

Methods for Patent Portfolio Valuations

- Challenges for and Responses by Academia

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A very provocative statement...

“Most investment banks have teams of accountants, tax advisers, management consultants, and regulatory affair experts to structure their deals to a company’s greatest advantage. But one would be hard-pressed to find a major investment bank that employs even one individual with experience in evaluating patent portfolios. Doubtless this will change as corporate America and Wall Street become more attuned to the financial and strategic value of intellectual property, but as matters stand now, “due diligence” regarding patent assets is usually more myth than reality.”

(Harvard Business Review, January/February 2000)

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Patent portfolio valuation

The "punchline"

Questions for this talk

- What are the theoretical and applied challenges when valuing patent portfolios?
- Optimally, how would an portfolio valuation approach look like?
- Where do we stand right now?
- Realistically speaking, what can we hope to see in the future?

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The sum of all challenges

Theoretical challenges

Definition of patent value
Assessment of future cash-flows
Assessment of volatility
Synergies

Individual patent valuation

Portfolio valuation

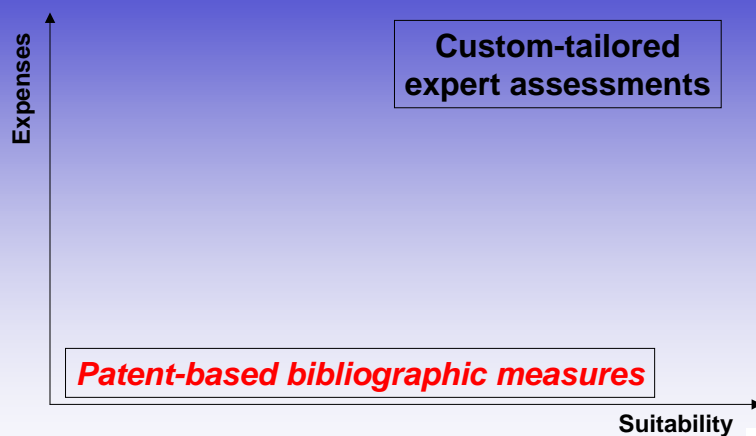
Reduce individual evaluation costs



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Applied issues: HOW to assess parameters CHEAP?

Data sources



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Wishful thinking...

How an patent portfolio valuation algorithm would "optimally" look like ...

C: Option value of the individual patent

$$\Pi_{Portfolio} = \int Cum(C(x)) dCdx$$

Cum: Aggregation function

x: Bibliometric indicator



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Wishful thinking...

...and why we are so far away from it...

S: Current underlying share price

r: Risk free interest rate

E: Exercise price of the option

$$C = S \cdot \Phi \left\{ \frac{\ln\left(\frac{S}{E}\right) + \left(r + \frac{1}{2} \cdot \sigma^2\right) \cdot t}{\sigma \cdot \sqrt{t}} \right\} - E \cdot e^{-rt} \cdot \Phi \left\{ \frac{\ln\left(\frac{S}{E}\right) + \left(r + \frac{1}{2} \cdot \sigma^2\right) \cdot t}{\sigma \cdot \sqrt{t}} \right\} - \sigma \cdot \sqrt{t}$$

σ : Volatility of the share price

t: Time to expiry



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Empirical evidence – where we stand today

Linear aggregation and betting on "large numbers" – let's focus on the variables instead...

$$\Pi_{Portfolio} = \sum_{Patent=1}^P \sum_{i=1}^I x_{P,i} b_i$$

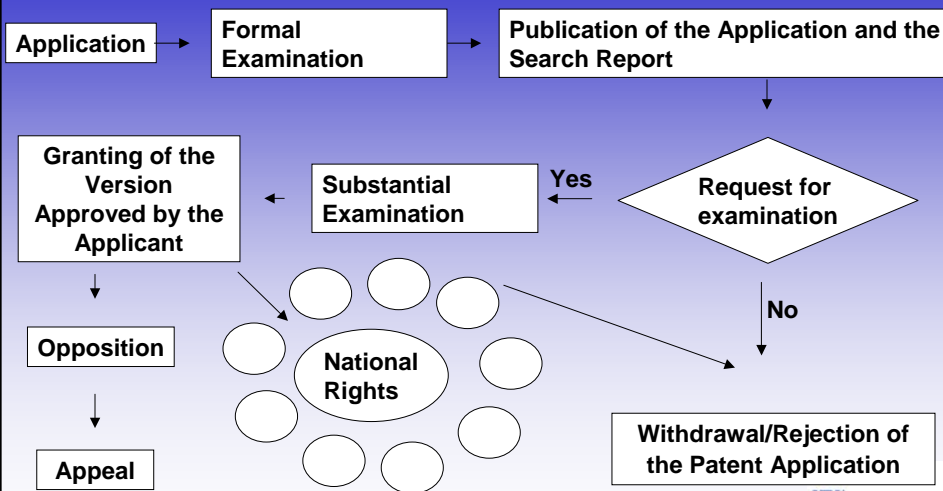
RHS: x_i =Bibliometric indicator



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Empirical evidence – where we stand today

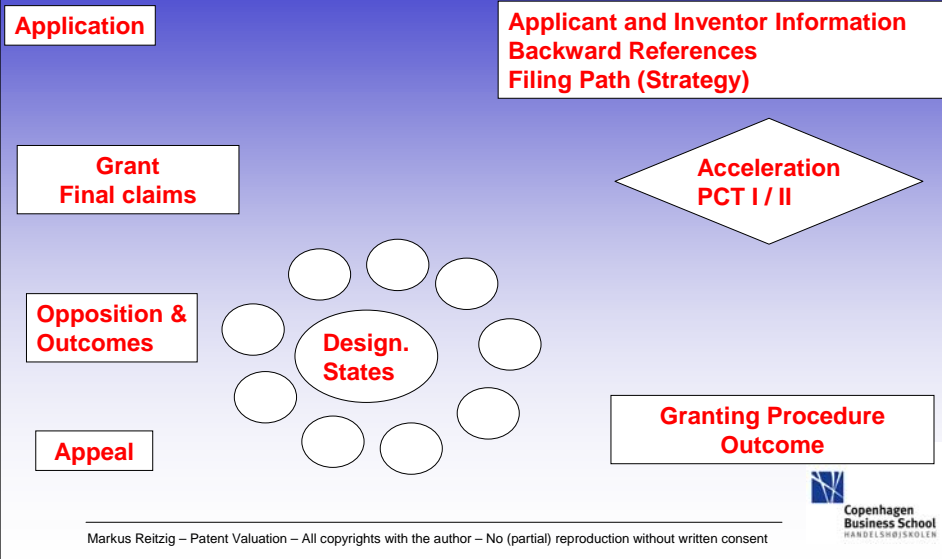
The RHS variables (1): granting procedures



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Empirical evidence – where we stand today

The RHS variables (1): granting procedures



Empirical evidence – where we stand today

The RHS variables (2): hypothesized links

Variable	Hypothesized Link to Patent Value		Overall Effect on Patent Value
	Measure of Technological Quality	Non-Technological Measure	
Backward References to the Non-Patent Literature	+: Science Linkage	-: Market Distance	?
Backward References to the Patent Literature	+: Market Size	+: Market Size (also for minor modifications)	+
Number of Designated States (Family Size)	+: Market Size	+: Market Size (also for minor modifications)	+
Number of Forward Citations	+: Novelty / Inventive Step	+: Market Size	++
Number of Applicants / Number of inventors	+: Inventive Step		+
Indicators Referring to the Filing Strategy (Accelerated Examination Request, PCT Indicators)		+: Market Proximity	+

Legend: -: negative / +: positive / ++: highly positive / missing: no link or effect

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Empirical evidence – where we stand today

Linear aggregation – and focus on the variables...

$$\Pi_{Portfolio} = \sum_{Patent=1}^P \sum_{i=1}^I x_{P,i} b_i$$

LHS: Value-related variable

RHS: x_i =Bibliometric indicator

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Empirical evidence – where we stand today

The LHS variables: value-related variables

Expert ratings

Albert et al. (1991); Harhoff et al. (2003); Reitzig (2003)

Residual market value

Cockburn and Griliches (1988); Megna and Klock (1993); Conolly et al (1986); Conolly and Hirschey (1988); Bloom and van Reenen (2000); Hall et al. (2000); Bosworth and Rogers (2001); Hirschey and Richardson (2004); Ramb and Reitzig (2004)

Value-related phenomena (e.g. validity suits and oppositions)

Lanjouw and Lerner (2001); Harhoff and Reitzig (2004)

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Empirical evidence – where we stand today

The RHS variables (3): an overview

Variable	Validity		Availability in Time (Lower bounds)	Compilation Costs
	Theoretical Foundation	Empirical Evidence as of Today		
Backward Citations	+	+/-	18	E
Forward Citations	++	++	ca. 42+	E
Family Size	++	+	18+ (preliminary); ca. 42+ (finally)	E
'Scope'	+	-	18+ (preliminary); ca. 42+ (finally)	E
Ownership	+	++	18+ (preliminary); ca. 42+ (finally)	E
Number of Claims	++	+/-	18+ (preliminary); ca. 42+ (finally)	E
Patenting "Strategy"	++	+/-	19 + (preliminary); ca. 42+ (finally)	E
Number of Applicants	+	+/-	18+ (preliminary); ca. 42+ (finally)	E
Number of Trans- Boarder Research Co-operations	+	+/-	18+ (preliminary); ca. 42+ (finally)	E
Key Inventors	+	+	18+ (preliminary); ca. 42+ (finally)	E
Legal Disputes (Opposition in Particular)	++	+/-	ca.42+ (preliminary); ca. 49+ (finally)	M, partially E

Empirical evidence – today and tomorrow

Summary

Explanatory power in selected cases

- Average deviation on the order of 5% between predicted and "observed" portfolio value when estimating the value of portfolios on a dichotomous scale in the chemical industry

Remaining caveats

- Variance of indicators at the firm level
- Availability of indicators in time
- Structural relationships between portfolio value and indicators

Ongoing research

Tackling the caveats

- Full-text analysis
- Early time indicators
- Structural test of more complicated models

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