NERA
Economic Consulting

A Real Options Approach to Estimate the Risk Premium for an FTTH Investment

Tomas Haug

Senior Consultant

Berlin

8 October 2011

Insight in Economics™

Agenda

- Economics of a Fibre-to-the-Home (FTTH) investment that give rise to real options
- Valuing a ‘wait and see’ option for an FTTH investment
- Valuing the flexibility option for an access seeker under regulatory open access
- Outlook: Valuing the impact of risk sharing mechanisms

A regulated FTTH project exhibits elements which give rise to real options

NERA Economic Consulting

1. The investment is (partly) irreversible
2. There is uncertainty over the future rewards of the investment
   - Demand uncertainty
     - Uncertainty relating to take up (Take-up risk)
     - Uncertainty relating to willingness to pay (ARPU risk)
   - Cost uncertainty (Capex risk)
   - Uncertainty relating to market dynamics and competition
   - Macro-economic uncertainty
3. There is some leeway about the timing of the investment
4. Investors must provide access to competitors (regulatory open access provisions)

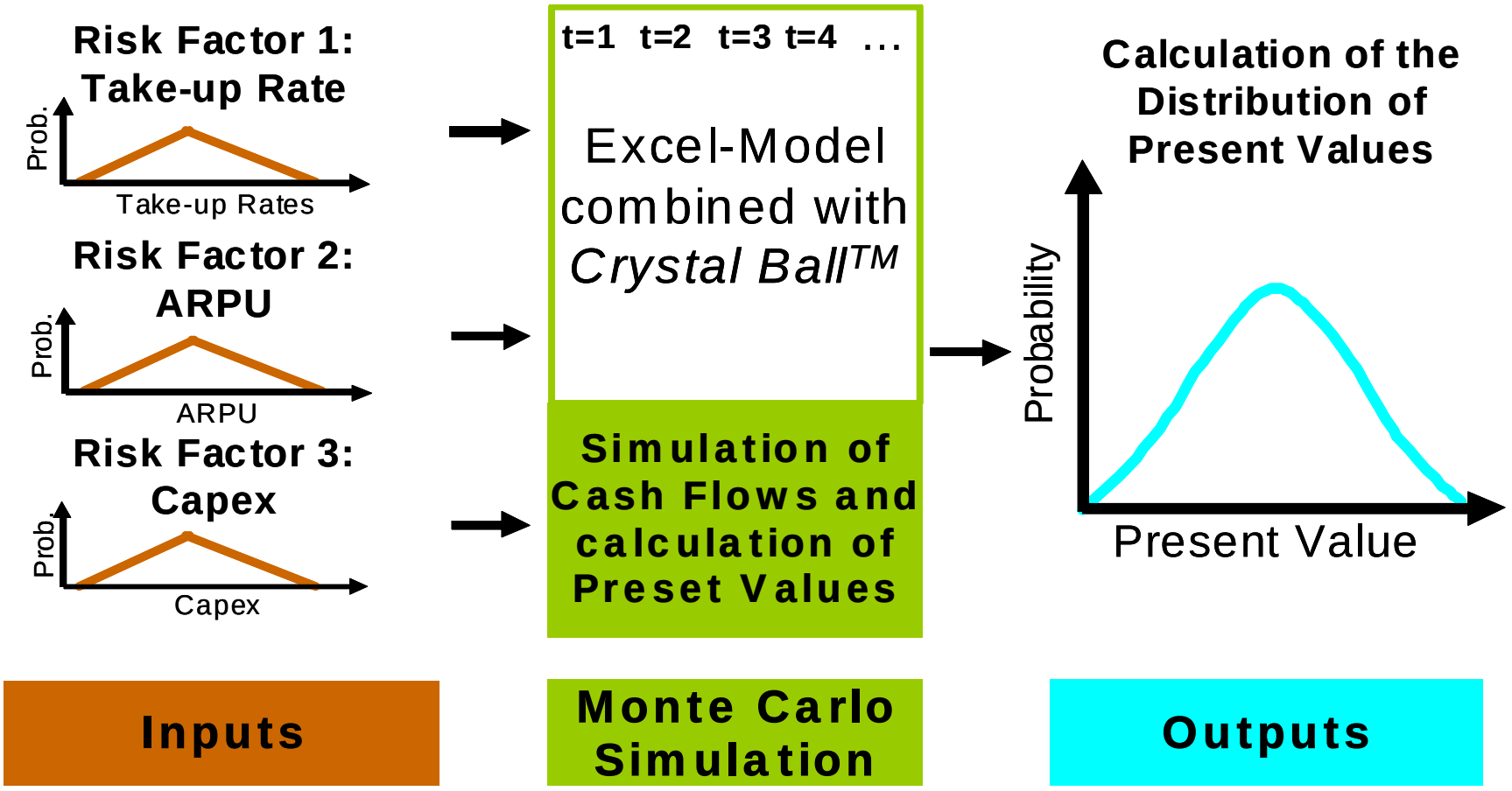
There are two potential types of real options for an FTTH project

NERA Economic Consulting

1. ‘Wait and see’ option: opportunity cost of investing
   - *“When a firm makes an irreversible investment expenditure, it exercises, or ‘kills,’ its option to invest. It gives up the possibility of waiting for new information to arrive that might affect the desirability or timing of the expenditure…. This lost option value is an opportunity cost that must be included as part of the investment*” (Dixit and Pindyck)

2. Flexibility option: asymmetric risk caused by regulatory open access
   - “*Because the entrant does not bear the sunk costs, this leads to an asymmetric allocation of risk and return that is not properly accounted for in the pricing of network services…”* (Pindyck, 2007)
   - Ofcom sees real options to be greatest in NGA networks context
     - *“… real options are likely to be greatest in the cases of next generation access networks.”* (2005 Consultation)
     - “*The imposition of mandatory access … may result in asymmetric risk borne by investors*” (Ofcom, 2007)

Input risks are combined to compute the project volatility which drives the real option premiums

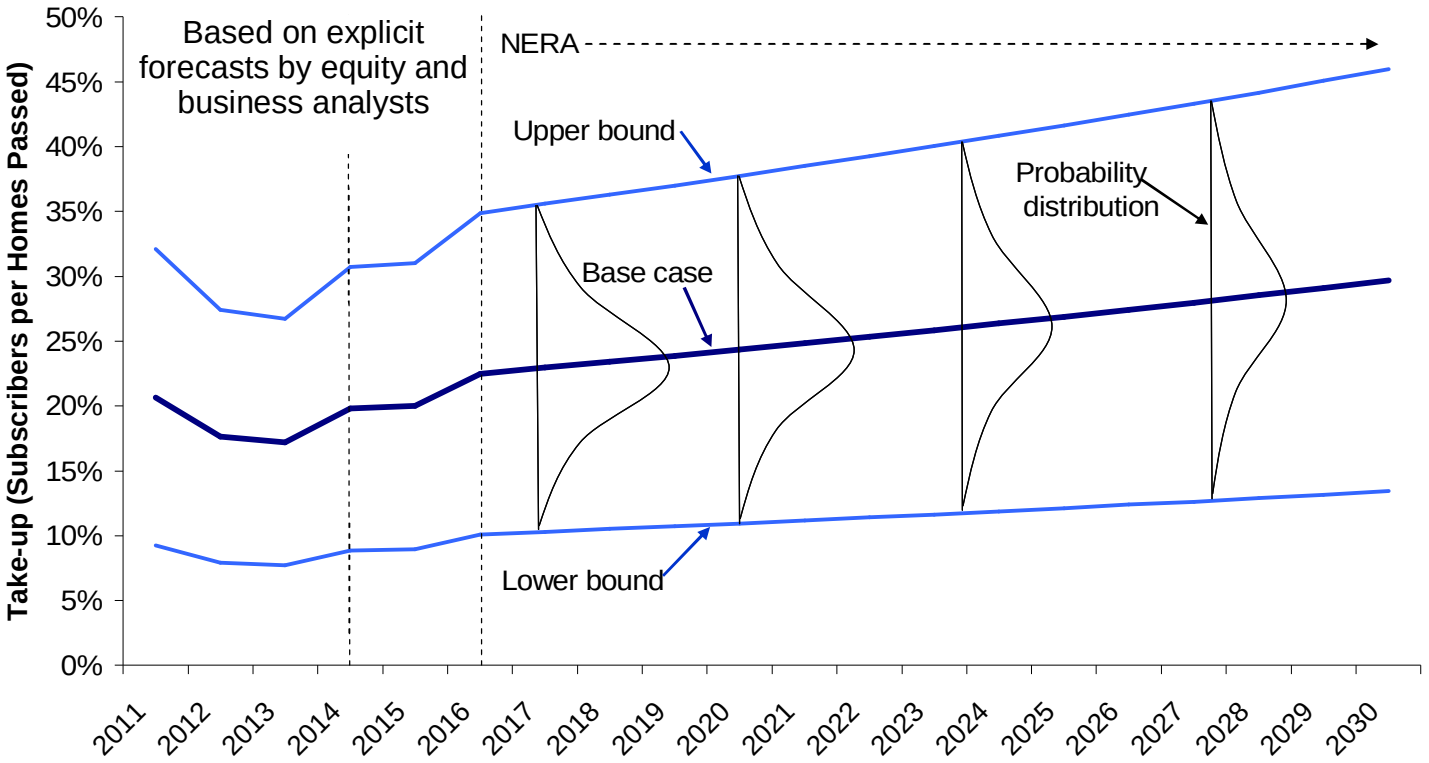


Input parameters will depend on the specific characteristics of the project and the economic geography

We derive key uncertainties for FTTH using published sources

NERA Economic Consulting

Example: Constructing the Distribution of Take-up Rate



- Dispersion (distance from base case to upper/lower bound) is determined by variations of forecasts made by experts

Inputs are based on analysts' forecasts **à** overall simulated volatility reflects *market expectations*

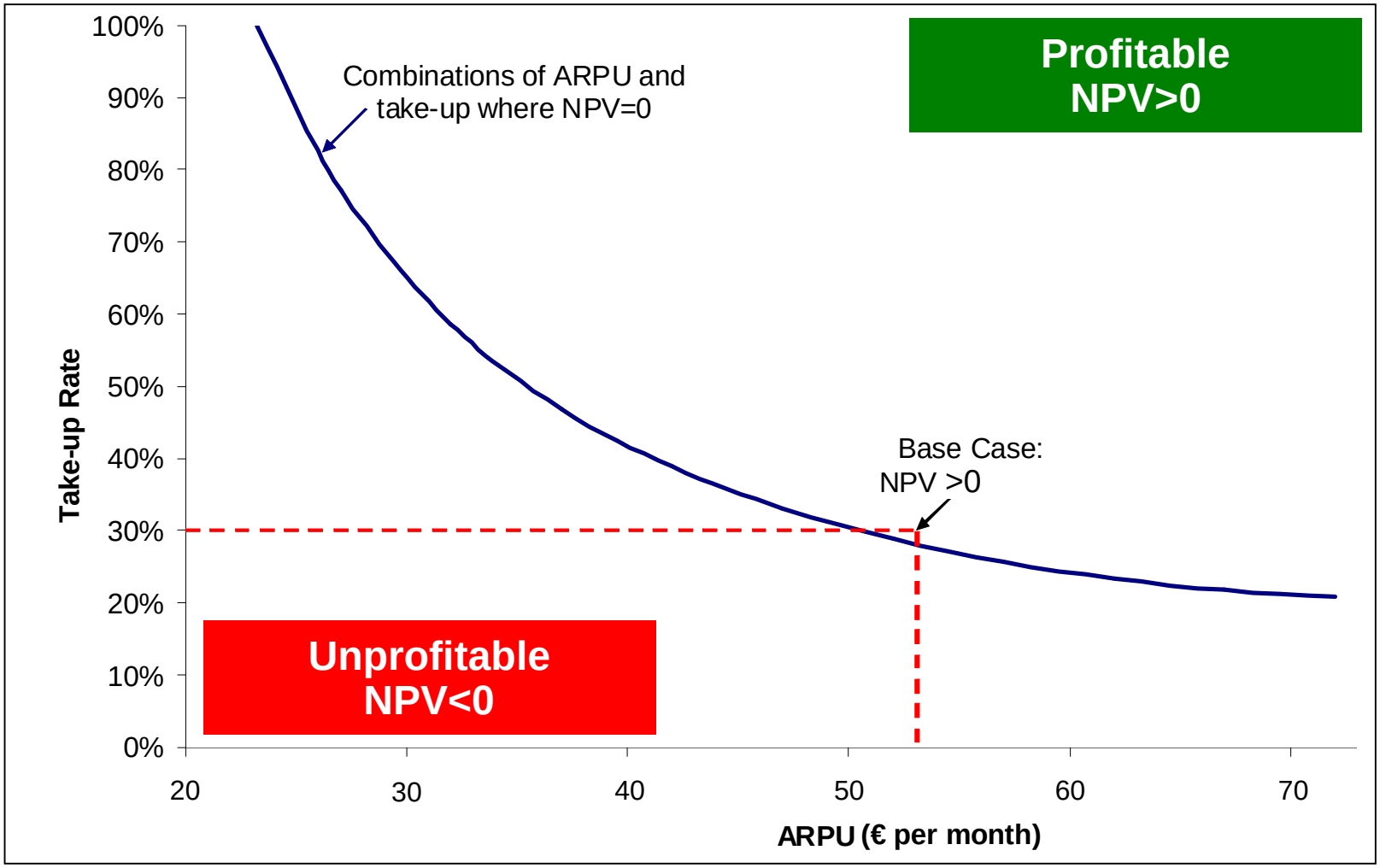
NERA
Economic Consulting

Model Outputs

An example where the base case of the project is marginal NPV positive

NERA Economic Consulting

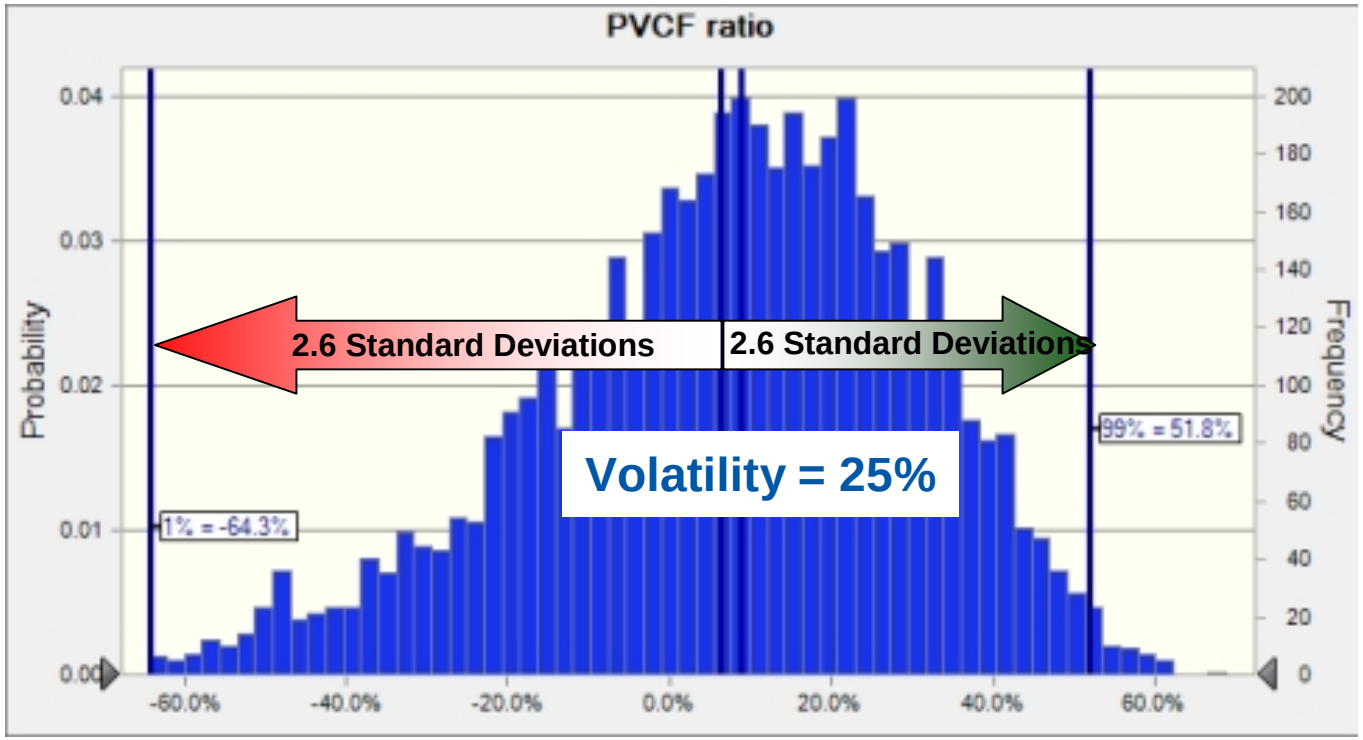
Breakeven Analysis of Project Profitability (NPV=0 Combinations of Take-up and ARPU)



We use Monte-Carlo simulation to combine input uncertainties

NERA Economic Consulting

Return volatility of the FTTH investment

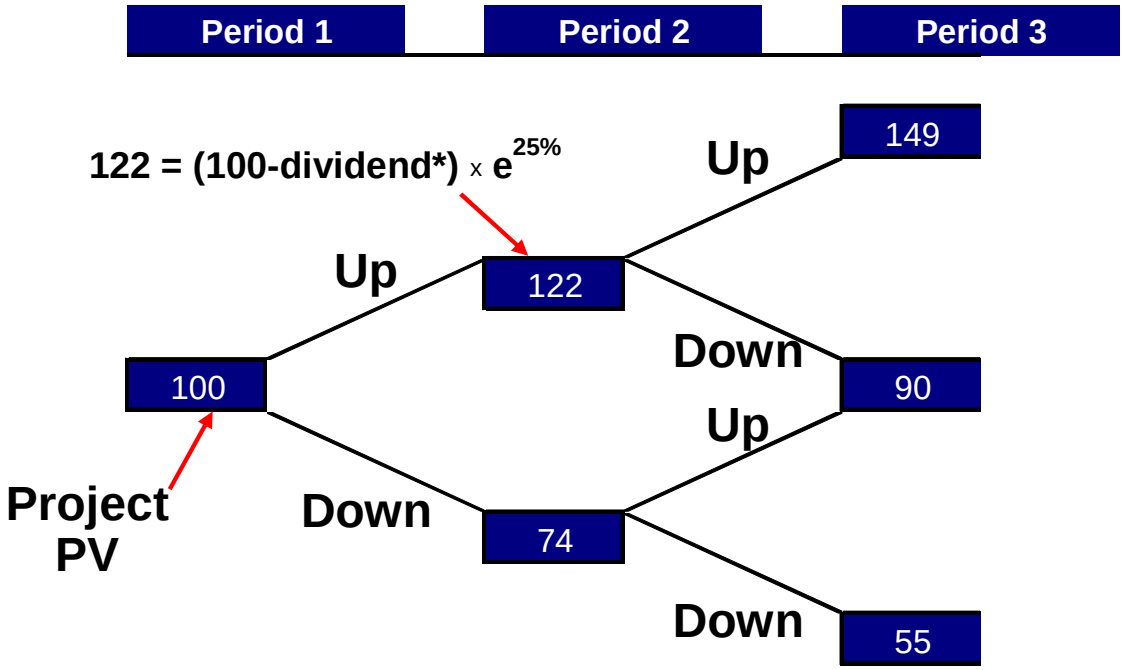


The *simulated* volatility of the project returns is a proxy for the *'true'* volatility of the project as if it was quoted

The project volatility of 25% is used to construct the binomial lattice for the calculation of the real option value

NERA Economic Consulting

Distribution of the Project Value
In a Binomial Lattice



- The volatility of the project determines the size of the Up and Down movements

$$\text{Up} = e^{s} \qquad \text{and} \quad \text{Down} = 1/\text{Up}$$

  - σ is 25% (simulated Volatility)

- …and the corresponding (following standard option pricing formulae):

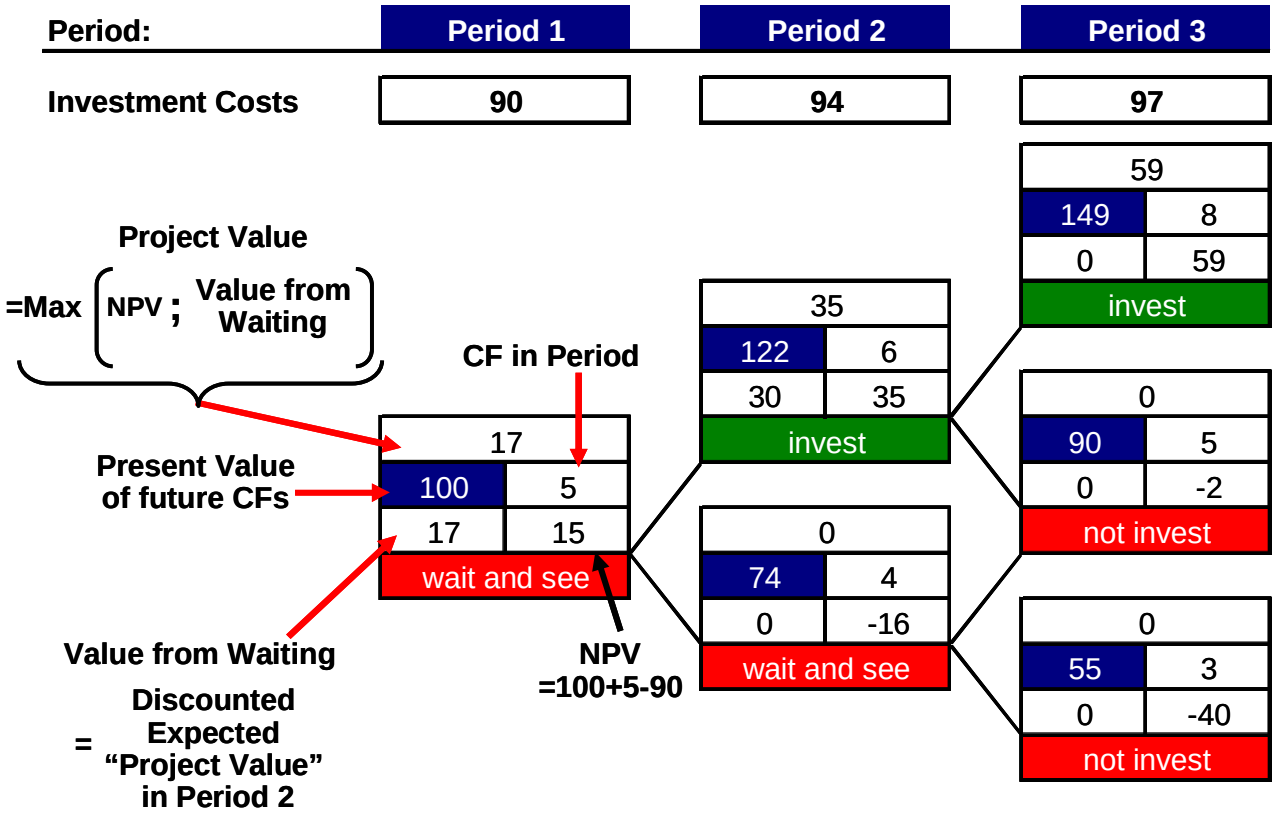
$$q = \frac{\text{Risk free rate - Down}}{\text{Up - Down}}$$

*This example assumes a dividend yield of 5%
e is the base of the natural logarithm and is equal to 2.718…

NERA
Economic Consulting

Wait and See Option Premium

We derive the 'wait and see' option premium by backward induction



Stylised Example. The example assumes that all uncertainty is resolved after 3 years. In reality uncertainty prevails over the economic asset life.

- Project value (€17m) lies above the NPV (€15m) in period 1
- Wait and see option premium is equal to €2m (=€17m-€15m)
- But option value is only positive if
  - competitors cannot pre-empt the investor
  - there is no first mover advantage
- These conditions will depend on market dynamics and the evolving competitive situation in a particular economic geography

NERA
Economic Consulting

Flexibility Option Premium

Under open access competitors have a flexibility option

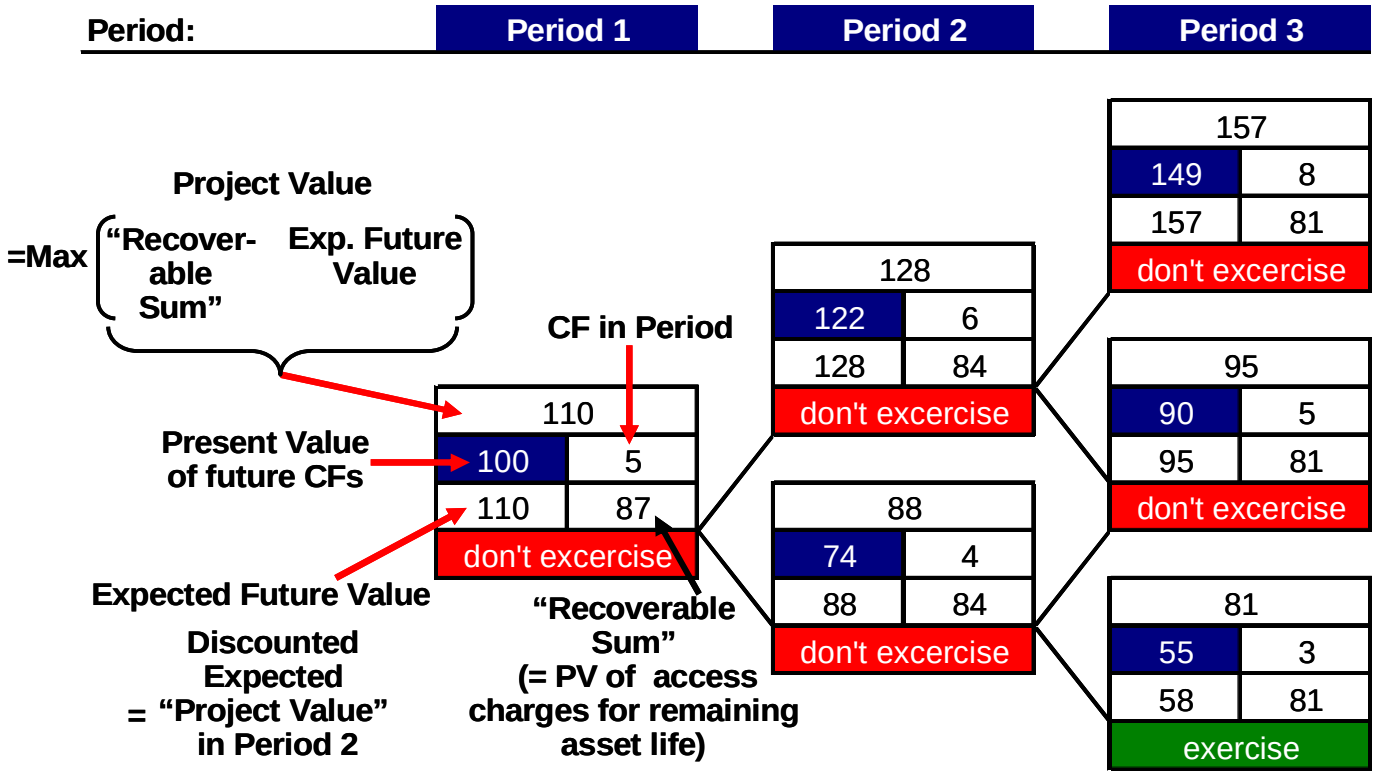
NERA Economic Consulting

- Under open access, the access seeker has the flexibility to "rent" (upside scenario) or "not to rent" (downside scenario)
  - Investor needs to be compensated for the flexibility benefit the investment creates for the access seeker
  - EC recommendation (2010) states:

    "Short-term contracts would … normally be priced higher per access line, with access prices reflecting the potential value attaching to the flexibility of such form of access which benefits the access seeker"
    (p.46; emphasis added)

- The flexibility option associated with "renting" can be seen as an insurance against asset stranding
  - The access seeker is "insured" against the payment of future access charges, if the investment turns out to be unprofitable

We use a binomial tree to value the flexibility option using backward induction



- The project value (€110) for an access seeker lies above the value for the investor (€105)
- The difference (€5) is the value of the flexibility
- The value of flexibility is created by the investment
- One way to account for premium is to increases the rate of return above the CAPM cost of capital

Under a "real world scenario" the flexibility option premium lies within a range of 1.8-2.5% (real pre-tax)

NERA
Economic Consulting

The impact of risk sharing

EC, EU regulators (and others) propose risk sharing to reduce required risk premiums

NERA Economic Consulting

Impact of the Contracting Length

on the Flexibility Option Premium (real pre-tax)

Contracting length (Years)	1	3	5	8	15	20
"Discounted" Premium to WACC (%)	2.3	2.2	2.0	1.9	1.2	0.0
Discount (ppt)	0.0	0.1	0.3	0.4	1.1	2.3

- Increasing contract length reduces the flexibility option as the degree of flexibility diminishes
- When contract length equals asset life the flexibility option reduces to zero

NERA
Economic Consulting

Thank You for Your Attention

Tomas Haug

Senior Consultant
London
+44 (0)20 7659 8856
tomas.haug@nera.com