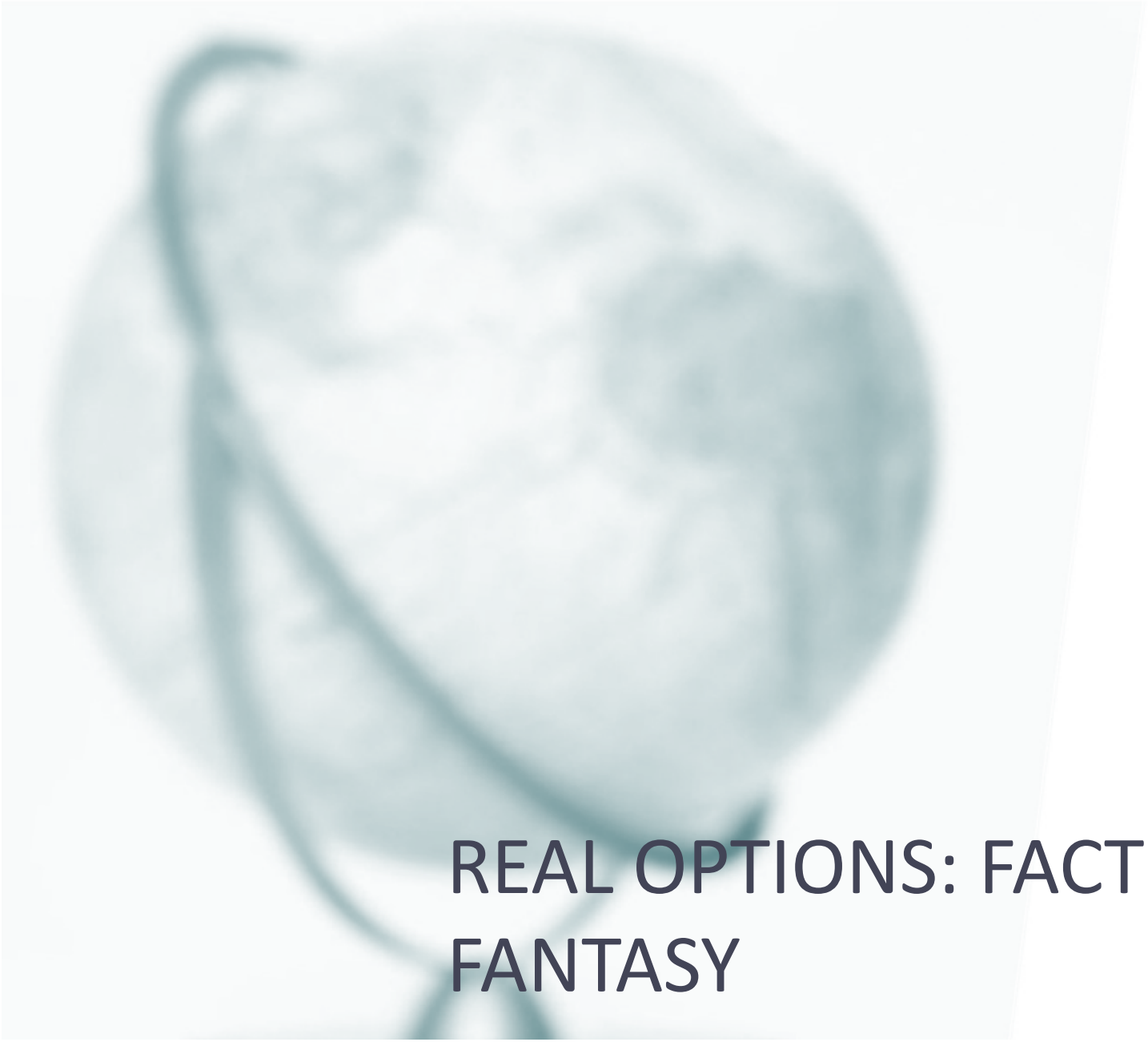
Private company valuation: Closing thoughts

- The value of a private business will depend on the potential buyer.
- If you are the seller of a private business, you will maximize value, if you can sell to
  - A long term investor
  - Who is well diversified (or whose investors are)
  - And does not think too highly of you (as a person)
- If you are valuing a private business for legal purposes (tax or divorce court), the assumptions you use and the value you arrive at will depend on which side of the legal divide you are on.
- As a final proposition, always keep in mind that the owner of a private business has the option of investing his wealth in publicly traded stocks. There has to be a relationship between what you can earn on those investments and what you demand as a return on your business.

VALUATION: PACKET 3
REAL OPTIONS, ACQUISITION VALUATION AND VALUE ENHANCEMENT

Aswath Damodaran

Updated: January 2021



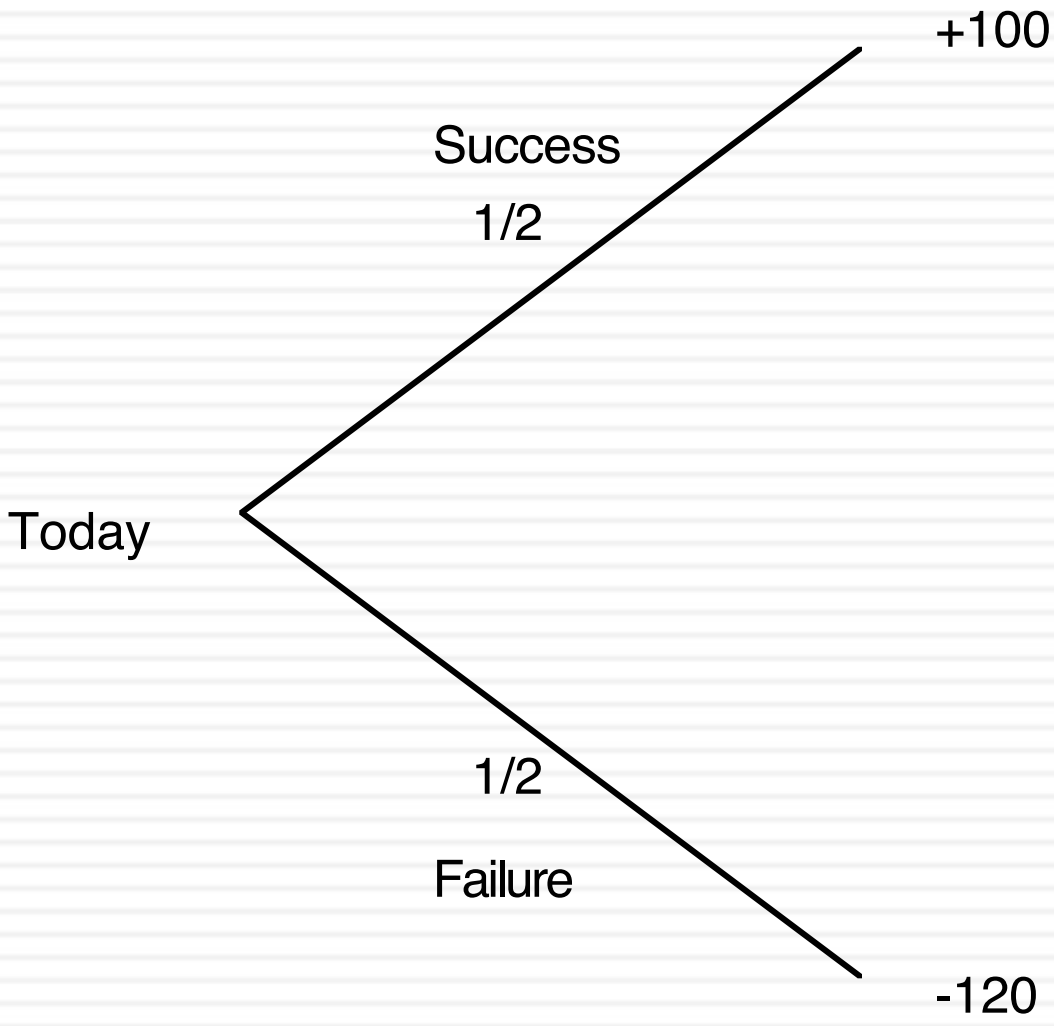
REAL OPTIONS: FACT AND FANTASY

Aswath Damodaran

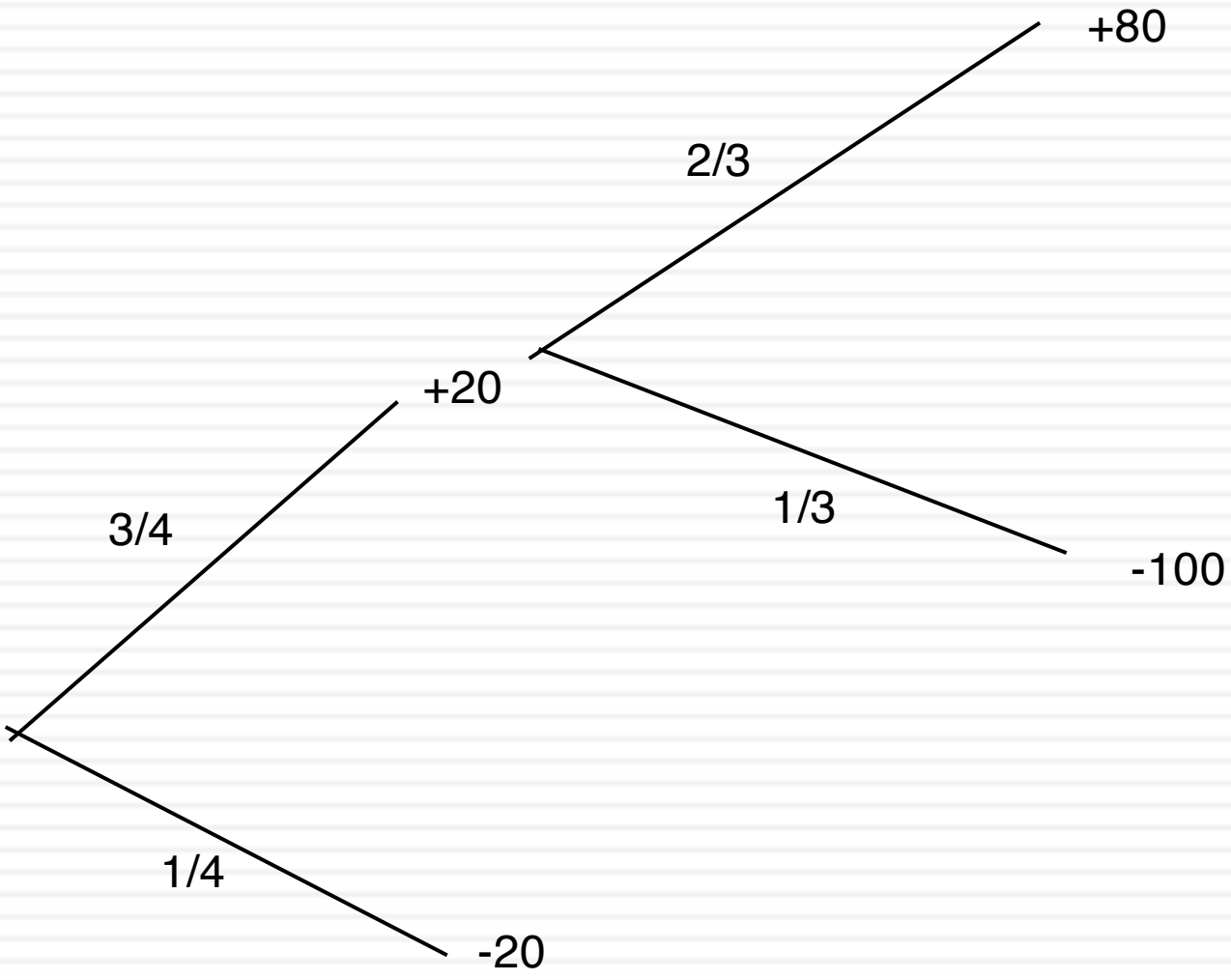
Underlying Theme: Searching for an Elusive Premium

- Traditional discounted cashflow models under estimate the value of investments, where there are options embedded in the investments to
  - Delay or defer making the investment (delay)
  - Adjust or alter production schedules as price changes (flexibility)
  - Expand into new markets or products at later stages in the process, based upon observing favorable outcomes at the early stages (expansion)
  - Stop production or abandon investments if the outcomes are unfavorable at early stages (abandonment)
- Put another way, real option advocates believe that you should be paying a premium on discounted cashflow value estimates.

A bad investment…



Becomes a good one…



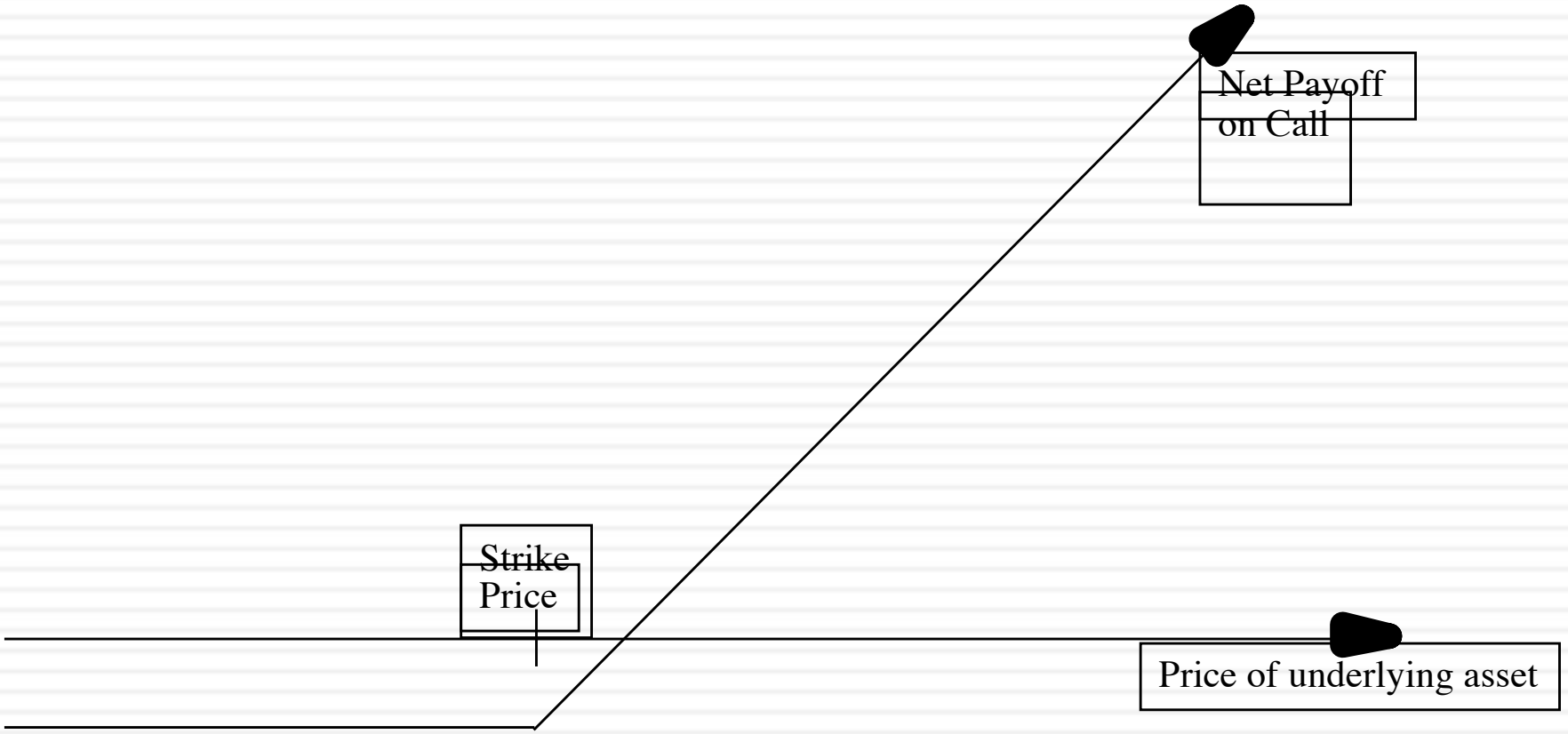
Three Basic Questions

- When is there a real option embedded in a decision or an asset?
- When does that real option have significant economic value?
- Can that value be estimated using an option pricing model?

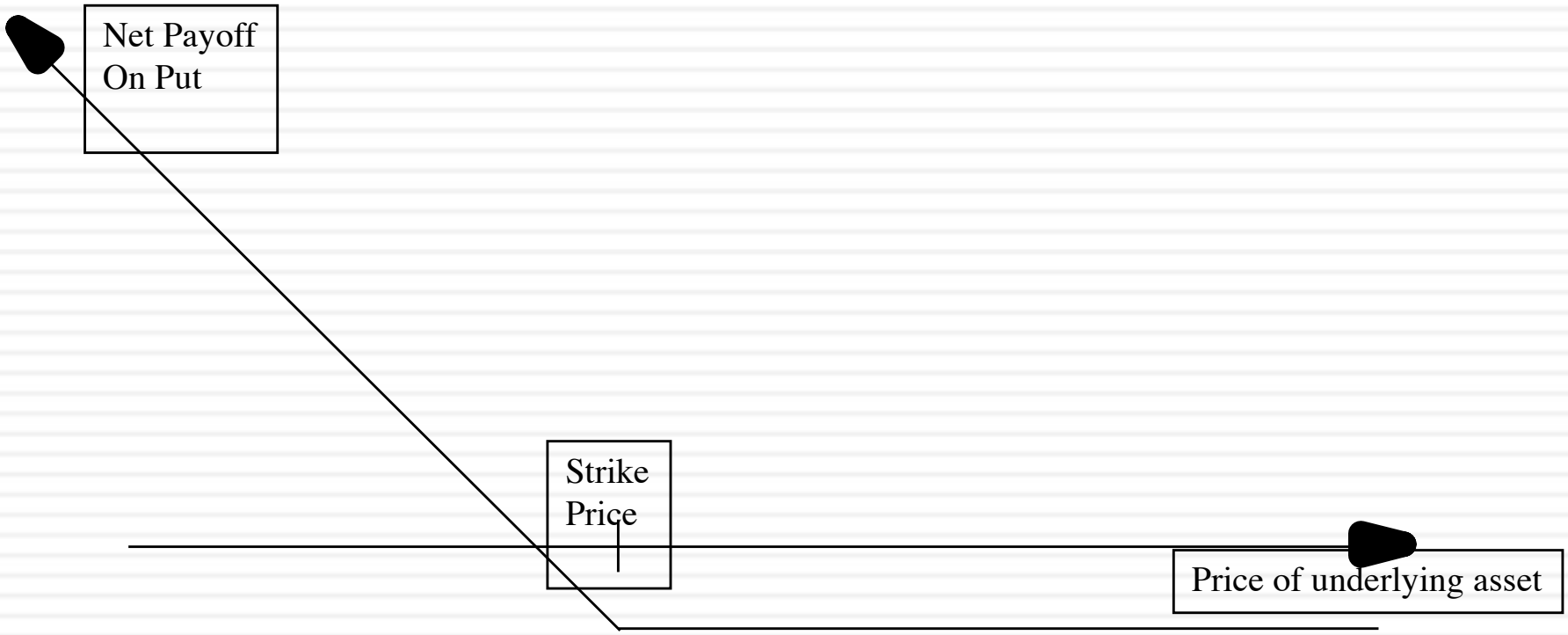
When is there an option embedded in an action?

- An option provides the holder with the right to buy or sell a specified quantity of an underlying asset at a fixed price (called a strike price or an exercise price) at or before the expiration date of the option.
- There has to be a clearly defined underlying asset whose value changes over time in unpredictable ways.
- The payoffs on this asset (real option) have to be contingent on an specified event occurring within a finite period.

Payoff Diagram on a Call



Payoff Diagram on Put Option



When does the option have significant economic value?

- For an option to have significant economic value, there has to be a restriction on competition in the event of the contingency. In a perfectly competitive product market, no contingency, no matter how positive, will generate positive net present value.
- At the limit, real options are most valuable when you have exclusivity - you and only you can take advantage of the contingency. They become less valuable as the barriers to competition become less steep.

Determinants of option value

- Variables Relating to Underlying Asset
  - Value of Underlying Asset; as this value increases, the right to buy at a fixed price (calls) will become more valuable and the right to sell at a fixed price (puts) will become less valuable.
  - Variance in that value; as the variance increases, both calls and puts will become more valuable because all options have limited downside and depend upon price volatility for upside.
  - Expected dividends on the asset, which are likely to reduce the price appreciation component of the asset, reducing the value of calls and increasing the value of puts.
- Variables Relating to Option
  - Strike Price of Options; the right to buy (sell) at a fixed price becomes more (less) valuable at a lower price.
  - Life of the Option; both calls and puts benefit from a longer life.
- Level of Interest Rates; as rates increase, the right to buy (sell) at a fixed price in the future becomes more (less) valuable.

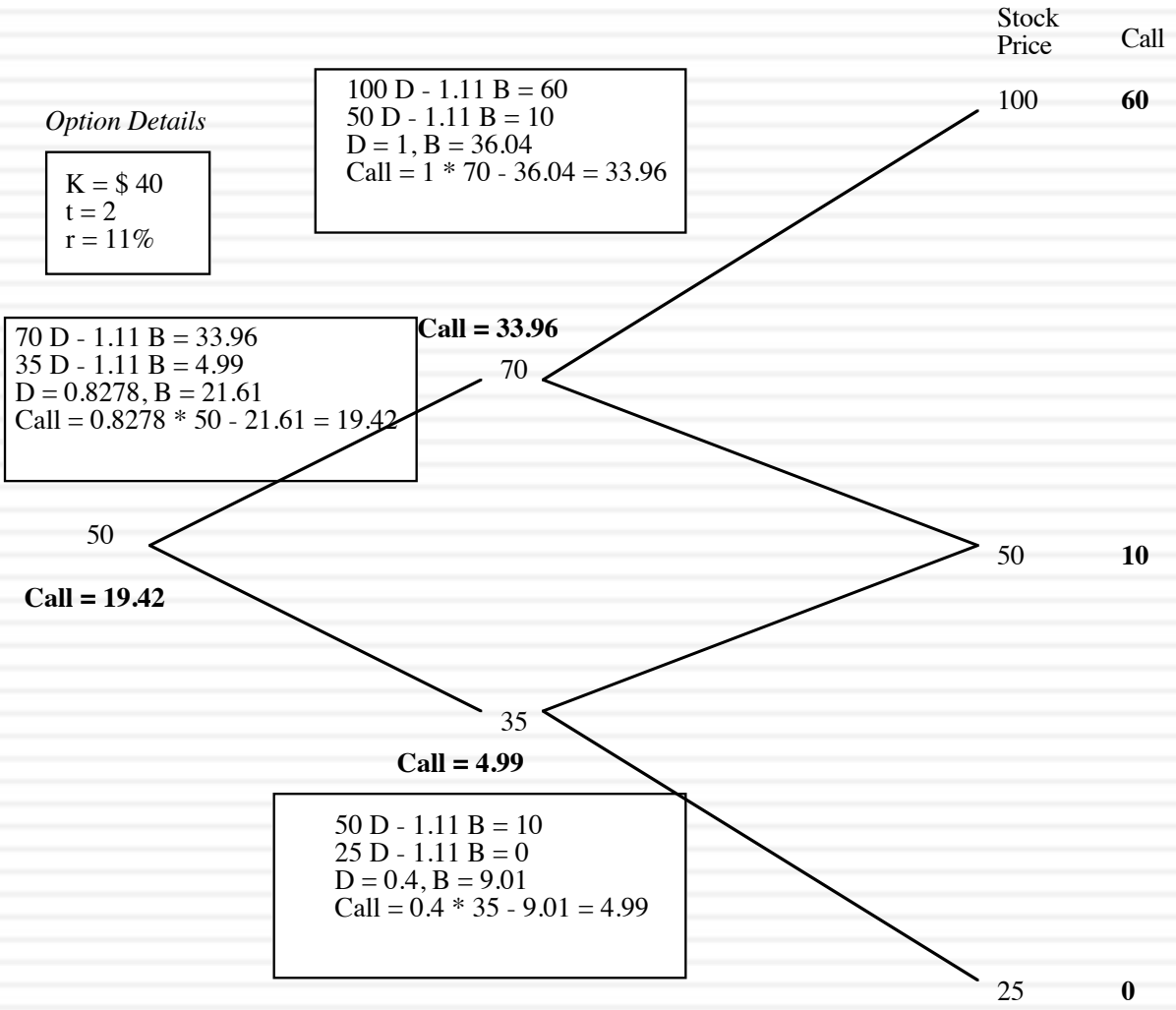
When can you use option pricing models to value real options?

- The notion of a replicating portfolio that drives option pricing models makes them most suited for valuing real options where
  - The underlying asset is traded - this yield not only observable prices and volatility as inputs to option pricing models but allows for the possibility of creating replicating portfolios
  - An active marketplace exists for the option itself.
  - The cost of exercising the option is known with some degree of certainty.
- When option pricing models are used to value real assets, we have to accept the fact that
  - The value estimates that emerge will be far more imprecise.
  - The value can deviate much more dramatically from market price because of the difficulty of arbitrage.

Creating a replicating portfolio

- The objective in creating a replicating portfolio is to use a combination of riskfree borrowing/lending and the underlying asset to create the same cashflows as the option being valued.
  - Call = Borrowing + Buying D of the Underlying Stock
  - Put = Selling Short D on Underlying Asset + Lending
  - The number of shares bought or sold is called the option delta.
- The principles of arbitrage then apply, and the value of the option has to be equal to the value of the replicating portfolio.

The Binomial Option Pricing Model



The Limiting Distributions….

- As the time interval is shortened, the limiting distribution, as t -> 0, can take one of two forms.
  - If as t -> 0, price changes become smaller, the limiting distribution is the normal distribution and the price process is a continuous one.
  - If as t->0, price changes remain large, the limiting distribution is the poisson distribution, i.e., a distribution that allows for price jumps.
- The Black-Scholes model applies when the limiting distribution is the normal distribution , and explicitly assumes that the price process is continuous and that there are no jumps in asset prices.

Black and Scholes…

- The version of the model presented by Black and Scholes was designed to value European options, which were dividend-protected.
- The value of a call option in the Black-Scholes model can be written as a function of the following variables:
  - S = Current value of the underlying asset
  - K = Strike price of the option
  - t = Life to expiration of the option
  - r = Riskless interest rate corresponding to the life of the option
  - σ^2 = Variance in the ln(value) of the underlying asset

The Black Scholes Model

Value of call = S N (d1) - K e^{-rt} N(d2)

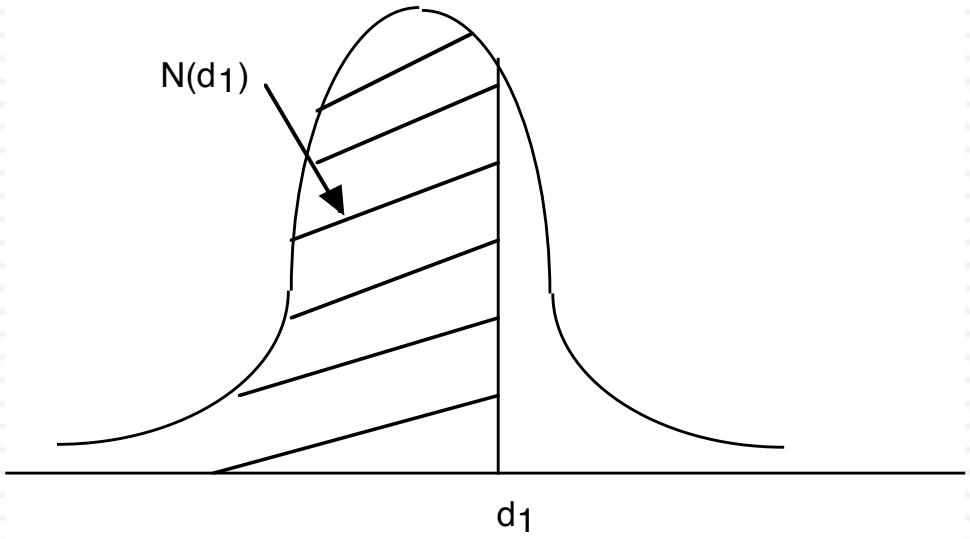
where

$$d_1 = \frac{\ln\left(\frac{S}{K}\right) + \left(r + \frac{\sigma^2}{2}\right) t}{\sigma \sqrt{t}}$$

d2 = d1 - ? √t

- The replicating portfolio is embedded in the Black-Scholes model. To replicate this call, you would need to
  - Buy N(d1) shares of stock; N(d1) is called the option delta
  - Borrow K e^{-rt} N(d2)

The Normal Distribution



d	N(d)	d	N(d)	d	N(d)
-3.00	0.0013	-1.00	0.1587	1.05	0.8531
-2.95	0.0016	-0.95	0.1711	1.10	0.8643
-2.90	0.0019	-0.90	0.1841	1.15	0.8749
-2.85	0.0022	-0.85	0.1977	1.20	0.8849
-2.80	0.0026	-0.80	0.2119	1.25	0.8944
-2.75	0.0030	-0.75	0.2266	1.30	0.9032
-2.70	0.0035	-0.70	0.2420	1.35	0.9115
-2.65	0.0040	-0.65	0.2578	1.40	0.9192
-2.60	0.0047	-0.60	0.2743	1.45	0.9265
-2.55	0.0054	-0.55	0.2912	1.50	0.9332
-2.50	0.0062	-0.50	0.3085	1.55	0.9394
-2.45	0.0071	-0.45	0.3264	1.60	0.9452
-2.40	0.0082	-0.40	0.3446	1.65	0.9505
-2.35	0.0094	-0.35	0.3632	1.70	0.9554
-2.30	0.0107	-0.30	0.3821	1.75	0.9599
-2.25	0.0122	-0.25	0.4013	1.80	0.9641
-2.20	0.0139	-0.20	0.4207	1.85	0.9678
-2.15	0.0158	-0.15	0.4404	1.90	0.9713
-2.10	0.0179	-0.10	0.4602	1.95	0.9744
-2.05	0.0202	-0.05	0.4801	2.00	0.9772
-2.00	0.0228	0.00	0.5000	2.05	0.9798
-1.95	0.0256	0.05	0.5199	2.10	0.9821
-1.90	0.0287	0.10	0.5398	2.15	0.9842
-1.85	0.0322	0.15	0.5596	2.20	0.9861
-1.80	0.0359	0.20	0.5793	2.25	0.9878
-1.75	0.0401	0.25	0.5987	2.30	0.9893
-1.70	0.0446	0.30	0.6179	2.35	0.9906
-1.65	0.0495	0.35	0.6368	2.40	0.9918
-1.60	0.0548	0.40	0.6554	2.45	0.9929
-1.55	0.0606	0.45	0.6736	2.50	0.9938
-1.50	0.0668	0.50	0.6915	2.55	0.9946
-1.45	0.0735	0.55	0.7088	2.60	0.9953
-1.40	0.0808	0.60	0.7257	2.65	0.9960
-1.35	0.0885	0.65	0.7422	2.70	0.9965
-1.30	0.0968	0.70	0.7580	2.75	0.9970
-1.25	0.1056	0.75	0.7734	2.80	0.9974
-1.20	0.1151	0.80	0.7881	2.85	0.9978
-1.15	0.1251	0.85	0.8023	2.90	0.9981
-1.10	0.1357	0.90	0.8159	2.95	0.9984
-1.05	0.1469	0.95	0.8289	3.00	0.9987
-1.00	0.1587	1.00	0.8413		