BEFORE PRESENTATION...SOME DATA ON UBI..JUST TO CONTEXTUALIZE:

- 8000 students
- 5 faculties
- Main R&D areas – Medical devices, Cellular communication, Biomedical, Biotechnology, Materials, IT
- Incubator in Science park
- 22 spin-offs
- Medical incubator
VALUATING ACADEMIC PATENTS AS A TOOL FOR BOOSTING INNOVATION:

A REAL OPTIONS APPROACH
1. Motivation
2. Goals
3. Need for patent valuation
4. Method proposed
5. Expected results
6. Final remarks
1. MOTIVATION

Need for reliable measurements under uncertainty, intangibility and lack of market data - REAL OPTIONS THEORY

The field of academic patenting has not been target of many studies in patent valuation

Majority of academic patents are still on the proof of concept stage, being the optimal incentive strategy a mixture of royalties and sponsored research

Since academic patents are target of uncertainty, volatility, few information and lack of historical and market-base data the use of ROT can be of great potential
Empirical model for patent valuation: ROT

VARIABLES:
- underlying asset
- market uncertainty
- time to maturity
- volatility of expected demand
- exclusivity
- geographical scope

VALUE OF ACADEMIC PATENTS

Made through the exercise of licensing option

Using a probit model
2. GOALS

**Main goal:**
(i) To develop and propose an innovative methodology for valuing academic patents.

**Secondary goal:**
(ii) To study the influence of the determinants of patent value.
3. NEED FOR PATENT VALUATION

- For licensing, patent portfolio decisions
- As financing tools or investment assets to be used by financial institutions and VC
- Valuation needed for intangible assets to benefit from open market conditions
- Measure patent stock as knowledge indicators
- New indicators and application of rationales – justified by recent financial reporting standards
4. Method Proposed

Black-Scholes model can be appropriate when valuing real options - Black-Scholes option pricing model.

\[ S, \text{ is the asset price} \]
\[ K, \text{ is the investment cost,} \]
\[ R \text{ is the risk-free rate,} \]
\[ t \text{ is the time to expiration.} \]

Being valid for both European and American options.

Empirical model of panel analysis to deal with the data set time series observations.
4. Method Proposed

**INDEPENDENT VARIABLES**
- ✓ underlying asset
- ✓ market uncertainty
- ✓ time to maturity
- ✓ volatility of expected demand
- ✓ exclusivity
- ✓ geographic scope

**DEPENDENT VARIABLE**
- ✓ Patent value

**INDICATORS**
- Patent citations
- Patent counts
- Patent lifetime
  - Standard deviation of the market growth rate from year $t-3$ until year $t$
- $Nr$ of patent licensors
- $Nr$ of countries in which the patent is granted

Probit Model - cross-section data on filled patents from a EU university
Proposition 1: Academic patent value increases in accordance with the underlying asset value (S)

Proposition 2: Academic patent value increases in accordance with the time to maturity (t)
Proposition 3: Academic patent value increases in accordance with an increase in the volatility of the expected demand ($\delta$)

Proposition 4: Academic patent value increases in accordance with the exclusivity of the patent ($e$)

Proposition 5: Academic patent value increases with an increase in the geographical scope of the patent ($g$)
<table>
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<tr>
<th>EXPLAINED VARIABLE</th>
<th>EXPLANATORY VARIABLES</th>
<th>TB ON PATENT VALUE DETERMINANTS</th>
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<tr>
<td></td>
<td>Time to maturity</td>
<td>++ (Wu &amp; Tseng, 2006)</td>
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<td></td>
<td>Exclusivity</td>
<td>+ Oriani and Sobrero (2008)</td>
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<td>Geographical scope</td>
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<td>Royalties agreed</td>
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<td>Warrants</td>
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This study proposed a methodology for valuing academic patents and analysed the determinants of patent value. Since academic patents are target of uncertainty, volatility, few information and lack of historical and market-base data, the use of ROT can provide a valuation model to apply when transferring these assets to industry.

Collected cross-section data on filled patents from a recognized European university analyzed through the use of a Probit Model.

Dependent (or explained) variable: the Patent value; and as Independent (or explanatory) variables: Underlying asset; Time to maturity; Volatility of expected demand; Exclusivity; Geographical scope.
6. Final Remarks

- **Limitations:** complexity of the ROT analysis; lack of available data regarding academic patents; due to the uniqueness of patents it’s very difficult to find a comparable price in the market for a target patent; the high uncertainty and information asymmetry in the patent trading market constraints the development of a standard patent appraisal model; early-stage phase of academic patents limits data available to process valuation; ROT and Monte Carlo methods are more realistic since they treat costs and revenues and also risk and uncertainty.
Guidelines for future: it will be interesting to cross check the data using other valuation methods and explain differences achieved in results; to compare international methods for valuing academic patents in the US and European context – this is already being done through a collaboration with COTEC, INPI and US partners in order to publish a guide on how to value intangibles.
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