Project Finance Specialist Module

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Before we get started – what is this Specialist Module (… and what it is not)

This module is …

- An **introduction to the financial concept of Project Finance**
- a tool to enable **cost-benefit analysis** of project finance
- hands-on and suitable for **capacity-building** initiatives
- **Builds on concepts** (such as NPV and IRR) covered in other learning materials of this series.

This module is not …

- an **exhaustive and complete** list of all project finance benefits and challenges
- a **scientific study** comparing different financing methods and proposing "one best" method
- **applicable to all countries** without reflection of local conditions
- a **blueprint** for corporate finance vs project finance

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Learning objectives

1. Who are the relevant players in project finance?
2. What is project finance?
3. How is project finance different from on-balance-sheet financing?
4. How are returns and risk aggregated across projects?
5. What is contamination risk?

Overview of what will be covered

- 1 What is Project Finance and Who are the relevant players?
- 2 Differences between PF and normal financing
  - 2A Cost of Capital
  - 2B Contamination and Diversification
  - 2C Improved total payoffs
  - 2D Conflict between equity and debt
- 3 Risk and complexity
- 4 Risk Management
  - 4A PF as risk management
  - 4B Risk management within PF
- 5 PF and Joint Ventures
- 6 Short examples
- 7 Examples and cases

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What is Project Finance?

Project Finance involves a <u>corporate sponsor</u> investing in and owning a <u>single purpose</u>, industrial asset through a legally <u>independent</u> <u>entity</u> financed with <u>non-recourse debt</u>.

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Source: Harvey, C. et al. (2006) [PowerPoint slides]

Who are the relevant players?

Player	Description
The project company	▪ A legally independent (!) company that is set up to conduct a certain (often infrastructure) project
The sponsors	▪ Firms, governments, or international organizations that provide equity in the project company
The lenders	▪ Firms (usually banks) that provide debt capital to the project company

The project	▪ Project finance is used to conduct concrete high-investment projects like
	  ▪ roads
	  ▪ electricity plants
	  ▪ oil field exploration, etc.
	▪ The projects usually provide predictable and stable cash flows

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Who are the relevant players: Sponsors

Sponsors	Description
Industrial sponsors with PF linked to core business	▪ These firms want to use PF to extend their value chain activities (upstream or downstream), but want to minimize risk
Public sponsors with social welfare goals	▪ Public-private-partnership (PPP) is used to involve private capital to reach a social welfare goal ▪ Build, operate, transfer (BOT) contracts: A private firm is in charge of building and operating a facility for a while, then the facility is transferred to a public entity ▪ Build, own, operate, transfer (BOOT) contracts: In addition to BOT, here the private entity also owns the facility for a while ▪ Build, operate, own (BOO) contracts: In this case, ownership is not transferred to a public entity
Sponsors who develop, build, and run the plant	▪ These players contribute equity to sell their skills in building or running a plant
Financial investors	▪ These firms (often investment banks) are looking exclusively for profitable investments

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What is Project Finance?

A **project finance deal** has five peculiarities:

- The project company is legally and financially independent from the sponsors
- Debtors have very limited or no recourse to the sponsors in the case of cash flow shortfalls etc.
- Project risks are allocated equitably among all parties involved (different risk profiles than usually for debt vs. equity)
- Cash flows generated from the project must be sufficient to cover operating expense AND debt service. Only after those payments funds flow to sponsors.
- Collateral to lenders is often the asset created in the project

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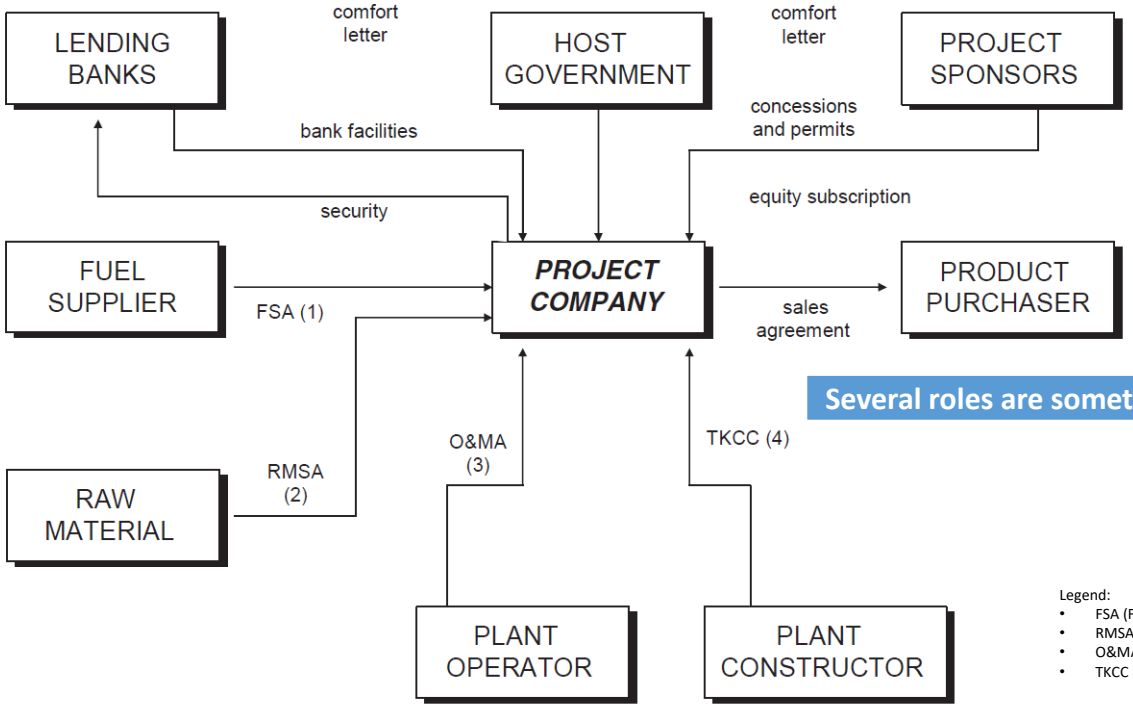
A typical contract structure of a PF deal



Several roles are sometimes taken on by a single player

Legend:
- FSA (Fuel Supply Agreement)
- RMSA (Raw Material Supply Agreements)
- O&MA (Operations and Maintenance Agreement)
- TKCC is Turnkey Construction Contract (build the plant)

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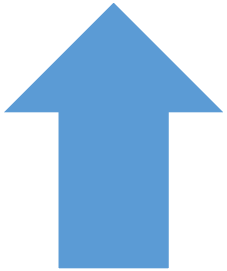
Source: Figure 1.2 in Gatti (2008)

Why would a someone do this?

PF **sounds like a bad deal** for both sponsors and lenders

- Creating a new entity, a special purpose vehicle (SPV), is costly
- Monitoring cost is high
- Lenders get no recourse and have to get involved in management



So, **why do it**?

- Because risk allocation is direct, debt-to-equity ratios can be higher in PF than in normal investments.
  - This allows you to have high debt-ratios, but maintain low risk
- Sponsors do not have to take on the full risks of non-performance because of the non-recourse clause
  - This means that a sponsor firm‘s overall cost of capital remains untouched

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Differences between PF and normal financing

Factor	Corporate Financing	Project Financing
Guarantees for financing	Assets of the borrower (already-in-place firms)	Project assets
Effect on financial elasticity	Reduction of financial elasticity for the borrower	No or heavily reduced effect for sponsors
Accounting treatment	On balance sheet	Off-balance sheet (the only effect will be either disbursement to subscribe equity in the SPV or for subordinated loans)
Main variables underlying the granting of financing	Customer relations Solidity of balance sheet Profitability	Future cash flows
Degree of leverage utilizable	Depends on effects on borrower's balance sheet	Depends on cash flows generated by the project (leverage is usually much higher)

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Source: Table 1.1 in Gatti (2008)

Cost of Capital

Normally, the cost of capital for a new project depends on existing investment projects and how they are financed

$$WACC = r_{equity} \cdot \frac{E}{V} + r_{debt} \cdot \frac{D}{V} \cdot (1 - T_C)$$

requity = cost of equity
rdebt = cost of debt
E = market value of the firm's equity
D = market value of the firm's debt
V = E + D = total market value of the firm's financing (equity and debt)
E/V = percentage of financing that is equity
D/V = percentage of financing that is debt
Tc = corporate tax rate

Investors usually consider the following when pricing new capital :

1. How sound is the project?
2. How sound is the company realizing a project?

Problems arise:

1. If the new project is large compared to firm size
2. If risk in the new project is substantially higher than in the firm average
3. If there is a strong link to existing firm activities (lack of diversification)

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Cost of Capital

The return on two projects (A and B) is straightforwardly computed as the weighted average of the two returns:

$$r_{A+B} = \frac{ROI_A * size_A}{size_A + size_B} + \frac{ROI_B * size_B}{size_A + size_B}$$

What is the return on a portfolio of two projects, where project A has a value of 1,000, project B a value of 4,000, The ROI on A is 10% and the ROI on B is 20%?

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Cost of Capital

What is the return on a portfolio of two projects, where project A has a value of 1,000, project B a value of 4,000, The ROI on A is 10% and the ROI on B is 20%?

$$r_{A+B} = \frac{0.1 * 1{,}000}{1{,}000 + 4{,}000} + \frac{0.2 * 4{,}000}{1{,}000 + 4{,}000} = 0.18$$

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Contamination risk and diversification

If the three issues covered in page 14 come together, a special complication arises:

The risk underlying the portfolio (σ_{A+B}) of the two projects is more complicated. **The risk depends on the correlation between the two projects (ρ_{AB}) and the w_A and w_B are the weights (relative size of the projects e.g. 20% and 80%)**

$$\sigma_{A+B} = \sqrt{\sigma_A^2 \cdot w_A^2 + \sigma_B^2 \cdot w_B^2 + 2 \cdot \sigma_A \cdot w_A \cdot \sigma_B \cdot w_B \cdot \rho_{AB}}$$

What is the risk on the portfolio (project A has a value of 1,000, project B a value of 4,000), the risk of A is 5% and the risk of B is 20%, and correlation is zero?

$$\sigma_{A+B} = \sqrt{5^2 * 0.2^2 + 20^2 * 0.8^2 + (2 * 5 * .2 * 20 * .8 * 0)}$$

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Contamination risk and diversification

	Existing Assets (Project A)	New Assets (Project B)			
Market value	1,000	4,000			
% on total value	20.0%	80.0%			
Expected Return	10%	20%			
Standard deviation (+/−)	5%	20%			
		Correlation Coefficient			
	−1	0	0.4	0.8	1
Expected return	18.0%	18.0%	18.0%	18.0%	18.0%
Risk (std deviation)	15.0%	16.03%	16.4%	16.8%	17.0%

If the new project is heavily related to existing firm activities. **Risk increases as correlation increases**

- Return rises from 10% to 18% in all cases.
- Risk, however, rises in all cases (from 5%), depending on correlation to 15% to 17%.

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Source: Table 1.4 in Gatti (2008)

Contamination risk and diversification

Even in the best case of portfolio diversification*, when correlation = -1 (the project actually adds to diversification) risk overall increases (from 5% to 15%). **This is contamination risk.**

- As a consequence, the cost of capital to refinance the company if e.g. debt matures will be substantially higher.
- This effect naturally is dependent on the relative size of the new project to the old one.
- The effect can be reinforced by related projects.

	Existing Assets (Project A)	New Assets (Project B)
Market value	1,000	4,000
% on total value	20.0%	80.0%
Expected Return	10%	20%
Standard deviation (+/−)	5%	20%

	Correlation Coefficient				
	−1	0	0.4	0.8	1
Expected return	18.0%	18.0%	18.0%	18.0%	18.0%
Risk (std deviation)	15.0%	16.03%	16.4%	16.8%	17.0%

If the increase in risk leads to an increase in average cost of capital greater than the increase in ROI, the **project reduces firm value.**

- That is (one reason) why projects get financed off balance sheet

*does not necessarily mean this is the best case overall for every investor

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Improved total payoffs

Hypothesis	Scenario 1	2	3	4	5	6
Debt Project A (assets in place)	100	100	100	100	100	100
Debt Project B (new project)	100	100	100	100	100	100
Expected cash flows Project A (assets in place)	50	50	130	130	300	300
Expected cash flows Project B (new project)	50	130	50	130	50	130
Solution 1: on-balance-sheet financing						
Total cash flows Project A + B	100	180	180	260	350	430
Total debt Project A + B	200	200	200	200	200	200
Payoff creditors	100	180	180	200	200	200
Payoff shareholders	default	default	default	60	150	230
Solution 2: off-balance-sheet financing						
Total cash flows Project B	50	130	50	130	50	130
Total debt Project B	100	100	100	100	100	100
Payoff creditors Project B	50	100	50	100	50	100
Payoff for shareholders Project A (dividends)	default	30	default	30	default	30
Dividends from Project B (X)	0	30	0	30	0	30
Total cash flows 1 (Y)	50	50	130	130	300	300
Total cash flow (X + Y)	50	80	130	160	300	330
Total debt Project A	100	100	100	100	100	100
Payoff creditors	50	80	100	100	100	100
Payoff shareholders sponsors	default	default	30	60	200	230

There are two financing scenarios and six performance scenarios in this table

- The company defaults in scenarios 1, 2, and 3 under solution 1 (on-balance-sheet)
- Project B is in default in scenarios 1, 3, and 5 under solution 2 (off-balance-sheet). However, **the company only defaults in scenarios 1 and 2**.

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Source: Table 1.5 in Gatti (2008)

Conflict of interest between equity and debt

Hypothesis	Scenario 1	2	3	4	5	6
Debt Project A (assets in place)	100	100	100	100	100	100
Debt Project B (new project)	100	100	100	100	100	100
Expected cash flows Project A (assets in place)	50	50	130	130	300	300
Expected cash flows Project B (new project)	50	130	50	130	50	130
Solution 1: on-balance-sheet financing						
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Total debt Project A + B	200	200	200	200	200	200
Payoff creditors	100	180	180	200	200	200
Payoff shareholders	default	default	default	60	150	230
Solution 2: off-balance-sheet financing						
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Total debt Project B	100	100	100	100	100	100
Payoff creditors Project B	50	100	50	100	50	100
Payoff for shareholders Project A (dividends)	default	30	default	30	default	30
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Total debt Project A	100	100	100	100	100	100
Payoff creditors	50	80	100	100	100	100
Payoff shareholders sponsors	default	default	30	60	200	230

- In scenario 2, project finance is optimal because it avoids the contamination of project B from project A. Project B survives.
- In scenario 3, project finance is still optimal, because A survives while B defaults because contamination is avoided.
- In scenario 5, project finance is still optimal from shareholders', but not from debtholders' position. Cash flows from A would have been sufficient to avoid default in project B.
  - Not using coinsurance, value was redistributed from bondholders to shareholders

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Why are we discussing risk and complexity?

- As we briefly discussed previously, Project Finance grants you the ability to **directly allocate risks**. This makes this type of financing **particularly suited** for rather large, complex, and/or risky projects.

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Common risks in complex projects

- Complexity is not easy to manage
- Different kinds of complexity:
  - Technical complexity
  - Social complexity
- Complexity is amplified by
  - Large scale and scope of international projects
  - Different, ambiguous, and interconnected tasks
  - Technology is new and functionality is hard to predict
  - Substantial number of project participants including the public attention

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Common risks in complex projects

Complexity leads to

- Underestimation of project related features such as costs, delays, contingencies and changes in quality, price, project specifications, designs, exchange rates, and external environmental factors
- Demand prediction failures due to methodology weaknesses, poor databases, unexpected changes, and the effect of appraisal bias
- Conflict of interests
- Opportunistic behavior by stakeholders

Despite all of these risks, it is unlikely that a project will be cancelled. Why?

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Source: Kardes et al. (2013) p. 6-7

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Common risks in complex projects

Because of the following reasons:

Illusion of control

Tendency to underestimate complexity. A manager's misinterpretation of her management ability or her power to influence outcomes of the project leads to underestimation of risks and overvaluation of positive information.

The ''Illusion of control'' pitfall arises often due to the high degree of uncertainty which leads to an inherent difficulty in forecasting. Thus, the greater the uncertainty, the greater the perception of control and level of overconfidence which leads to a higher probability of underestimating the risks.

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Source: Kardes et al. (2013) p. 6-7

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Common risks in complex projects

Because of the following reasons:

Sunk cost effect

Deeper into a highly visible project, partners have invested more money and time eventually reaching a point of no return. The risk of being viewed as unsuccessful and wasteful, puts at risk credibility and positions of decision makers. They then escalate their commitment to avoid criticism or loss of reputation.

Consider the following situation:

When 85% of your project for a radar-blank plane is completed to be $15 million, another firm begins marketing a plane which is much faster and far more economical than the plane your company is building. The question is: should you invest the last 15% of the research funds to finish your radar-blank plane?''

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Common risks in complex projects

Because of the following reasons:

Decisions under risk

Individuals are more risk-seeking in order to avoid negative outcomes than they are risk-avoiding to obtain positive outcomes. This means they are willing to take more risks to avoid the negative consequences of failed projects.

Risk seeking behavior arises, and to continue to invest in the failed project in hope of future gain is more likely to happen than total withdrawal.

For example, once $100 million has already been spent in an unsuccessful project, taking an additional risk on an additional $10 million is not perceived so risky.

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Common risks in complex projects

Because of the following reasons:

Self-justification

This theory also provides an explanation for escalating commitment of managers – the tendency of decision makers to stick with a failing course of action.

Individuals might be unwilling to admit wrongdoing. Therefore, they justify their behavior and avoiding negative feedback.

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Managerial recommendations for complex projects

Trained workforce	Training ensures new technology is used effectively and reduces resistance to change. Managers and employees should possess the skills and knowledge to use the necessary technology for a complex project.
Clear goals	Managers can avoid disagreements that might distract from the already complex project. Management should allocate time to clarification of goals and interpretations and revelation of hidden agendas using transparent information flows.
Clear contracts	Contracts should clearly define goals, rights and obligations for all partners and sponsors. They can introduce backup plans for critical elements in the supply chain
Transparency	Decrease the risk of overestimating manager competence and minimizing project complexity by using external checks to maintain transparency. Greater transparency, independent project appraisals, and scrutiny can help overcome the “illusion of control”.

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Source: Kardes et al. (2013) p. 10

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Managerial recommendations for complex projects

Collaboration	Pay attention to the soft criteria, such as partner and people selection. Detailed knowledge of potential partner's management culture, strong relationships, effective communication, trust and confidence, cross-cultural communication, evaluation and monitoring of the relationship quality, and creating a cooperative environment are necessary to ensure success.
Structure	Maintaining lasting mutual interests can contribute to success. Collaborations based on gain-sharing and risk-sharing. This can mean creating a specific project structure to achieve this - ''sink or swim together''.
Prior experience	Prior cooperative experience between partners and the reputation of the companies before the partnership are key determinants of relationship quality.
Balance	Balance control and commitment. Too much control increases the possibility of self-serving behavior and distrust, while lack of commitment can make contributions unforthcoming.
Shape early	Start out with a viable project idea and thoroughly shape projects during the early stages since most projects have little flexibility after start. Investments in the early stages of the project can help alleviate problems and improve quality. Therefore, cost reduction is secured and better outcomes are achieved

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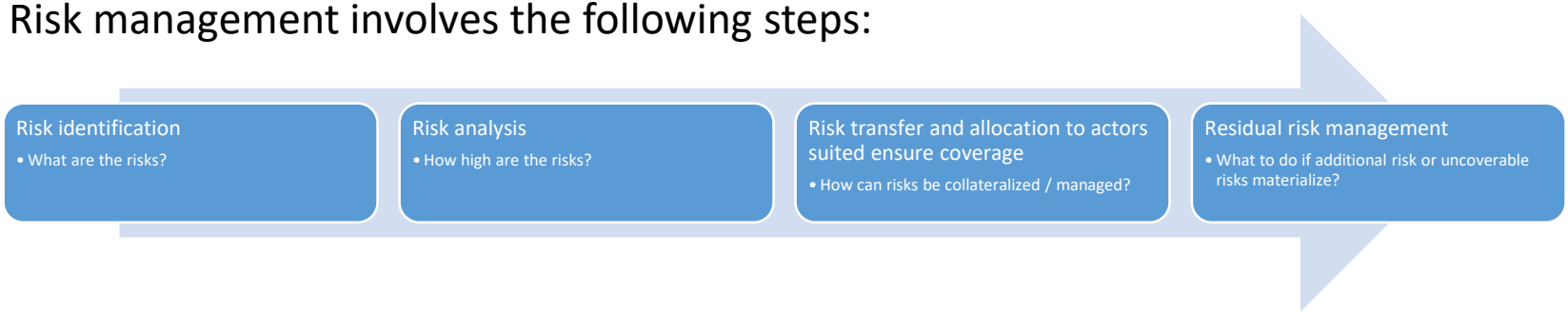
Project Finance as a risk management technique

Risk management involves the following steps:



In a way, the whole Project Finance setup is designed to distribute risks

Bounded rationality (limitations to individual decision making), makes PF contracts difficult. There need to be for **something** a to solve residual issues

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Risk Contamination

Problems:

- A high risk project can potentially drag a healthy corporation into ***distress***. Short of actual failure, the risky project can increase cash flow volatility and reduce firm value. Conversely, a failing corporation can drag a healthy project along with it.

Structural Solutions:

- Through project financing, **sponsors can share project risk** with other sponsors. Pooling of capital reduces each provider's distress cost due to the relatively smaller size of the investment and therefore the overall distress costs are reduced. This is an illustration of how structuring can enhance overall firm value.
- Project financed investment **exposes the corporation to losses only to the extent of its equity commitment,** thereby reducing its distress costs.
- Co-insurance benefits are negative (increase in risk) when sponsor and project cash flows are strongly positively correlated. **Separate incorporation eliminates increase in risk.**

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Source: Harvey, C. et al. (2006) [PowerPoint slides]

NOT EXHAUSTIVE

Risk management within PF

1. Risk retention

- Corporate finance: if the project is on-balance-sheet, and does not perform, cashflows from other projects can be used to compensate the shortfalls
- Project finance: only one source of revenue

2. Transfer risk to one of the counterparties

- In PF, specialized counterparties take on the risk they are best able to deal with
- This is essentially their business risk, dealing with which is (one of) their core competency(ies)

3. Transfer risk to a specialized insurer

- Some risks are too remote to be taken on by a counterparty to the contract
- These are transferred to insurers (or specialized banks)

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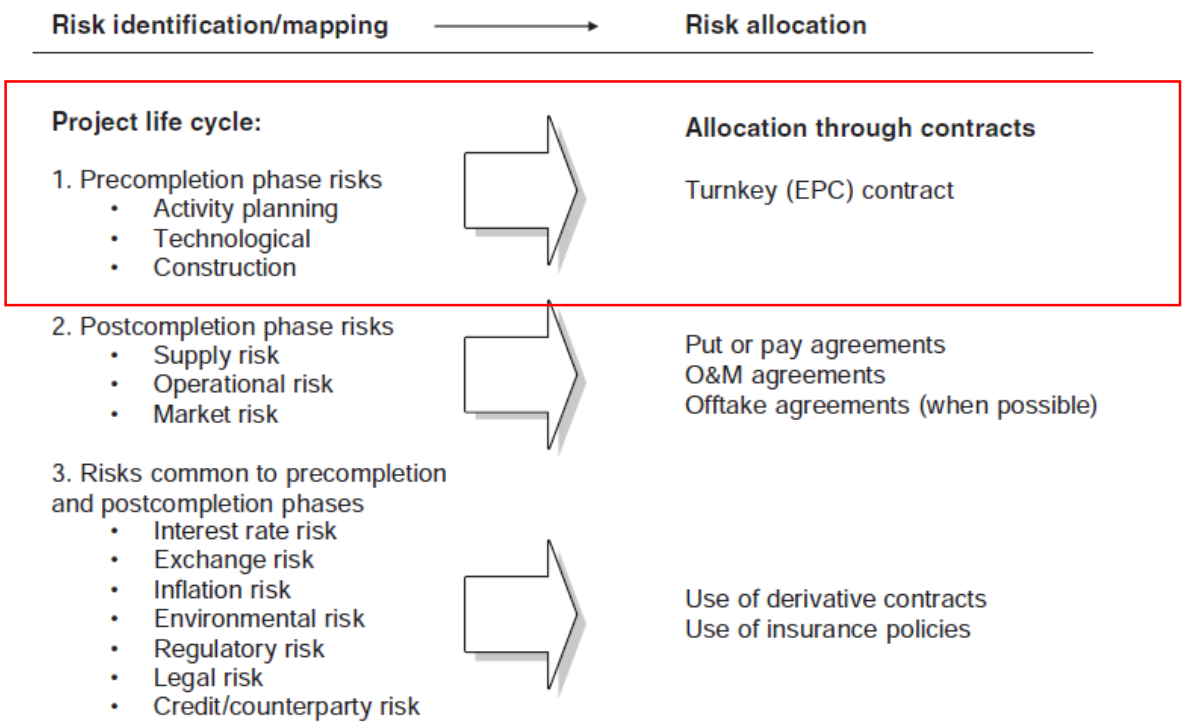
Risk allocation in PF project phases



Legend:
EPC: Engineering, Procurement, and Construction
O&M: Operations and Maintenance

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Source: Figure 3.1 in Gatti (2008)

EPC contracts as risk management tools

Engineering, Procurement, and Construction (EPC) agreements transfers construction risk to the constructing entity

Constructor guarantees completion date, cost of the works, and plant performance

Risk and penalties

Additional risk (like interest rate or exchange rate) is covered by specialized entities	Penalties for non-delivery of the constructor or subcontractors are less than project value

In reality, there is no true “guarantee“ for turnkey completion

Renegotiation and refunds for missed revenues are put in place	Lending banks are involved in the renegotiation process

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Risk allocation in PF project phases

Risk identification/mapping	→	Risk allocation
Project life cycle:		**Allocation through contracts**
1. Precompletion phase risks • Activity planning • Technological • Construction	⇨	Turnkey (EPC) contract
2. Postcompletion phase risks • Supply risk • Operational risk • Market risk	⇨	Put or pay agreements O&M agreements Offtake agreements (when possible)
3. Risks common to precompletion and postcompletion phases • Interest rate risk • Exchange risk • Inflation risk • Environmental risk • Regulatory risk • Legal risk • Credit/counterparty risk	⇨	Use of derivative contracts Use of insurance policies

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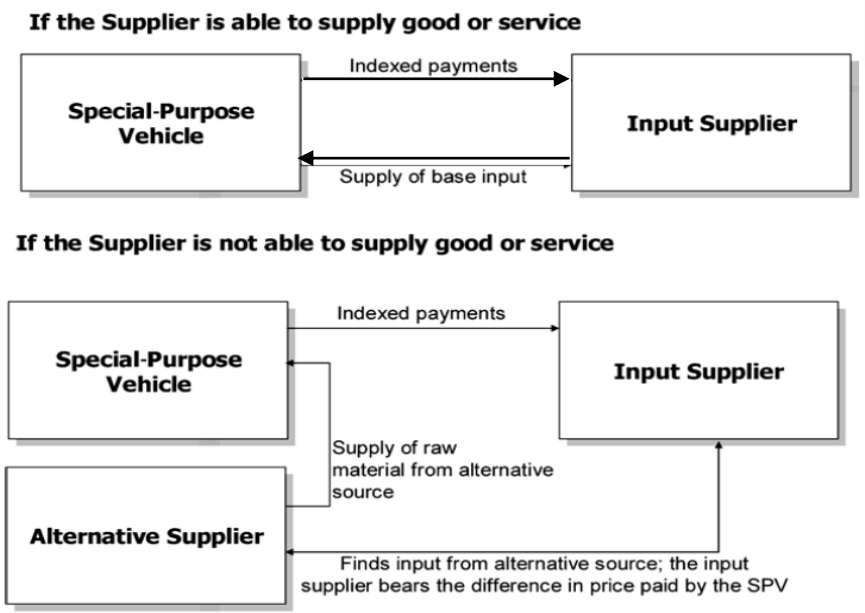
Source: Figure 3.1 in Gatti (2008)

Put or pay agreements protect from supply risk

You can draft contracts for unconditional supply:

- In these accords, the supplier sells the SPV preset volumes of input at pre-agreed prices.
- If supply is lacking , normally the supplier is required to compensate for the higher cost incurred by finding another source of input



Source: Figure 3.5 in Gatti (2008)

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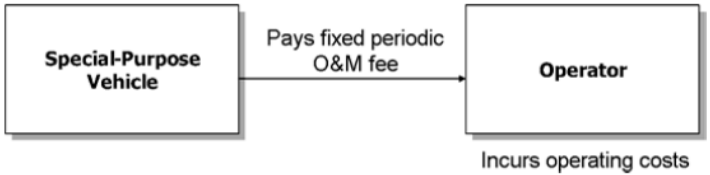
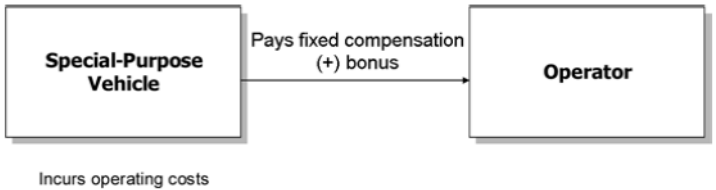
O&M agreements allocate operational risk

Operations and Maintenance (O&M) agreements allocate operational risk to the contractor in charge of running a facility

- Fixed price contract: the operator assumes the risk of fluctuating operating cost



- Pass-through contract: the SPV pays performance bonuses to the operator depending on plant efficiency



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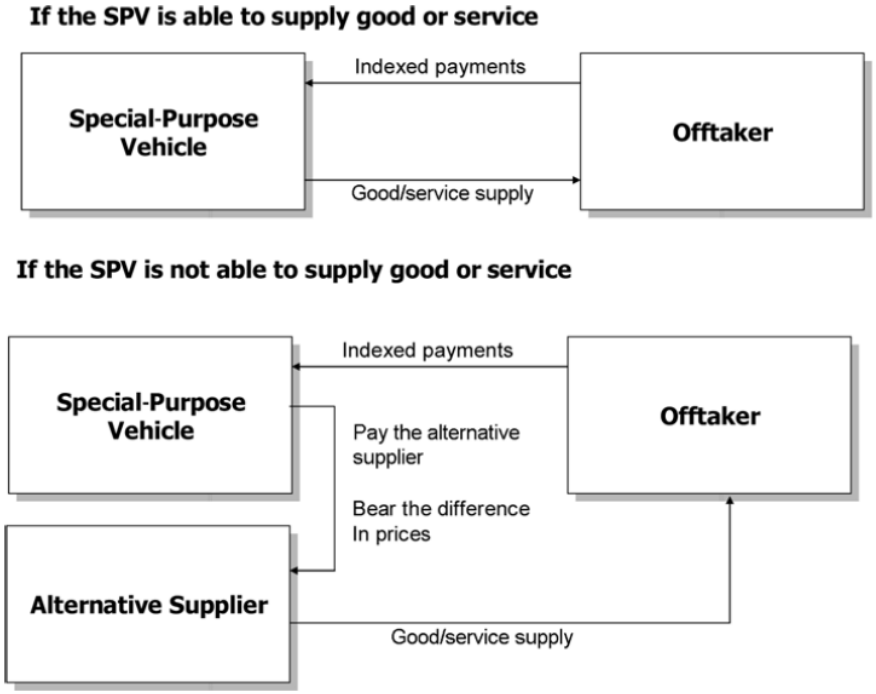
Source: Figure 3.6 in Gatti (2008) and Figure 3.7 in Gatti (2008)

Offtake agreements limit market risk for the SPV

Mitigating market risk through offtake agreements can make use of good credit ratings of buyers (in infrastructure, these are often national governments)

- In these contracts, prices are fixed in relation to parameters that track e.g. inflation
- They work similarly to put or pay agreements



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Source: Figure 3.9 in Gatti (2008)

Overview of what will be covered

1. What is Project Finance and Who are the relevant players?
2. Differences between PF and normal financing
   - 2A Cost of Capital
   - 2B Contamination and Diversification
   - 2C Improved total payoffs
   - 2D Conflict between equity and debt
3. Risk and complexity
4. Risk Management
   - 4A PF as risk management
   - 4B Risk management within PF
5. PF and Joint Ventures
6. Short examples
7. Examples and cases

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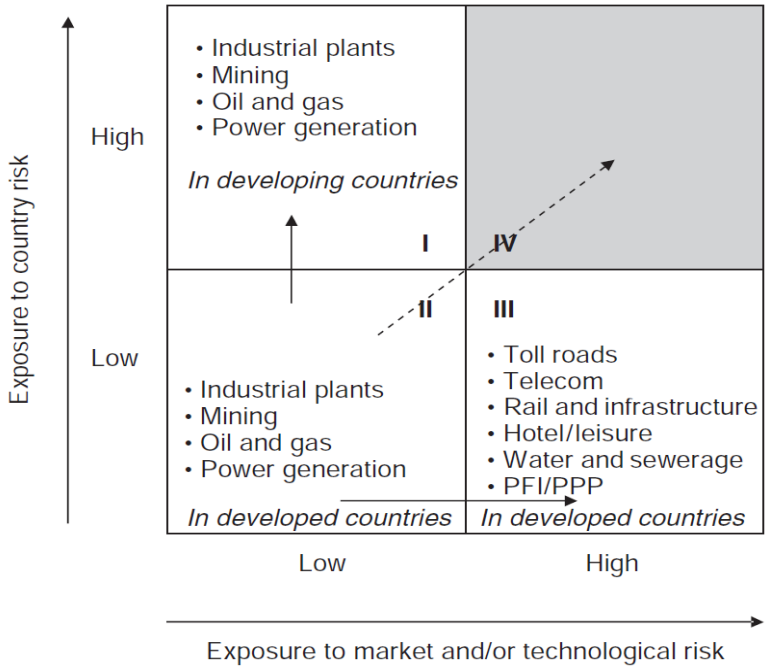
How project finance fits in with JVs



PF must consider the country risk and the market and/or technological risk. It can be used in situations:

- When both risks are low (quartile II),
- When country risk is high but market and/or technological risk is low (quartile I)
- When country risk is low but market and/or technological risk is high(quartile III)

A JV can minimize exposure to risk when both, country risk and market and/or technological risk, are high (quartile IV)

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Source: Figure 2.1 in Gatti (2008)

How project finance fits in with JVs: Political Risk

Risk	Solution
Political and Sovereign Risk	• External accounts for proceeds • Political risk insurance (Expensive) • Export Credit Guarantees • Contractual sharing of political risk between lenders and external project sponsors • Government or regulatory undertaking to cover policies on taxes, royalties, prices, monopolies, etc • External guarantees or quasi guarantees • Externalizing the project company by forming it abroad or using external law or jurisdiction

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Source: Harvey, C. et al. (2006) [PowerPoint slides]

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Example: Poland's A2 Motorway

Background: AWSA is an 18 firm consortium with concession to build and operate toll road as part of Paris-Berlin-Warsaw-Moscow transit system. It is seeking financing for the € 1bn deal (25% equity). It is being asked to put in additional € 60-90m in equity. Concession due to expire in 6 weeks.

Key Issues:

- How to assess the project risk and allocation of risks.
- How can project the project be structured to best manage risk?

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Source: Harvey, C. et al. (2006) [PowerPoint slides]

Example: Poland's A2 Motorway

Construction Risk:

- Best controlled by builder and government.
- Fixed priced turnkey contract with reputed builder.
- Government responsible for procedural delay risk and support infrastructure.
- Insurance against Force Majeure, adequate surplus for contingencies.

Operating Risk:

- Best controlled by AWSA and the operating company.
- Multiple analyses by reputable entities for traffic volume and revenue projections.
  - **Update:** in 2018, AWSA had to return approx. EUR 450m of undue state aid due to basing the calculation on the outdated forecasts of traffic volume.
- Comprehensive insurance against Force Majeure.

Political Risk:

- Best controlled by Polish Government and AWSA.
- Assignment of revenue waterfall to government: Taxes, lease and profit sharing.
- Use of UK law, enforceable through Polish courts.
- Counter guarantees by government against building competing systems, ending concession.

Financial Risk:

- Best controlled by Sponsor and lenders.
- Contracts in € to mitigate exchange rate risk.
- Low senior debt, adequate reserves and debt coverage, flexible principle repayment.
- Control of waterfall by lenders gives better cash control.
- Limited floating rate debt with interest rate swaps for risk mitigation.

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Source: Harvey, C. et al. (2006) [PowerPoint slides]

Case : The Chad Cameroon Project

Background: An oil exploration project sponsored by Exxon-Mobil in Central Africa with two components:

1. Field system*:* Oil wells in Chad, cost: $1.5bn.
2. Export System*:* Pipeline through Chad and Cameroon to the Atlantic, cost: $2.2bn.

Key Issues:

- Chad is a very poor country ruled by President De'by, a "warlord". Expropriation risk.
- Possibility of hold up by Cameroon.
- Allocation of proceeds – World Bank's role and Revenue Management Plan.

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Source: Harvey, C. et al. (2006) [PowerPoint slides]

Case : The Chad Cameroon Project

Possible financing Strategies for Exxon-Mobil			
Financing Options	**Field System**	**Export System**	**Total Investment**
Corporate Finance: 1 sponsor, EM 100% owner	$1521m	$322m+$1881m=$2203m	$3723m
Corporate Finance: 3 Sponsors, EM 40% Owner	40%* $1521m = &608m	40%*($2203m) = $881m	$1489m
Hybrid structure: 3 Sponsors, EM 40% owner	Corp. Finance 40%* $1521m = $608m	Project Finance 40%*(123+680)= $321m	$929m
Project Finance: 3 sponsors D/V=60% EM 40% Owner	16%*$1521m = $243m	16% * ($2203) =$352m	$596m

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Source: Harvey, C. et al. (2006) [PowerPoint slides]

Case : The Chad Cameroon Project

Structural choice: Hybrid structure

- Brings in the World Bank to address the issue of Sovereign Risk.
- Exxon-Mobil chooses corporate finance for oil fields since investment size is small. Other means of managing sovereign risk.
- **Exxon-Mobil chooses project finance for the pipeline to diversify and mitigate risk.**
- Involves the two nations to prevent post opportunistic behavior with the export system.

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Source: Harvey, C. et al. (2006) [PowerPoint slides]

Conclusions

- Project finance involves many different parties, each balancing their own interests
- Project finance can protect company's assets, even if the project is not successful
- Project finance allows for higher debt levels
- Project finance can be used to manage complex projects
  - There is a strategy to manage almost every kind of risk…
  - Contamination risk can be avoidable by using project finance
- Project finance requires extensive contracting and lots of communication

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AES case study

Can be purchased at:
https://hbsp.harvard.edu/product/204109-PDF-ENG?Ntt=aes+capital+budgeting&additionSource=Item+Detail+Page&dialog=teaching-note&itemFindingMethod=Search&parentProductId=204109-PDF-ENG

General question structure

The past:	What does the firm do and how did we get to the problem?
The present:	What is the problem?
The suggestion:	How does the case suggest to solve the problem?
The evaluation:	What does the suggestion imply, particularly regarding the past? Where would we be if we had followed the suggestion in the past?
The analysis:	What do we get if we apply the suggestion to an element in the case
Take aways:	Key learnings and relate the case back to other class materials

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Questions for the case report

- Case reports have to answer the following questions:

1. How would you evaluate the capital budgeting method used historically by AES? What's good and bad about it?
2. If Venerus implements the suggested methodology, what would be the range of discount rates that AES would use around the world?
3. Does this make sense as a way to do capital budgeting? How do the underlying assumptions under the new methodology differ from the old ones?
4. What is the value of the Pakistan project using the cost of capital derived from the new methodology? If this project was located in the US, what would its value be?
5. How does the adjusted cost of capital for the Pakistan project reflect the probabilities of real events? What does the discount rate adjustment imply about expectations for the project because it is located in Pakistan and not the US?

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AES’s business and its historic approach to capital budgeting

AES‘s business and history

- What was AES‘s original business and how did it change?
  - Originally domestic US firm
  - Liberalization in many countries led to FDI being possible
  - Now four business units
    - Contract Generation
    - Competitive Supply
    - Large Utilities
    - Growth Distribution

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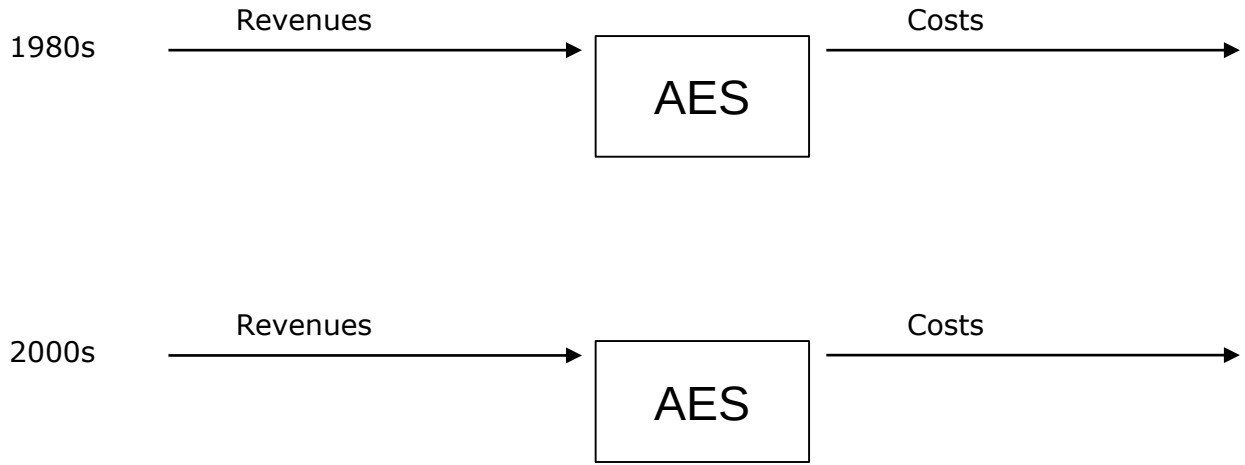
- How did inflows and outflows of cash change at AES?



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Capital budgeting at AES (historically)

- What were the key principles to capital budgeting at AES
  - All flows are equally risky
  - All non-recourse debt deemed good
  - Discount rate of 12% for all projects

- Did this make sense in the past (1980s)?
  - (see figure before)
  - Plants or utilities in Pittsburg, Indiana, Texas
  - Predictable US Dollar revenues (regulated industries)
  - Reasonable to assume equal risk

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Capital budgeting at AES (historically)

- What were the key principles to capital budgeting at AES
  - All flows are equally risky
  - All non-recourse debt deemed good
  - Discount rate of 12% for all projects

- Does this make sense in the later 1990s and after?
  - Geographic diversification means new risk
  - Different risks for different businesses
  - Different exchange rates

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The new methodology for determining discount rates

Capital budgeting at AES (proposed)

- What is the new methodology supposed to accomplish?
  - Different discount rates for different investments
  - Country risk and other risk to be considered in discount rates
  - We are going to get different adjusted WACCs for the projects

$$WACC = r_{equity} \cdot \frac{E}{V} + r_{debt} \cdot \frac{D}{V} \cdot (1 - T_C)$$

- We will go through the updated methodology using the Lal Pir project

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Capital budgeting at AES (proposed)

- The cost of equity

$$WACC = r_{equity} \cdot \frac{E}{V} + r_{debt} \cdot \frac{D}{V} \cdot (1 - T_C)$$

- What is unlevered equity beta?
  - conceptually?
    - the beta for an equity-financed project
  - for the Lal Pir project?
    - 0.25 (E7b)

- What is the levered beta for the Lal Pir project given the target capital structure?

$$\beta_{levered} = \frac{\beta_{unlevered}}{\frac{E}{V}} = \frac{0.25}{0.65} = 0.38$$

- What does it mean to use US-based comparables here?

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Capital budgeting at AES (proposed)

- The cost of equity

$$WACC = r_{equity} \cdot \frac{E}{V} + r_{debt} \cdot \frac{D}{V} \cdot (1 - T_C)$$

$$r_{equity} = r_f + \beta(r_M - r_f) = 0.045 + 0.38 * 0.07 = 0.072 = 7.2\%$$

- What does this mean?
  - This is a baseline cost of equity for Lal Pir, pretending it is in the USA.
- How do we adjust for the project being in Pakistan?
  - We add the sovereign spread (9.9%). This is the difference between the risk-free rates.

$$r_{equity\ (Lal\ Pir)} = 0.072 + 0.099 = 0.171 = 17.1\%$$

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Capital budgeting at AES (proposed)

- The cost of debt

$$WACC = r_{equity} \cdot \frac{E}{V} + r_{debt} \cdot \frac{D}{V} \cdot (1 - T_C)$$

$$r_{debt} = r_f + Default\ Spread = 0.045 + 0.0357 = 0.0807 = 8.07\%$$

- What is the intuition behind this approach?
  - The cost of debt reflects the risk-free rate plus the default spread
  - This is again assuming the project is in the USA.
- How do we correct for the project being in Pakistan?
  - We again add the sovereign spread

$$r_{debt\ (Lal\ Pir)} = 0.0807 + 0.099 = 0.18 = 18\%$$

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Capital budgeting at AES (proposed)

- The project‘s idiosyncratic risk

- How does the risk assessment work?
  - Risks are defined and weighted
  - Risk scores (between 0 and 3) are allocated
  - Risk score is mapped to 0 to 1500 bps risk premia

- What is the risk score for Lal Pir?
  - The risk score is 1.4
  - The risk adder is 7.0%

Category	Weight	Score
Operational	3.5%	1
Counterparty	7.0%	1
Regulatory	10.5%	2
Construction	14.5%	0
Commodity	18.0%	1
Currency	21.5%	2
Legal	25.0%	2
Risk Score		1.4
Risk Adder		7.0%

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Capital budgeting at AES (proposed)

- Computing the adjusted WACC (IRM = Idiosyncratic Risk Measure)

$$WACC_{adjusted} = 0.171 * 0.65 + 0.18 * 0.35 * (1 - 0.23) + 0.07 = 0.23 = 23\%$$

- What is the Lal Pir project value at the Lal Pir discount rate?
  - $277.52
- What is the Lal Pir project value at the Red Oak discount rate (6.5%)?
  - $730.34

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What is the range of discount rates?

- How you compute the highest and lowest adjusted WACCs?

Lowest = Red Oak = 9.7%
Highest = Andres = 29.9%

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Evaluating the new methodology

Capital budgeting at AES (evaluation)

- If you were on the board of AES, what would you say? Does any of this make sense?
  - The idiosyncratic risk measure?
    - Little trust in project cash flows
    - How will local forecasters react?
  - The use of sovereign spreads?
    - What risks do sovereign spreads capture?
    - How does the different valuation under different discount rates translate into cash flow probabilities?
      - 6.5% vs. 23%?
    - How likely is it that Lal Pir will be expropriated in 2009 (or otherwise seize to generate CFs)?

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Expropriation in politically unstable countries

- Expropriation means that expected cash flows might not materialize
  - The net present value can be changed accordingly

$$NPV = C_0 * S_0 + \frac{C_1 * S_1}{1+r} + \cdots + \frac{C_m * S_m}{(1+r)^m} + \frac{C_m * (1+g) * S_m}{(r-g) * (1+r)^m} - p_h * \frac{G_h * S_h}{(1+r)^h}$$

  - We add a (negative) term indicating the discounted value of the expropriated project (G_h) to our NPV computation. We multiply this value with the probability that the project will be expropriated (p_h).

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Expropriation of Lal Pir

- If we pretend all this is because of fear of expropriation
  - What is the probability of expropriation, say in year 2009?

$$NPV = \frac{C_1}{1+r} + \cdots + \frac{C_m}{(1+r)^m} - p_h * \frac{G_h}{(1+r)^h}$$

$$277.52 = 730.34 - p_h * \frac{730.34}{(1+0.065)^6}$$

$$p_h = 0.905$$

- Is this a reasonable assumption?

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A 50% reduction in Lal Pir cashflows

- What if we assume the project only delivers 50% of projected cash flows (under the Red Oak discount rate)?

$$NPV' = \frac{C_1 * 0.5}{1+r} + \cdots + \frac{C_m * 0.5}{(1+r)^m} = 0.5 * NPV = 0.5 * 730.34 = 365.17$$

- This is still more than under the “appropriate“ Lal Pir discount rate (NPV=277.52)

- What do you think?

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AES and international CAPM

Relating this back to previous content

- Why do people adjust discount rates?
  - because it seems more sophisticated...
- We can at least cover different types of risks differently (by adjusting the betas)
- A scenario analysis of different cash flow scenarios may be helpful
- Real option contributions may capture some of the upside potentials of risk

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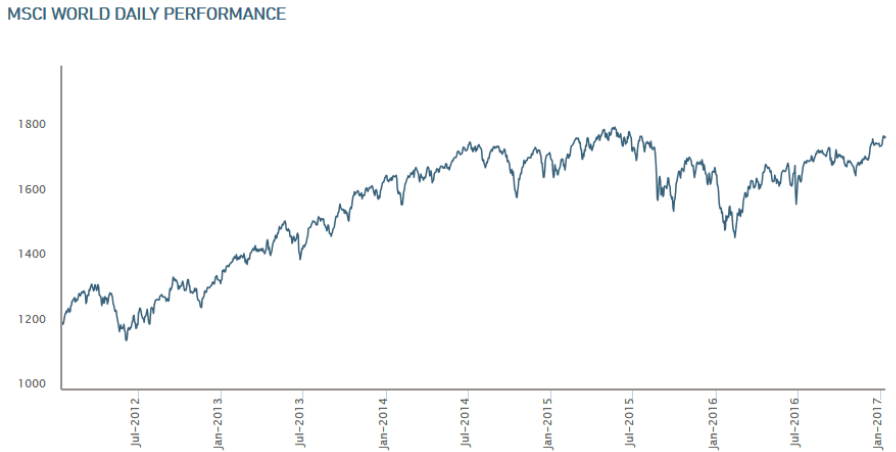
Risk adjustment for cross-border investment (I)

- For integrated capital markets, literature suggests using a world-market (e.g. MSCI world) for the average return (r_{WM}), computing the risk relative to this (β_{WM}) and adding a country's default spread (α_C) to the cost of capital.

$$r = r_f + \beta(r_M - r_f)$$

$$r = r_f + \alpha_C + \beta_{WM} \cdot (r_{WM} - r_f)$$



Source: https://www.msci.com/world

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A continuum in the degree of integration

Highly segmented financial markets	Fairly segmented (or mildly integrated) financial market	Highly integrated financial market
Embryonic capital markets in developing countries	*Emerging capital markets* in newly industrialised countries	*Advanced industrialised countries* with sophisticated currency, bond and equity markets
Examples: India, Indonesia, Philippines; Venezuela, Nigeria, China, Thailand	Examples: Turkey, Mexico, Brazil, Malaysia, Argentina, South Korea, Taiwan	Examples: USA, UK, Japan, Netherlands, Germany, France

Source: Buckley, International Finance (2012)

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Risk adjustment for cross-border investment (II)

- For non-developed countries, this approach is argued by some scholars to be insufficient.
- Two ways are proposed to account for additional risk.
  1. Exchange β_{WM} for the ratio of standard deviation in returns from the project (σ_i) over standard deviations in returns in the market portfolio (σ_{WM}). Sometimes, this ratio is simply approximated by 0.6.
  2. Add a premium that reflects the country's default spread (α_C) and the ratio of variability in its equity market (σ_{Mi}) and in government bonds (σ_{Gi}) to the market risk premium

$$r = r_f + \alpha_C + \beta_{WM} \cdot (r_{WM} - r_f)$$

$$r = r_f + \alpha_C + \frac{\sigma_i}{\sigma_{WM}} \cdot (r_{WM} - r_f) \qquad r = r_f + \alpha_C + \beta_{WM} \cdot (r_{WM} + \alpha_C * \frac{\sigma_{Mi}}{\sigma_{Gi}} - r_f)$$

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Capital budgeting at AES (proposed)

- The cost of equity

$$WACC = r_{equity} \cdot \frac{E}{V} + r_{debt} \cdot \frac{D}{V} \cdot (1 - T_C)$$

$$r_{equity} = r_f + \beta(r_M - r_f) = 0.045 + 0.38 * 0.07 = 0.072 = 7.2\%$$

- What does this mean?
  - This is a baseline cost of equity for Lal Pir, pretending it is in the USA.
- How do we adjust for the project being in Pakistan?
  - We add the sovereign spread (9.9%). This is the difference between the risk-free rates.

$$r_{equity\ (Lal\ Pir)} = 0.072 + 0.099 = 0.171 = 17.1\%$$

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The new approach in the context of S2

- The suggested (new) methodology for capital budgeting at AES:

$$r = r_f + \alpha_C + \beta_{US} \cdot (r_{US} - r_f) = 17.1\%$$

- For integrated capital markets:

$$r = r_f + \alpha_C + \beta_{WM} \cdot (r_{WM} - r_f) < 17.1\%$$

- For fairly segmented capital markets:

$$r = r_f + \alpha_C + \beta_{WM} \cdot \left(r_{WM} + \alpha_C * \frac{\sigma_{Mi}}{\sigma_{Gi}} - r_f\right) >? 17.1\%$$

- For embryonic capital markets

$$r = r_f + \alpha_C + \frac{\sigma_i}{\sigma_{WM}} \cdot (r_{WM} - r_f) <? 17.1\%$$

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In summary

The key take aways from the AES case

- Idiosyncratic (micro) risk should not go into discount rates (against CAPM assumptions)
- Adding risk spreads to the discount rate may double (triple?) penalize projects
- The resulting valuation spiral might turn problematic
- Stuffing risks into discount rates implies unrealistic (?) probabilities of expropriation
- This kind of evaluation suggests there is a lot of precision where really there is not so much

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