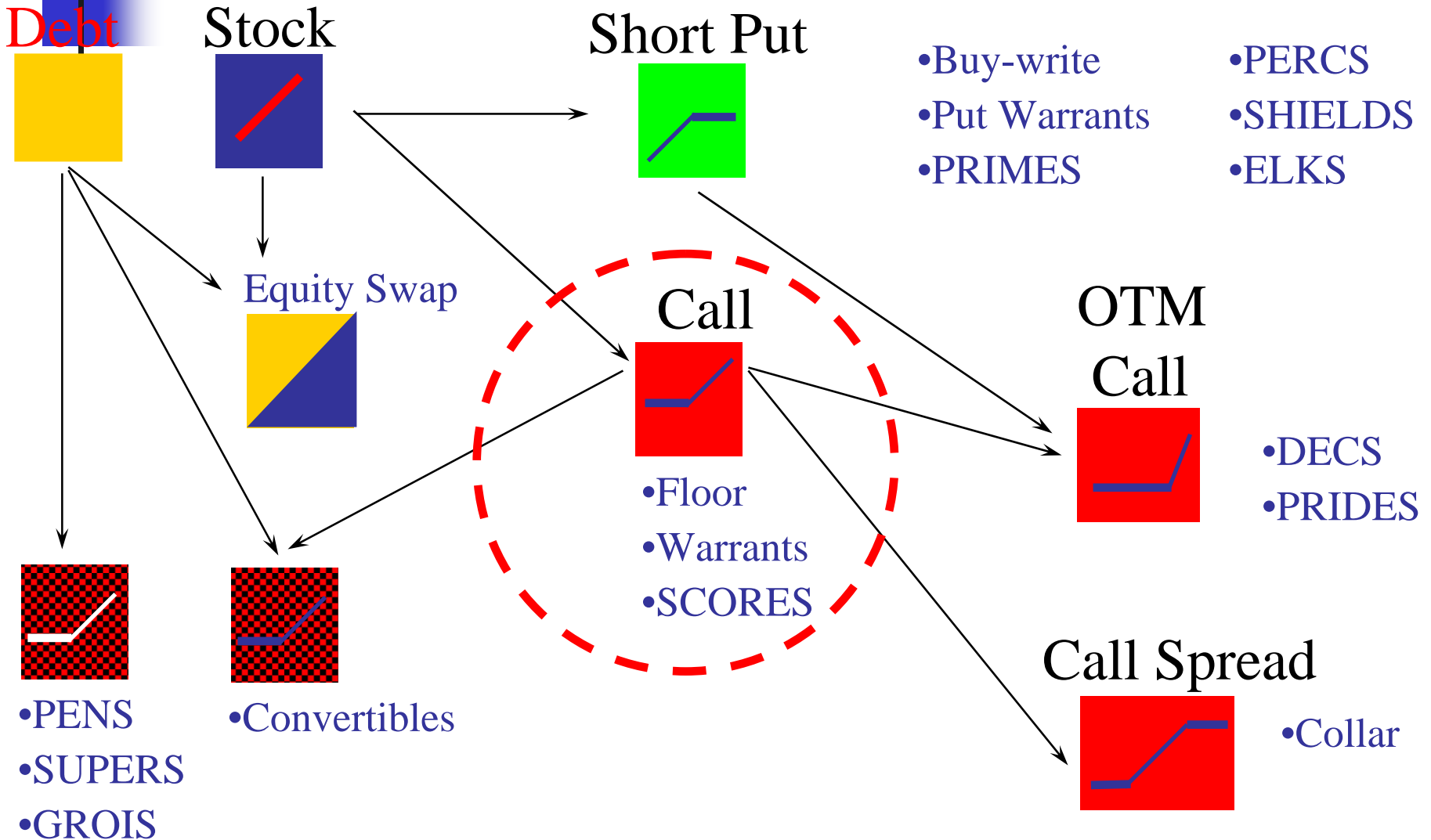




Warrants

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Roadmap: Warrants





Agenda: Warrants

- What are warrants
- How they are traded
- Warrant valuation
- Warrant markets



Warrants

- Option to purchase stock
 - Agreed strike price (Subscription price)
 - Fixed term, typically 4-5 years
 - Either European or American
- Issuer: Mainly corporations
 - Some third party issuers
- Most warrants issued as part of package
 - Stock or debt issue - "Bonds cum Warrants"
 - Warrants usually detachable
 - Bonds subsequently traded "Expaper" - straight debt



Rationale for Issuing

- Purpose:
 - Increase attractiveness of offering
 - Reduce financing cost
- Tax & Accounting Advantages
 - Fair market value of warrant treated as equity
 - rather than as debt for convertible bond
 - Issuer can use “Treasury Stock” method for EPS
 - rather than “if converted” method for convertibles
 - Amortized warrant value allocated to host bond
 - Increases interest expense for accounting purposes



Warrant Types

- Warrants with Common Stock or Bonds
 - Debt Warrants
 - Allow investors to purchase additional debt
 - Warranted bond usually has same coupon & maturity as host bond
 - Harmless Warrants:
 - Variant of debt warrants
 - Warrant not exercisable until host bond becomes callable
 - If warrants exercised bonds will be called, so no increase in debt



Warrant Types

Covered Warrants

- Synthetic warrants issued by third party
 - e.g. Japanese debt warrants: BT issued identical warrants in local currency for Swiss investors
- Put Warrants
 - Right to sell company's common stock
 - Typically used as part of share repo program
 - e.g. company wants to hedge employee share options
 - Takes in option premium
- Asset Warrants
 - Based on any asset, e.g. currency, Nikkei 225



Warrant Trading

- Mostly OTC
- Exchange traded:
 - Rules for common stock apply
 - Settlement 5 days from trade date
 - Can be bought on margin
 - Can be sold short, but only on plus tick
 - Must borrow warrant to sell short



History of Warrant Market

- 1920's bull market
 - Used for speculation
 - Abandoned after collapse in 1929
- 1960's : conglomeration (until 1969)
- 1970's 1st major blue chip issue (AT&T)
 - Listed by NYSE for first time
- 1980's: Japanese Warrant Market
 - \$65Bn in 1990
 - \$3Bn in 1992



Japanese Warrant Market

- Over 1,700 warrants by 850 companies in 1980's
- Motivation:
 - Issuing costs (underwriting)
 - Eurodollar issue: 2.25%
 - Warrants: 1.625%
 - Japanese Accounting
 - Bond cum warrant valued as straight bond!
 - Currency: strengthening Yen cheapened US\$ issues
- Result: All-in net cost under 2% in Yen terms
 - Some issuers achieved -ve financing cost!



Synthetic Warrants

- Warrants created to match required features/payoffs
 - Usually based on existing warrant issue
 - Issued by banks rather than corporations
- Example: Swiss Franc Warrants
 - Swiss wanted SF denominated securities
 - Banks issued SF warrants
 - Hedged by buying US\$ denominated Japanese warrants
- Other Examples:
 - Equity Index warrants
 - Foreign Exchange warrants
 - Warrants on Latin American, HK stocks



Why Synthetic Warrants?

- Tax
 - Switzerland
 - Warrants not considered securities
 - Escape stamp tax
 - Germany
 - No capital gains tax
- Investment Restrictions
 - Fund may be restricted from shorting a security outright, or even trading a spread
 - Create a synthetic warrant which will exercise into the difference between two securities



Warrants & Call Options

Warrants

Options

Issuer

Company

Third party

Term

4 years

1 year

Traded

OTC

Exchange

Delivery

New Stock

Existing Stock



Implications for Warrant Valuation

- Company Issued
 - Higher issuing cost
 - OTC Traded
 - Higher transaction cost
- ☞ Longer Term
 - ◆ Mean reversion of volatility
 - ◆ Likely to reduce cost
 - ☞ New Stock
 - ◆ Dilution
 - ◆ Reduces share value

☞ CONCLUSION:


- Warrants are typically priced lower than call options
- Often look “cheap” on a Black-Scholes valuation basis



Lab: Atlas Pharmaceuticals

■ \$100mm Debt & Warrant Issue

- Existing Debt = \$500MM D
- Value Ex-paper = \$80MM
- Shares Outstanding = 10MM N
- Current Stock Price = \$65 S
- Number of Warrants = 1MM M
- Exercise Price = \$65 X
- Term = 4 years t
- Stock volatility = 30% v
- Risk-free rate = 5% r_f



Questions: Atlas Pharmaceuticals

- What is the warrant premium?
- Construct the Balance Sheet
 - Before Issue
 - After Issue
 - After Conversion
- What is the share price after conversion?
- Worksheet - Atlas Balance Sheet

Solution: Atlas Balance Sheet

- Warrant Premium

- New Issue Value – Expaper = \$100MM - \$80MM = \$20MM

- Post-Exercise Balance Sheet

	Assets	Liabs	
Existing Assets	1,150	500	Existing Debt
New Assets	145	80	Expaper
		715	Common Stock
	<u>1,295</u>	<u>1,295</u>	

- Share Value Post-Exercise:

- Shares outstanding = 10MM + 1MM = 11MM
- Value per share = \$715 /11 = \$65



Conventional Measures

- Premium

- $$\frac{(\text{Subscription price} + \text{Warrant Premium}) - 1}{\text{Share Price}}$$

- Lower the premium, more attractive the warrant

- Gearing Ratio

- $$\frac{\text{Share Price}}{\text{Warrant Premium}}$$

- How much warrant price changes for given change in stock price
- Higher the gearing, more attractive the warrant



Conventional Measures

- Break-even Share Price

- Share Price \times Subscription Price

- $\frac{\quad}{\text{Share Price} - \text{Warrant Price}}$

- Price level which stock must achieve before warrant will outperform:

- % Gain on Stock = % Gain on Warrant

- Assumes premium goes to zero:

- $(S^* - S)/S = (W^* - W) / W = ([S^* - E] - W) / W$

- $S^*/S = (S^* - E) / W$, hence $S^* (S - W) = S E$

- $S^* = S \times E / (S - W)$



Lab: Atlas Warrants - Conventional Analysis

- Worksheet: Atlas Warrants
- Compute:
 - Premium
 - Gearing
 - Break-even
- How useful / valid are these measures?

Solution: Atlas Warrants - Conventional Analysis

■ Premium

- $$\frac{(\text{Subscription price} + \text{Warrant Premium})}{\text{Share Price}} - 1$$

- $$(65 + 20)/65 - 1 = 30.8\%$$

■ Gearing Ratio $\frac{\text{Share Price}}{\text{Warrant Premium}} = 65/20 = 3.25$

■ Break-even Share Price

- $$\text{Share Price} \times \frac{\text{Subscription Price}}{\text{Share Price} - \text{Warrant Premium}}$$

- $$65 \times 65 / (65 - 20) = \$93.89$$



Comments on Conventional Analysis

- Pre-dates option theory
 - Not bad, but largely superseded
- Makes very simple assumptions:
 - E.g. premium goes to zero
 - Ignores time value of money
- Premium:
 - Will rise as warrant moves into the money
- Break-even: Assumes premium goes to zero
 - Okay for deep in the money warrants
 - Too high break-even for most warrants (ignores time value of option)



Warrant Valuation: Option Models

- Underlying is Common Stock
 - Use Black-Scholes or Binomial
 - Adjust for dividends as usual
 - Adjust for dilution effect
 - Adjust for volatility effect
- Underlying is Debt:
 - Black-Scholes not applicable
 - Need a debt option model



Lab: Atlas Warrants - Option Valuation

- Next: Use option calculator to value warrants
- Compare with book value
- Do they look rich or cheap?



Adjusting for Dilution Effects

- Warrant Payoff at Maturity:
 - If we assume warrant premium retained:
 - $[1 - M/(N + M)] \times \text{Max}[(S + W/N) - X, 0]$
 - If warrant premium paid out as dividends:
 - $[1 - M/(N + M)] \times \text{Max}[S - X, 0]$
 - (1-Dilution Factor) x Call Option
 - W = warrant premium
 - S = share price, prior to exercise
 - N = shares outstanding, prior to exercise
 - M = number of warrants
 - X = strike price



Adjusting For Dilution Effects

- Notation:-

- E = value of equity, prior to exercise
- E^* = value of equity, after exercise
- W = warrant premium
- S = share price, prior to exercise
- S^* = share price, after exercise
- N = shares outstanding, prior to exercise
- M = number of warrants
- X = strike price



Adjusting for Dilution Effects

- Pre-Exercise Equity: $E = N S + W$
- Post-Exercise
 - Shares Issued = $N + M$
 - Proceeds from warrant exercise = MX
 - $E^* = E + MX$
 - $S^* = E^* / (N + M) = (E + MX)/(N + M)$



Warrant Value at Maturity

- Warrant Payoff

- Post-Exercise Stock Price - Exercise Price
- $\text{Max}[S^* - X, 0]$
- $\text{Max}[(E + MX)/(N + M) - X, 0]$
- $\text{Max}[(NS + W + MX)/(N + M) - X, 0]$
- $(1 - M/(N + M)) \times \text{Max}[(S + W/N) - X, 0]$

The Underlying & Its Volatility

- Assume Warrant Premium W is Retained:
 - $[1 - M/(N + M)] \times \text{Max}[(S + W/N) - X, 0]$
 - Dilution Factor x Call Option
 - Use Black Scholes to value call option
- However: underlying is $S^* = (S + W/N)$
- S^* is like a similar stock, but:
 - Higher price
 - Different capital structure
 - Equity + Warrant instead of just Equity
- What is volatility of this stock S^* ?
 - Not yet observed!

Volatility Adjustment

- $\sigma_A = \frac{E}{D + E} \times \sigma_E + \frac{D}{D + E} \times \sigma_D$
- Assume:
 - Debt is riskless so $\sigma_D = 0$
 - And σ_A remains constant (within reason!)
- Then $\sigma_E^* = \frac{D^* + E^*}{E^*} \times \frac{E}{D + E} \times \sigma_E$
 - * denotes post-issue (NOT post-exercise!)



Lab: Complete Warrant Valuation For Atlas

- Dilution Factor
- Adjusted Stock Value
 - Add on warrant premium per share
- Volatility adjustment
 - Compute pre- and post-issue Equity Ratio
- Use Option Calculator
- Worksheet - Atlas Warrants



Solution: Atlas Warrant Valuation

Valuation
Method

Warrant
Value (\$)

Book	\$20.00
Unadjusted Black Scholes	\$20.57
Adjusted Black-Scholes	\$20.69



Trading Japanese Warrants in Practice

- New Issue Buyers Cash in Quickly
 - Warrants trade into the money on low implieds
 - Severely undervalued during sharp market advances
- Japanese Constrained from Realizing Losses
 - Deep out of the money warrants stick on high valuations
- Warrants are Difficult to Borrow
 - At the money warrants have high implieds
 - Arbitrageurs unable to borrow & go short
- Falling Interest Rates
 - Should decrease call premiums
 - Warrants trade up on good news for earnings!



Implications for Valuation

- Warrants often appear relatively cheap:
 - On Black-Scholes valuation basis
- Reasons:
 - Dilution
 - High transaction costs
 - Borrowing restrictions / poor liquidity
 - Long maturity / non-stationery volatility
- Exercise:
 - Options: exercise one, exercise all
 - Warrants: may not pay to exercise all due to dilution



Summary: Warrants

- Warrants are like call options - with a twist
- Packaged with Debt, Equity or standalone
- Markets & trading
 - Japanese market is key
- Valuation
 - Why warrants appear cheap
 - Requires adjustments for:
 - Dilution
 - Volatility