

Global Strategy of Infrastructure Business (2012.10.23)

元橋一之(技術経営戦略学専攻)

Kazuyuki Motohashi

Department of Technology Management
for Innovation (TMI)

Background

- Potentiality of infrastructure business
 - Substantial gap between demand and supply: blackout, congestions... in emerging economies
 - Regulatory reforms for flat world
- But risky business
 - Risk and uncertainly (unpredictable, uncontrollable)
 - Investment size, length

Objectives of Our Activities

- Research
 - Risk analysis of global infrastructure projects
 - Business modeling of PPP project
- Education
 - On-site training of global infrastructure business and exchange views across parties
 - Teaching materials (course contents, cases...)
- Business development
 - Regular contacts with government, private firms..

ケース(事例)ベースのアプローチ

フェーズ0

プロジェクトの概要
利害関係者の整理
リスク要因洗い出し

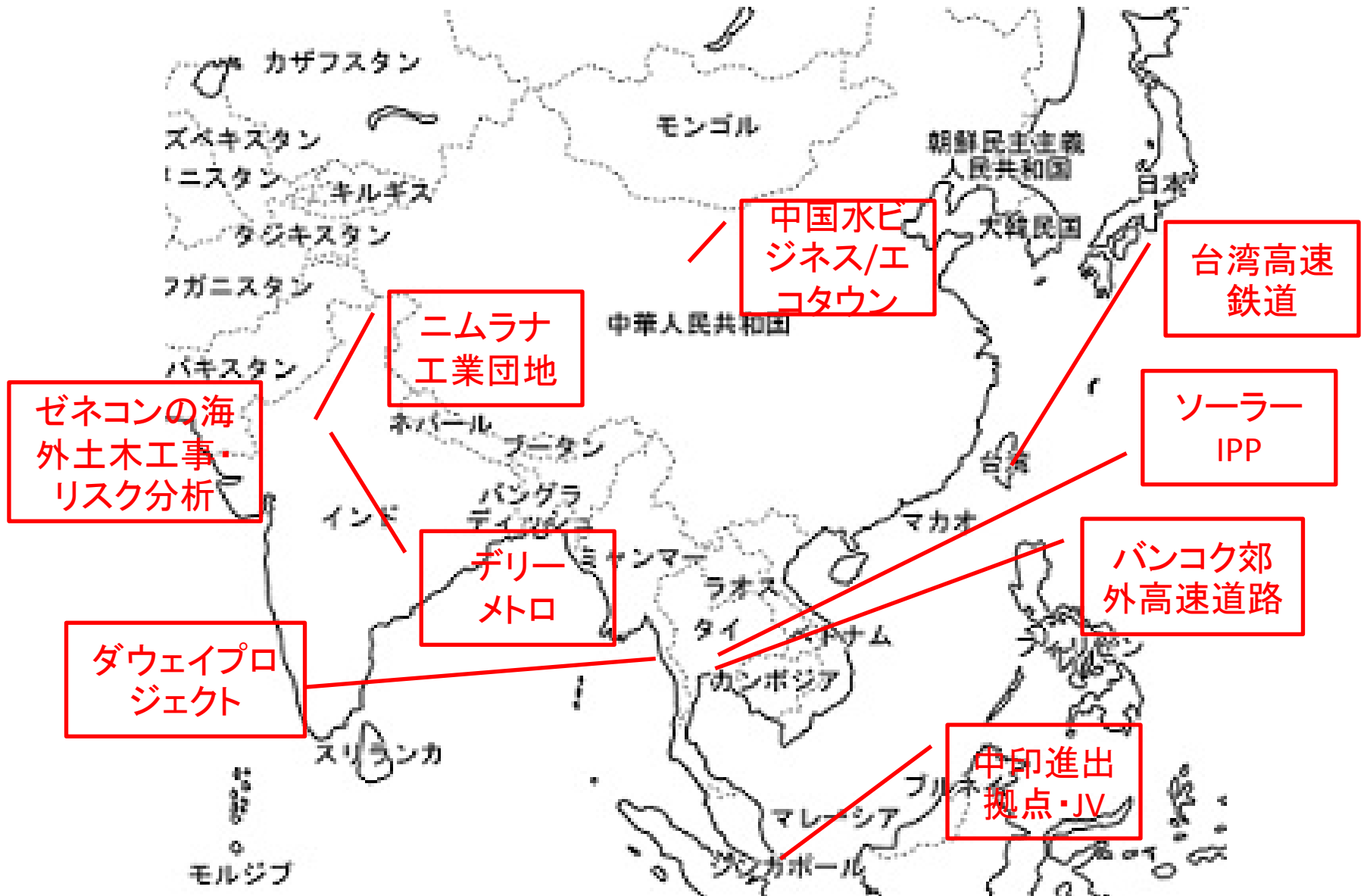
フェーズ1

:リスク分析
プロジェクトNPV、CF
モンテカルロシミュレーション
感応度分析

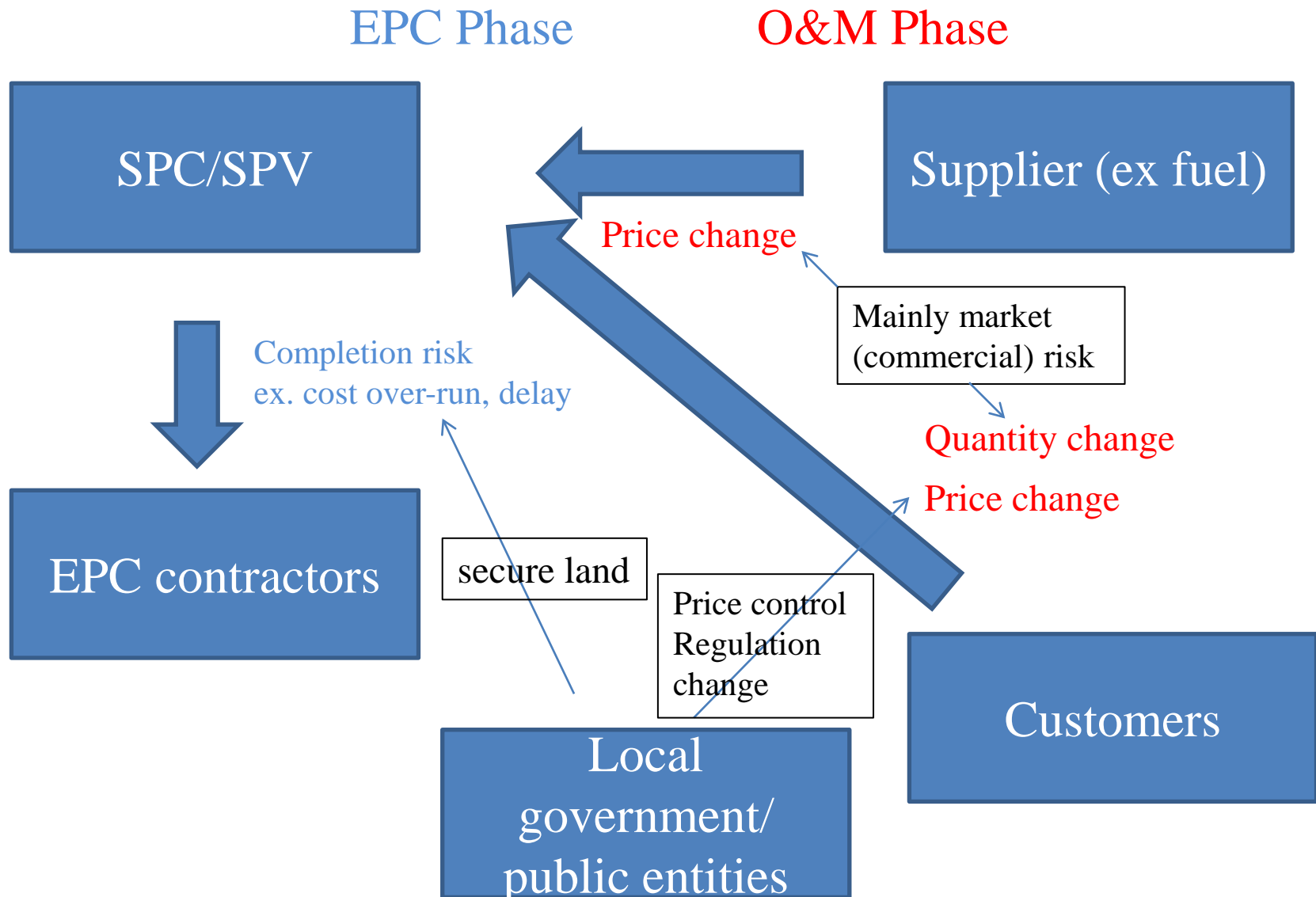
フェーズ2

ビジネスモデリング
エージェントシミュレーション、最適化、シナリオ分析

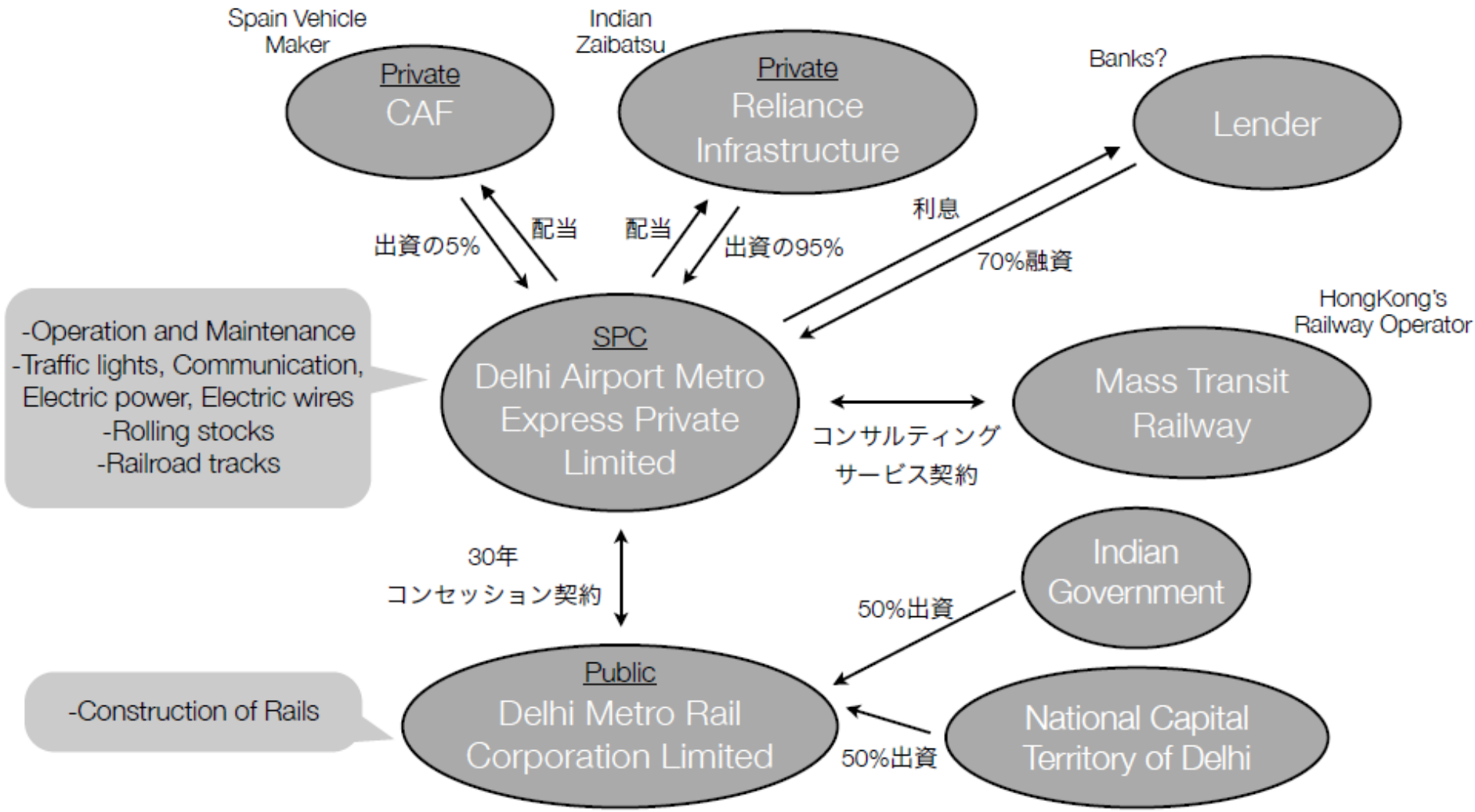
研究中の事例



Risk factors and analysis



Formation of infrastructure PPP project (case of Delhi metro airport line)



Necessity of business modeling

	Goal/Contingency	Key Variable	Major risks
Procurer	Value for money/ failure in PPP project	NPV of project Quality of public services	Bid qualification
Sponsor	Return on Equity/ financial close	Equity IRR	Demand factors and cost factors (OPEX, CAPEX)
Senior Lender	Return on Loan/ delay and default of interest and principle	Loan life cover ration (LLCR) Annual debt service cover ratio (ADSCR)	Whole project risks but senior over equity and junior loan

Example of optimization problem:

Too high D/E ratio -> LLCR (ADSCR) shortage -> Require mezzanine loan
-> higher financial costs -> Lower equity return

The degree of procurer's commitment to demand (electricity, ridership clause)

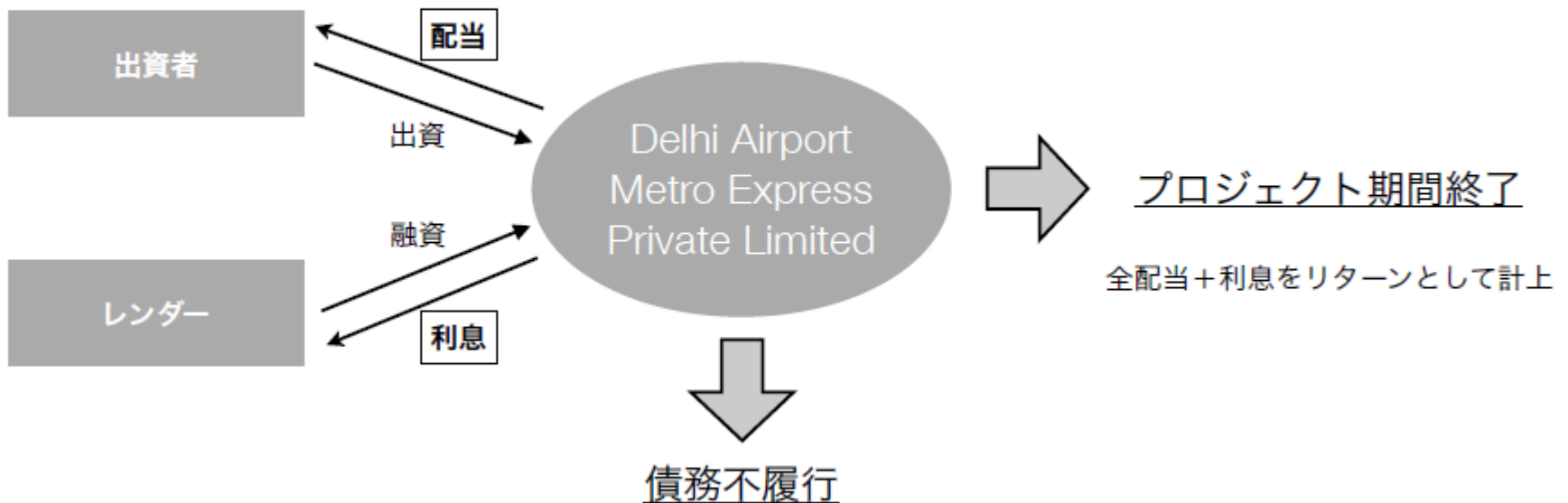
-> lower contingency (like bankruptcy of SPV) -> make NPV of project higher

Business modeling process

- Determine cash flows structure
 - Inter-relationship of entities (procurer, sponsor, lender)
 - Financing structure
 - Distinguishing endogenous or exogenous variable (for optimization)
- Quantifying risk factors (degree, correlation of risk factors, type of distribution function etc.)
- Run simulation and scenario analysis
 - Optimization for win-win solution for PPP entities
 - Worst scenario: identifying systemic risk factors

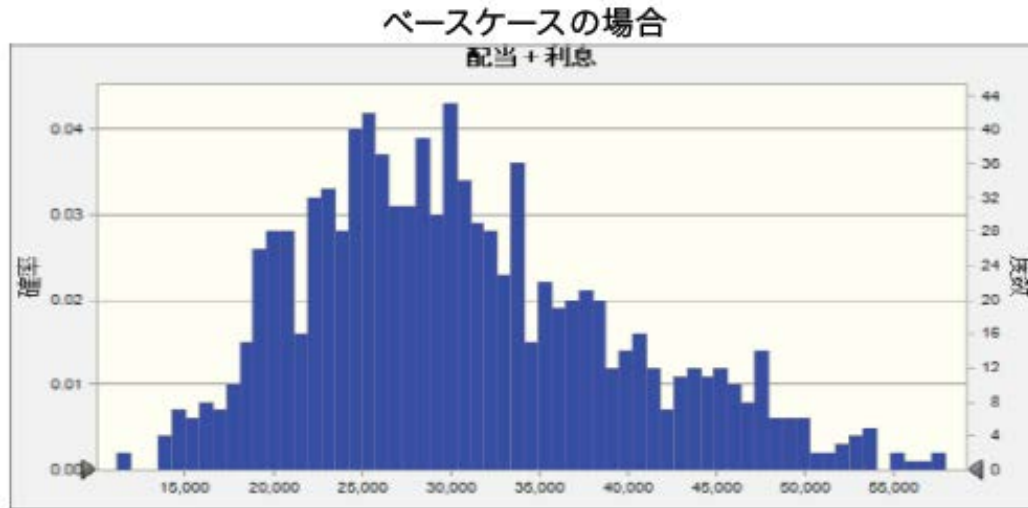
BMのセッティング

プロジェクトにおけるリターン（配当+利息）の現在価値を
最大化するようなD：E比率を求める。

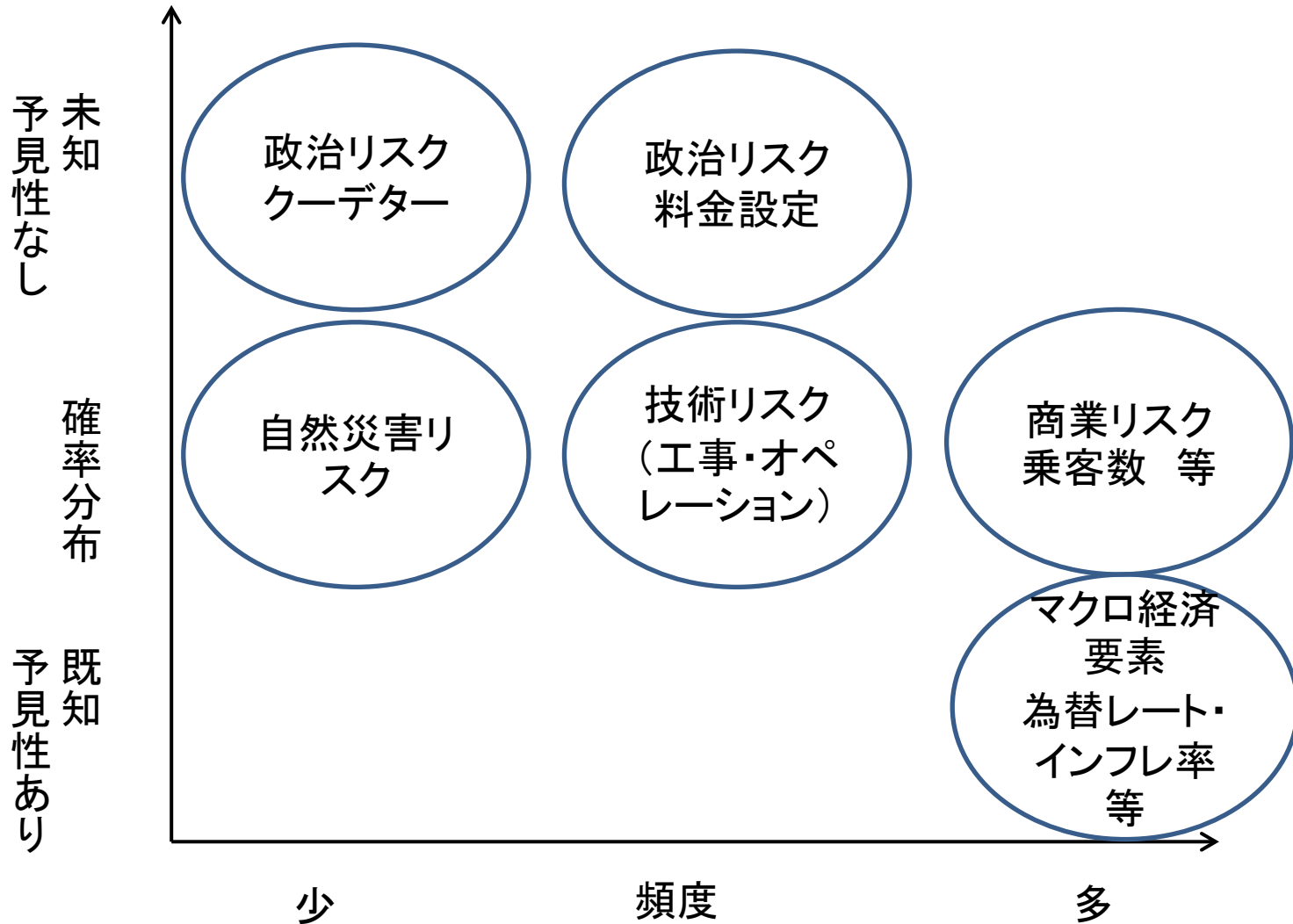


その一年前までの配当、利息-期初債務残高+返済可能額をリターンとして計上

分析結果：出資54.2%で最適化（ベースケース：30%）



リスクの分類と特徴



Goal of business modeling

- Risk management simulation
 - Contractual arrangement
 - Design change, slide clause, ridership clause etc.
- Understanding the nature of risk and inter-linkage (systemic risk)
 - Worst scenario analysis
- Proposition of solutions for risks (uncertainty), difficult to deal with
 - Type of organization (JV with whom?)
 - Localization of management
 - CSR