

# Masters in FINANCE

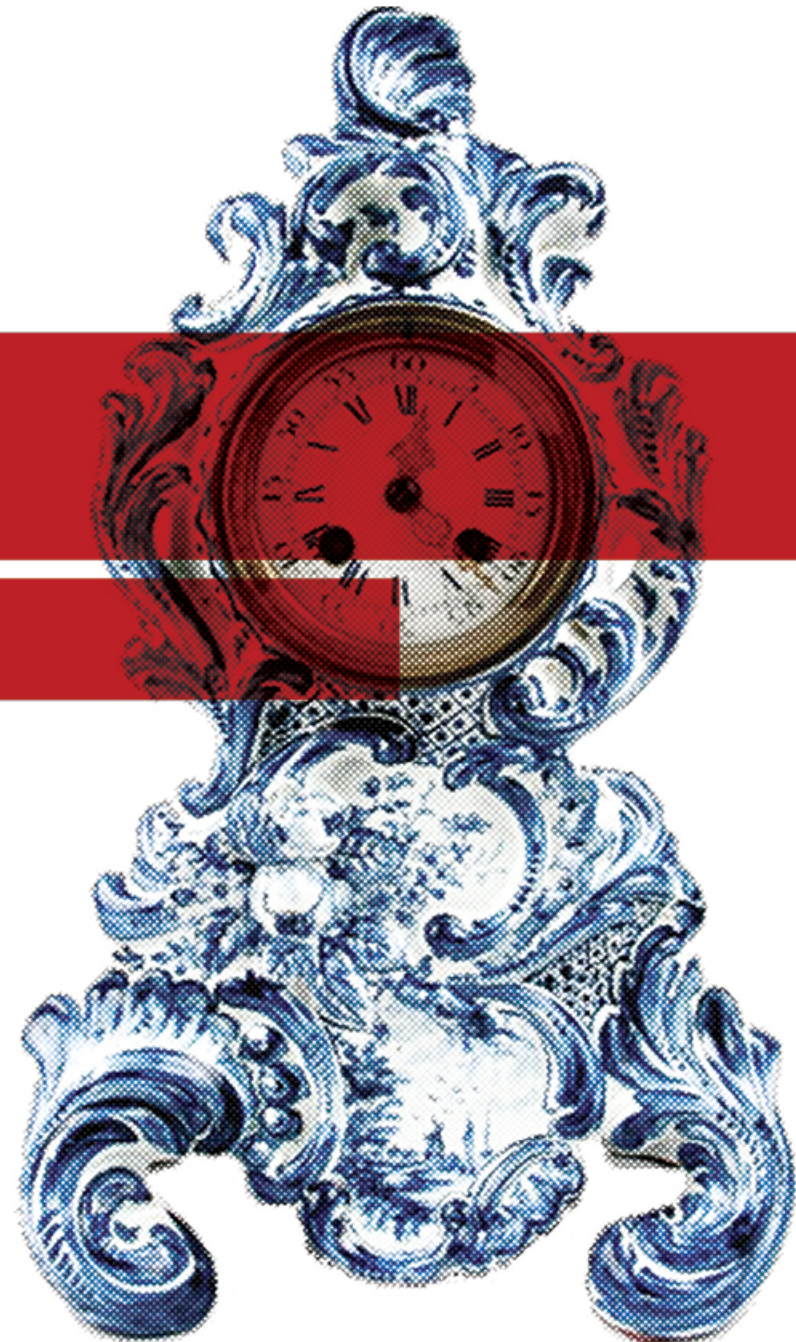
## HYBRID FINANCING Warrants & Rights Issues

Corporate Investment Appraisal

Fall 2016



100 ANOS A PENSAR NO FUTURO



# OUTLINE



LISBON  
SCHOOL OF  
ECONOMICS &  
MANAGEMENT  
UNIVERSIDADE DE LISBOA

1. Warrants
2. Rights issues



# 1. Warrants

Warrants are similar to call options traded in the market: their owner has the right to buy shares of a company for a certain exercise price at (or until) maturity.

However, there are some differences:

- When the warrant is issued by a company, the company raises that amount of cash;
- When the warrant is exercised, the exercise price is received by the company;
- When the warrant is exercised, NEW shares are issued by the company (“dilution” effect).

# Payoff at Maturity



Consider the payoff at maturity for the warrant-holders:

$n$  shares outstanding;

$m$  warrants issued;

Each warrant convertible into  $r$  shares;

At an exercise price  $K$ .

$V^*$  is the value of the company at maturity, if the warrants were not exercised.

Payoff to all warrant-holders in case they exercise:

$$\frac{rm}{n + rm} (V^* + rmK) - rmK = \frac{rm}{n + rm} (V^* - nK)$$

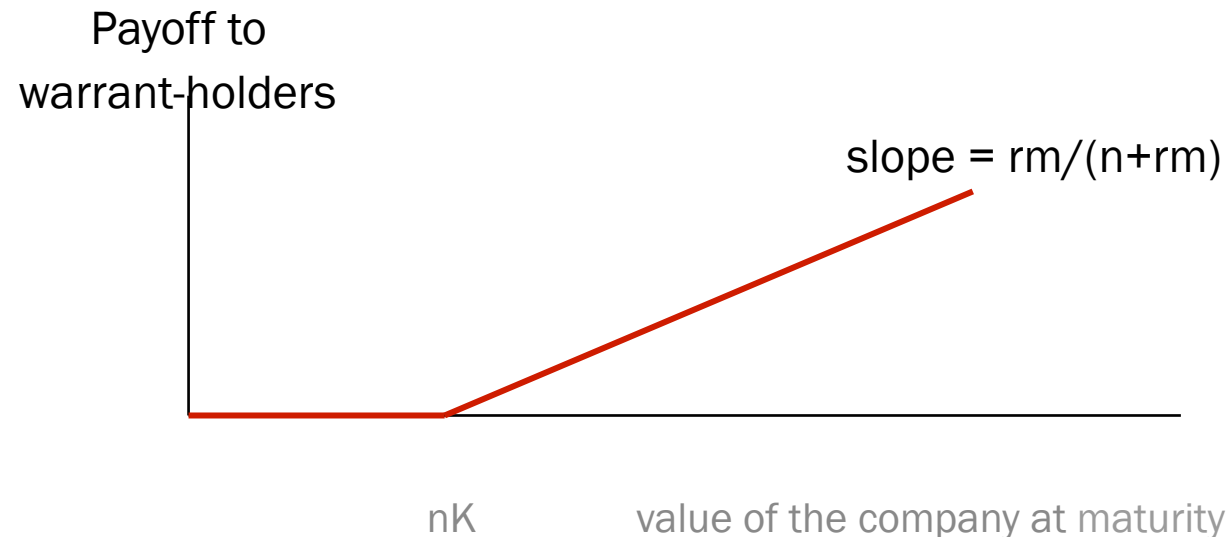
The dilution factor of the warrants is:

$$\lambda = \frac{rm}{n + rm}$$

# Diagram of Payoff at Maturity



Suppose that each warrant is convertible into  $r$  shares:



Thus, the Value of All Warrants =  $rm/(rm+n) * C(V, nK, t, \sigma, R_f)$

Note:  $C(.)$  represents the value of a call written on the assets of the company, with an exercise price  $nK$ .

## Black-Scholes Formula to value Warrants of a Zero-Debt Firm



- Value of the warrants =  $\lambda * Call(V, nK, t, \sigma, R_f)$
- $C(.) = N(d_1) * V - N(d_2) * PV(nK)$

$$d_1 = \frac{\ln\left(\frac{V}{PV(nK)}\right)}{\sigma\sqrt{T}} + \frac{\sigma\sqrt{T}}{2}$$
$$d_2 = d_1 - \sigma\sqrt{T}$$

- $N(d)$ : distribution function of a standardized Normal;
- $n$ : initial number of shares;
- $K$ : exercise price for each new share;
- $T$ : time to maturity;
- $V$ : current value of the assets of the firm;
- $\sigma$  : volatility (annualized standard-deviation of the rate of return of the assets).

# Example



## 100%-Equity Firm

Shares (n) = 1 million

No. of warrants (m) = 100,000

Conversion ratio (r) = 1

Exercise Price (K) = 10

Time to Maturity (T) = 4 years

Current Value of the Assets  
= 12 million (including sale  
of the warrants)

Volatility ( $\sigma$ ) = 40%

Risk-free interest rate (Rf) =  
10% p.a.

- Value of the warrants:

$$\frac{100,000}{1,100,000} C \left( V = 12 \text{ million}, nK = 10 \text{ million}, \right. \\ \left. T = 4, \sigma = 0.4, Rf = 0.1 \right) \\ = 0.0909 \times 6.152 \text{ million} = 559,271$$

- What should the current price of a share be?

$$(12 \text{ million} - 559,271) / 1 \text{ million} = \\ 11.44$$



... or ...

The warrant may be written as a call on the value of the shares, in terms of its value “per share”:

$$\frac{100,000}{1,100,000} \times 1 \text{ million} \times C(S = 12, T = 4, \sigma = 40\%, K = 10) =$$
$$= 0.0909 \times 1 \text{ million} \times 6.152 = 559,271$$

Note 1:  $[m/(n+m)](V^*-nK)$  or  $[m/(n+m)]n(V^*/n-K)$

Note 2: we have the value of “equity per share” ( $V^*/n$ ), and not the price of the share!





## 2. Rights Issues

Current shareholders receive “rights”, which may be converted into new shares at a pre-established strike price.

### Example:

#### Before the Rights Issue:

Number of shares: 100

Market price per share: € 10

#### Rights Issue:

2 rights per share;

Each right is convertible into 1 share for a price of € 5.



Are the shareholders better off as a result of this rights issue?

If the rights are exercised:

	Old Shares	New Shares	Total
Number	100	200	300
Value	666.67	1333.33	2000

Market Price per share = € 6.67

Market Value of 1 right =

= value of 1 new share – exercise price =

= €6.67 - €5.00 = €1.67

Value of the package “1 share and 2 rights” = € 10



## Rights vs. Warrants

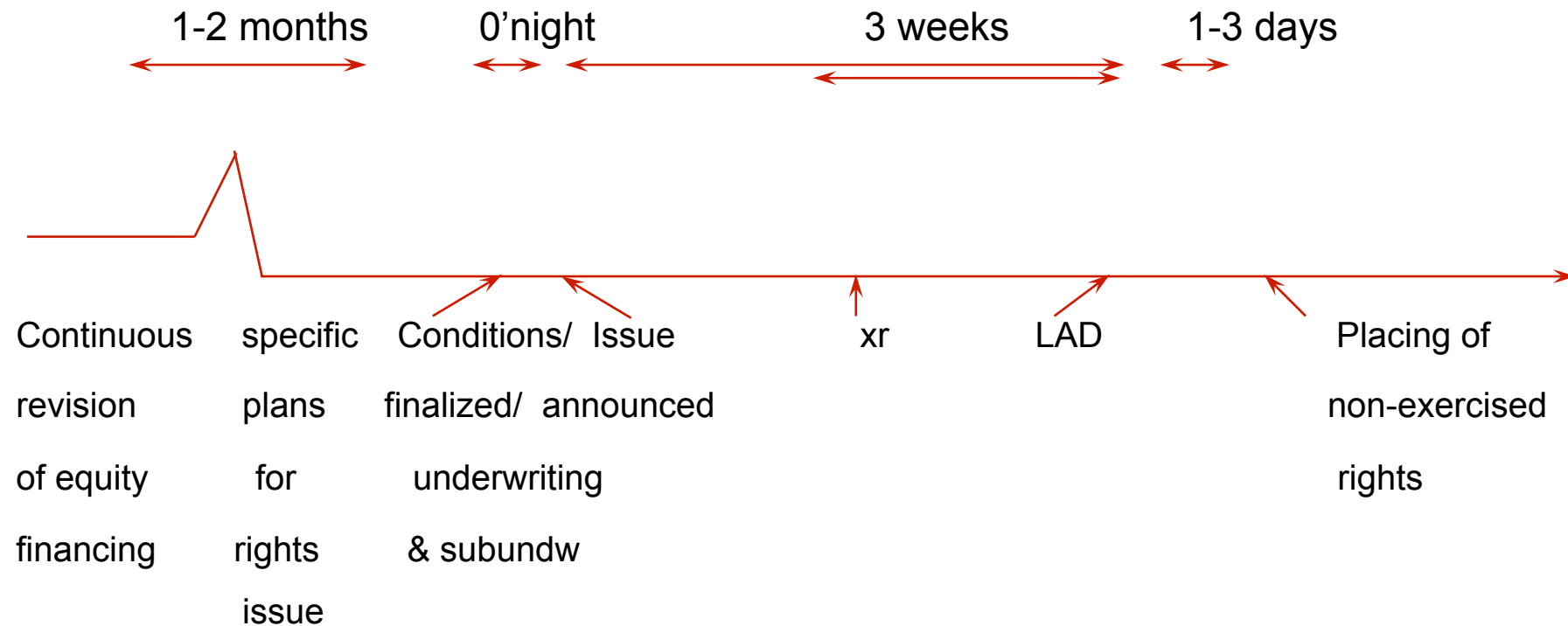
Rights are short-term Warrants: typically the right-holders have a few weeks until the option expires.

Rights are issued at price zero.



# Rights Issues: sequence of events

on average 5 weeks





## Value Rights as Warrants

### Example:

#### Pre - Rights Issue

Number of shares = 100

Market Price of a Share = € 10

Volatility of shares = 60% pa

Risk-Free interest rate = 10% pa

#### Rights Issue:

2 rights per share;

Each convertible into 1 share;

Exercise Price = € 5;

Time to maturity: 2 months

- Value of All Rights:

$$2/3 * 100 * C(S=10, T=2\text{months}/12, K=5, \text{volatility}=60\%) = \text{€ } 339$$

- Value of 1 right: € 1.695

## Rights: Underwriting & Firm Commitment

The underwriter guarantees placing all shares.

Example:

(consider the same example): if only 50 of the 200 rights were exercised, the underwriter would pay the firm €  $5 \cdot 150$ , receiving 150 new shares.

Rational Investors leave their rights unexercised only if the value of equity at maturity is below € 500.

Firm Commitment is equivalent to selling a put option to the firm.

Payoff to underwriter

