RISK MANAGEMENT IN BOT PROJECT FINANCING

by

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Abstract

BOT has been one of the recent innovation in project finance. The Build-Operate-Transfer (BOT) scheme is a limited recourse financing technique. Many have adopted this approach as an alternative to traditional public financing for infrastructure development projects.

The thesis first describes the BOT model, its different phases, as well as the parties involved and the contractual relationship between them. The success factors and the causes for project failure are identified.

Second, the thesis examines the risks involved in each phase of the project and suggest methods to mitigate these risks. Emphasis is on the financing of the project, and since allocating risk is the essence of project financing, the thesis describes the allocation of risks to the parties best able to manage them. Some of the methods used to limit these risks are identified.

Third, it examines the type of capital and debt in project financing. In addition, it examines the financial instruments used in project financing, and present some innovative financing techniques for a successful project finance.

Finally, the Channel Tunnel project is presented as a major illustrative case study for the BOT model. Although best known for its problem, the Channel Tunnel has demonstrated that the BOT project financing model is a viable way to meet the capital commitments required to launch major infrastructure projects. The case study describes the project background, the project contract, the financing of the project, the risks involved in each phases, the method used to limit the risks, the problems encountered, the current status of the project, as well as an overall assessment of the success or failure of the project.

Thesis Supervisor: Massoud Samii
Title: Senior Lecturer of Civil and Environmental Engineering

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May, 1996 Ahmad Kreydieh

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Chapter 1

The BOT Model

1.1 Introduction

There has been a growing trend in recent years for governments in many countries to place major public investments, particularly for infrastructure projects, into the private sector. Many have adopted the Build-Operate Transfer, or BOT approach, so that the private sector has to finance, construct, operate the project facility, and then transfer the ownership to the government after a specified concession period. Therefore, the BOT scheme is a limited-recourse project financing technique for implementing infrastructure projects by using private funding.

1.2 Objectives

The objectives of this thesis is to examine the risks in a BOT project and the methods used to mitigate them. The thesis first describes the BOT model, its different phases, as well as the parties involved and the contractual relationship between them. The success factors and the causes for project failure are identified. Next, the thesis examines the risks involved in each phase of the project and suggests methods that could be used to mitigate these risks. Emphasis is on the financing of the project, and since allocating risk is the essence of project financing, the thesis describes the allocation of risks to the parties best able to manage them. It also examines the type of capital and debt available for project financing as well as some financial instruments used in project financing, and present some innovative financing techniques for a successful project finance. Example from various BOT projects are used to illustrate the above concepts. In particular, the Channel Tunnel project is presented as a major illustrative case study for the BOT model. Although

best known for its problem, the Channel Tunnel has demonstrated that the BOT project financing model is a viable way to meet the capital commitments required to launch major infrastructure projects. The case study describes the project background, the project contract, the financing of the project, the risks involved in each phases, the method used to limit the risks, the problems encountered, the current status of the project, as well as an overall assessment of the success or failure of the project.

1.3 Definition of a BOT Project

The term BOT (build-operate-transfer) can be defined as a major start-up business venture where private organizations undertake to build and operate a project, which would normally be undertaken by the government, and return the ownership to the government after a fixed concession period (Tiong, 1990). Lenders and investors are expected to look to the revenues generated from the project as the main source of security for repaying the debts.

The concept 'Build-operate-Transfer' or BOT was first coined by the Turkish Prime Minister Turgut Ozal in 1984 within the framework of the privatization of Turkey's public project (Tiong, 1990). The idea was attractive, especially in developing countries which see BOT as a way of reducing public sector borrowing, and at the same time promoting direct foreign investments in their infrastructure and industrial projects' (Tiong, 1990). Examples of such projects are power stations, toll roads, toll bridges, Tunnels, and pipeline systems for oil and gas. The following table list some of the BOT projects in various countries (Walkers, 1995).

Country	Project	Status
Australia	Sydney Harbour Tunnel	Operating
Canada	Terminal 3 of Toronto International Airport	Operating
China	Shajiao 'B' power station	Operating
France	Toll roads (various)	Operating
Hong Kong	Central Cross Harbour Tunnel	Operating
	Eastern Cross Harbour Tunnel	Operating
	Western Cross Harbour Tunnel	Under construction
Malaysia	Kuala Lumpur Light Rail System	Proposed
	North-South Highway	Operating
Turkey	Istanbul Airport	In negotiation
UK	Eurotunnel	Operating
	Dratford Bridge	Operating

Table 1.1: List of some current BOT projects

1.4 Definition of Project Financing and Risk Management

The term project financing refers to the financing of an economic unit in which a lender looks initially to the cash flows and earning of that economic unit as the source of funds from which a loan will be repaid and to the assets of the economic unit as collateral for the loan (Nevitt, 1989).

Project financing is an old technique. It was developed in the United States 35 years ago because the borrowers could only offer underground oil reserves as a security. A new technique was created for that purpose where the bankers would lend on the future

revenues to be earned from the sale of the oil for only security. The major idea in project financing is that the bank directly shares the project risks with the company. The company is not a debtor of the bank; the project is the debtor. The bank is repaid from the project cash flows and has the project itself as security. The banks takes the project risk. If the project goes badly, the bank has no recourse against the company (Roger, 1990).

The ultimate goal in project financing is to arrange a borrowing for a project which will benefit the sponsor and at the same time be completely non-recourse to the sponsor, in no way affecting its credit standing or balance sheet. Project financing is sometimes called off-balance sheet financing. This is done using the credit of a third party to support the transaction (Nevitt, 1989).

The key to a successful project financing is structuring the financing of a project with as little recourse as possible to the sponsor, while at the same time providing sufficient credit support through guarantees or undertakings of a sponsor or third party, so that lenders will be satisfied with the credit risk (Nevitt, 1989). Project financing can be achieved by financial engineering which combines undertakings and guarantees by parties interested in a project in such a way that no party will assume the full credit risk responsibility for the project.

Risk management is the discipline of identifying risks in the environment, assessing their potential impact on critical performance measures, and employing direct and indirect means for either reducing the exposure of the underlying project activities to these risks or shifting some of the exposure to other (Lessard, 1995). Risk management is essential to achieve a successful BOT project financing. In the following sections, the process is described in more details, and used in the case study.

1.5 Analytical Requirements for Developing a BOT Project

BOT project are therefore a variant of limited recourse financing projects where financing is done on the basis of project risks and cash flows and where guarantees from project owners are limited. Its benefits include freeing potential borrowing capacity for the project sponsors and sharing project risks.

BOT project financing requires a combination of detailed risk analysis - to assess whether all the risks will be satisfactory covered; economic analysis - to demonstrate acceptable rates of returns to the government and the project; and financial analysis - to demonstrate adequate cash flows.

1.6 Cash Flow Management and Financial Engineering

Project finance is tailored to the project's economic viability and the relative reliability of its cash flows. Because lenders look to forecasted cash flows as collateral for the loan, extensive feasibility and engineering studies are necessary so that the cash flow projections can be relied upon (Beidleman, 1990).

Formulating the financial package for a complex project involves arranging a series of capital market instruments and structures necessary to finance the project successfully. This requires addressing contractual agreement and risk allocation among project participants to achieve a successful financing.

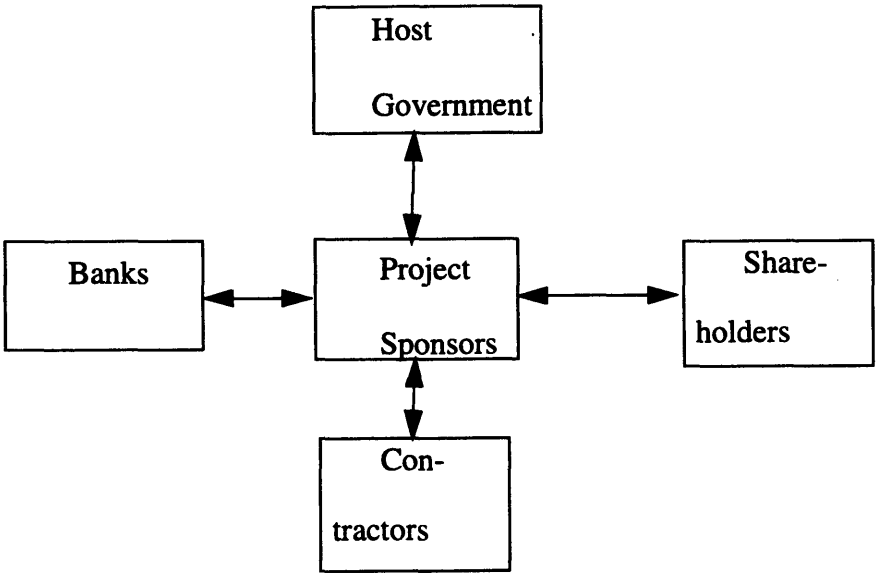

Figure 1.1: Main parties involved in a BOT project

1.7 BOT Project Structure

A whole series of risks has to be considered and allocated among the various parties involved in the project. The parties identify each other's positions and come up with a scheme. The various parties in a BOT project are identified below (Jones, 1990).

Government. The government grants a concession to the project company. If the project, such as the Eurotunnel between England and France, runs between two countries, there will be a treaty between two governments, and the concession may be given by two government to two companies. A government's strong commitment to a project and its ability to cooperate with the private sector is important for the success of the project.

Project sponsor. In general, project sponsors are developers, contractors, operators, suppliers, or other investors. There may be two groups of investors involved in the project. The initial shareholders, or sponsors, who either responded to an invitation from the host

government to bid or have come up with a scheme which they believe the host government should adopt. The shareholders of the wining consortium enters into a shareholders' agreement with each other which govern the relation among themselves and describe how the project company will be managed.

Contractors. Usually, the contract between the contractors and the project company is a fixed-price design-build contract, which limits some of the risk. In order to facilitate financing, the contractor takes responsibility of the design risk, by assuming risks for longer period of time as opposed to standard construction contracts of shorter concession life.

Lenders. Usually, equity contribution from shareholder constitute a limited part of the financing. Lenders usually provides the major amounts of funding needed for the project. Usually, senior lenders form a syndication and lend to the sponsor through it.

Purchasers. Usually, the lenders have concerns that the project will generate revenues to service the debt. At the same time, investors want to make sure that they will receive a dividend on their capital. The offtake agreement can provide such guarantees.

Suppliers. Large machinery and equipment companies sometimes participate in the financing of the project in order to sell their product. Equity participation could be beneficial for the suppliers in such cases.

Operator. The operator operate and maintain the project during the concession period. Usually, the operator is required to maintain a certain performance level to produce the maximum potential of the facility.

Insurance. It is helpful to have insurance advisors to consider when insurance can be used to mitigate some of the project risks. The government also needs insurance advisors to

determine the risks that need insurance coverage. Figure 1.2 describes the contractual relationships in a BOT project.

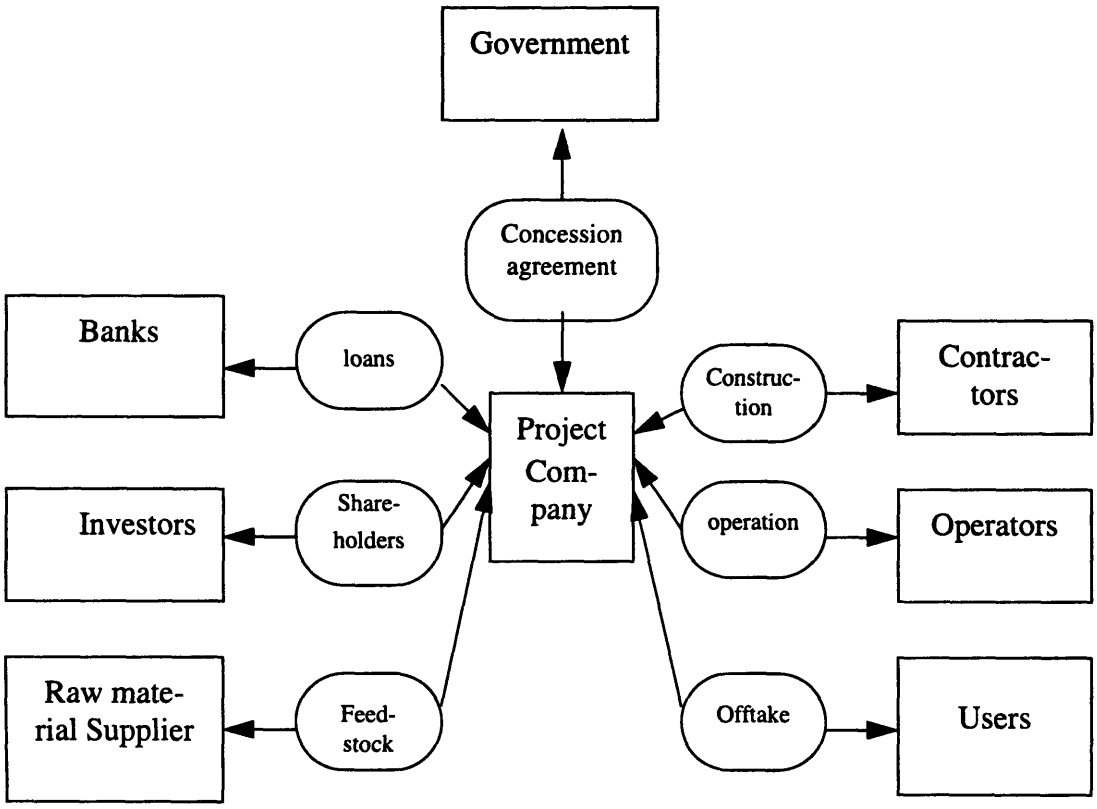

Figure 1.2: Contractual relations in a BOT project

1.8 Problems and Difficulties in BOT Projects

There are a number of problems and difficulties which are inherent in the application of BOT project financing. According to the World Bank Group, these problems and

difficulties can be summarized in the following list (Jones, 1990).

The untrusting relationship between the public and private sector.

Inexperience in the private sector.

Inexperience in the public sector.

High complexity of the project.

High development costs.

Conflicts of interests between the parties involved.

The high dependency on contractors joint ventures/consortia.

The long economic lives of BOT projects.

Changing requirements for project management.

The scarcity of appropriate sources of cash equity.

It is very important to understand the type of contractual relationships between the parties and the role of each party in order to perform risk management as it will be seen in the next chapters. It is also important to understand the problems and the causes for project failure in order to avoid similar problems as much as possible and to achieve better project performance.

Chapter 2

Risk Identification

In any construction project, risks are unavoidable. Project participants are exposed to various kinds of risk. One of the causes that leads to project failure is the inappropriate allocation of risks to the various parties in the project. Risk management starts by the identification of the various types of risk that could be encountered in a project. In order to identify the risks it is essential to understand what each risk consists of and what are the common causes for project failure. Understanding the causes for failure and the description of the various risks is a prerequisite for an efficient risk identification, allocation, and mitigation.

2.1 Causes for Project Failure

Only about 20 percent of the projects that are seriously considered are successfully completed. Some of the causes of this high failure rate are the following (Nevitt, 1989):

Delay in completion, with consequential increase in the interest expense on construction financing and delay in the contemplated revenue flow.

Capital cost overrun.

Technical failure.

Financial failure of the contractor.

Government interference.

Uninsured casualty losses.

Increased price or shortages of raw materials.

Technical obsolescence of the plant.

Loss of competitive position in the market place.

Expropriation.

Poor management.

Overly optimistic appraisals of the value of pledged security, such as oil and gas reserves.

Financial insolvency of the host government.

For a project financing to be successfully achieved, these causes must be properly considered, monitored and avoided throughout the life of the project.

2.2 Criteria for a Successful BOT Project Financing

The following is checklist that should be considered in order to achieve a successful financing package. This list is suggested by Nevitt (1989).

A credit risk rather than equity risk is involved.

The cost of product or raw material to be used by the project is assured.

A supply of energy at reasonable cost has been assured.

Building materials are available at the costs contemplated.

The contractor/operator is reliable.

Management personnel are experienced and reliable.

Contractual agreement among joint ventures partners, if any, is satisfactory.

A stable political environment exists; licences and permits are available.

Country risk is satisfactory.

Currency and foreign exchange risk have been addressed.

The key promoters have made an adequate equity contribution.

Adequate insurance coverage is contemplated.

Force majeure risk has been addressed.

Delay/Cost over-run risk has been addressed.

The project will have an adequate ROE, ROI, and ROA for the investor.

Nevitt (1989) explained the criteria for a successful project financing mentioned above. Some of these criteria may not apply for certain specific projects. The project sponsors should tailor the criteria to each project case.

1. Credit risk

An objective of many project financing is high leverage of the debt to equity ratios. However, more than a lending risk is involved when the borrower approaches the lender. A spread in excess of about 300 points over libor is generally considered by most project lenders as excessive lending risk is involved. Low credit risk makes it easier to raise equity capital and loans for BOT projects. The usage of a reliable contractor consortium could improve the credit risk of the project. Project sponsors reduce this risk by providing guarantees. This will be discussed in later sections.

2. Cost of product or raw material

Supply sources and contracts for feed stocks or raw material to be used by a project must be assured at a cost consistent with the financial projections.Long-term take-or-pay contracts are sometimes used to ensure a user a source of supply. Project dependents can use a put-or-pay contract, in which the supplier is obligated to provide the prod-

uct or service at certain prices over a period of time.

3. Supply of energy at reasonable cost

A number of project financing got into trouble because of their failure to anticipate future rising energy costs. Long term price contracts for feed stocks, coal or energy (with appropriate escalation provision) can be used as a way of limiting this risk. Energy price escalation should be carefully considered in the feasibility study of the project.

4. Availability of building materials

The actual cost of building material should be consistent with the estimated cost. The ability to import building material and machinery should be established. Existing or possible embargoes for political reasons must be considered.

5. Experience and reliability of the contractor and operator

The contractor must have technical expertise to complete the project. The contractor should be financially strong. He should also be large enough to have the resources to solve any problem which might arise. Usually, lenders to a project require a contractor with an established reputation for building similar projects. The operator must have the financial and technical expertise to operate the project in accordance with the cost and production specifications which form the basis for the financial feasibility of the project.

6. Experience and reliability of management personnel.

Good management personnel as well as experienced operating personnel are needed to operate a project. The general management of a project company makes the basic policy decisions, arranges the financing and is responsible for monitoring the project company.

7. Contractual agreement among joint ventures partners, if any.

If the project is a joint venture, the agreements between the partners are of considerable concern to lenders, who want assurance as to the identity of the companies and entities which will own and operate the project throughout the life of the loan.

8. Stable political environment

The need for a stable political environment is a necessity for a successful project financing. Permits must be readily available. It is very difficult to measure political stability. There exists some rating agencies that describe a country's risks as described in the next section. Sometimes, this information help to assess political stability level.

9. Country risk

There should be no risk of expropriation. Country risk should be satisfactory. Country risk is usually defined as a risk of a lender making a cross border loan to a private company. Country risk problems occur when the host country is not in an economic position to permit transfer of amounts of currency for payment of interest and principal on foreign debt to lenders. Sovereign risk should also be satisfactory. Sovereign risk differ from country risk in that it refers to the risk of loan to a sovereign nation by a lender located in another country. This has application in project finance where the sovereign nation is one of the investors or joint ventures in the project. Country risk is determined by measuring country credibility. Tables of country risks are produced by various organizations to measure a country's credibility. An example of such rating is the EIU/Business Risk International rating where countries are classified into four categories ranging from 'A' (Less risky) to 'E' (More risky) based on the country's international standing (Walker, 1995). Another rating used is the one prepared twice a year by "Institutional Investors" to assess country risk using a scale of 0 to 100.

10. Currency and foreign exchange risk

Currency risk arises where revenues, expenses, capital expenditures and loans are in more than one currency, and therefore the project is subject to potential losses from currency fluctuation. Careful analysis should be made of the expected cash flow of a project to determine what currencies will be used to finance the project, including the host country currency, and what currencies will be generated by the project. Hedging in the forward currency market should be done where possible. Swaps can also be used to hedge foreign exchange exposure. A multi-currency loan may help control this risk.

11. Adequate equity contribution by the key promoters

The key project sponsors or promoters must make equity contributions consistent with their capability and risk of the project. Lenders will require the sponsors of the project to have sufficient financial interest in the project so that it will difficult for the sponsors to abandon or ignore the project. Usually, lenders require an equity contribution of 20% on average as an indication of sponsors' commitment to the project.

12. Adequate insurance coverage

An insurance coverage is important during construction and operation of the project. This provides protection against risks. Usually insurance proceeds are assigned to lenders. Loan agreements include clauses that determine how the to restore the project or to repay the debt to the lenders in case of a casualty loss.

13. Force majeure risk

Force majeur risks results from events beyond the control of the parties in the project. These events may include fire, flood, war, strike, expropriation and political interference.

14. Cost over-run and construction delay risks

Cost Overrun risk occurs when the cost of construction or completion of a project facility is larger than the original estimation. This create a serious problem because the ability of the expected revenues to cover operating costs and amortize debt is dependent upon the assumed cost of the project. Overrun risk can be covered in a variety of ways: additional capital by sponsors, standby credit facility, fixed price contracts, and sponsor's escrow funds for completion.

A delay in completion of a project facility creates a serious problem. Interest on the loan continue to run, thus raising the capitalized costs of the project. At the same time, the expected revenue stream is delayed. Methods of handling cost of delay are the same as for capital cost over-runs.

15. Adequate ROE, ROI, and ROA for the investor

The return on equity, return on investment, and return on assets are useful measures used by lenders and investors in estimating the return in a BOT project.

Although it is difficult to alter the risk of a project, the allocation of the various risks to the parties best able to handle them reduces the project risk. Table 2.2 summarizes the major risks involved in infrastructure projects. Different procurement methods involve different risk exposure as seen in the table. The BOT model involve more risk than the traditional design-build (DB) and the design-build-operate(DBO) models. Mainly, the more the involvement of the private sector in the financing of the project, the greater is the exposure to risk. Therefore, in the BOT model, it is very critical to consider the various types of risks in order to assure success of the project. Also, the more the project is segmented, the less are the risks involved. The DB model which is known as the direct fund-

ing segmented approach involves less risk than the other models. The DBO model, which is the direct funding system approach involves less financing risks because it is funded by the public sector, but it involves other risks as described in the table. Therefore, in BOT projects, the risks are higher than in traditional project financing. This is expected due to the complexity of the financing package, the number of parties involved, and the contractual relationships among the parties.

Risk	II (BOT)	I (DBO)	IV (DB)
Credit risk	Yes	No	No
Product	Yes	No	No
Energy	Yes	Yes	No
Material	Yes	Yes	No
Contractor	Yes	Yes	Yes
Management	Yes	Yes	No
Agreement	Yes	Yes	No
Politics	Yes	Yes	No
Country	Yes	Yes	No
Currency	Yes	Yes	No
Equity	Yes	Yes	No
Insurance	Yes	Yes	No
Force majeure	Yes	Yes	No
Cost overrun	Yes	Yes	No
Return	Yes	Yes	Yes

Table 2.1: Risks Involved in Infrastructure Projects

2.3 Instruments Used in Project Financing

The choice of financial instruments available to a borrower varies with the type of project financing involved. With proper structuring of the credit risk, there are a broad range of financial instruments to use in project financing. In terms of structuring levels of debt and equity in projects, it is suggested to use as much debt as the project cashflows permits in order to have high return for the shareholders (Walker, 1995). There are three general categories of capital and loans used in a project financing: equity, subordinated debt, and senior debt.

1. Equity

The equity investment in a project financing represents the risk capital. Equity investors are the last in priority for repayment, however the upside potential is significant. Lenders look to the equity investment as providing a margin of safety. They have two primary motivation for requiring equity investments in projects which they finance (Nevitt, 1989):

- The more burden the debt service puts on the cash flow of the project, the greater the lenders' risk.
- Lenders do not want the investors to be in a position to walk away easily from the project.

To find the appropriate debt to equity ratio for a given project, many factors are taken into consideration, including debt to equity ratios for the particular industry involved and market expectation and risks. Unless guarantees are available, lenders will require a large equity investment in a project. Equity may be in the form of preferred stock as well as common stock (Nevitt, 1989).

2. Subordinated loans

Subordinated loans are senior to equity capital but junior to senior debt and secured debt. Subordinated debt has the advantage of being fixed rate, long term, insecure and be considered as equity.A subordinated loan is often used by a sponsor to provide capital to a project which will support senior borrowings from third party lenders. The sponsor may be the owner of the project, a supplier providing subordinated trade credit, or government interested in getting the project built. Sources for subordinated debt include finance companies, risk capital companies, and risk portfolio managers of insurance companies. Subordinated lenders are cash flow lenders. They are unsecured. subordinated lenders are sensitive to the capabilities of the management of the project to production and market share while servicing debt.

3. Senior debt

Senior debt constitute the largest portion of the financing. Most borrowings from commercial banks for a project financing are in the form of senior debt. Senior debt is not subordinated to any other liability. It falls into two categories: unsecured loans and secured loans. Senior debt holders have an advantage in liquidation over unsecured debt holders. An insecure loan is debt backed by the general credit of the borrower, and is not secured by a security interest in any asset. Secured loans are available to most projects where the asset securing the debt have value as collateral. Banks are good source of secured loans (Nevitt, 1989).

The interest rate is the price lenders charge for lending their money to the project. The lenders' profit is the spread. It is related to the risk in the project. The greater the cashflow of the project, the more the loan is protected. The DSCR (debt service coverage ratio)

is the most common financial ration used in cashflow lending. It measures the level of protection the cashflows of the project provide for servicing of principal and interest on the debt (Walkers, 1995).

In addition to the above, there exist other sources for BOT project financing. Some of the main sources are multinational agencies, the World Bank, and various regional development banks. Sometimes, suppliers and customers are a possible source for project financing.

2.4 Typical Financial Structure

Large-project risks are managed through joint ownership and control mechanisms. Partnership arrangements are used to limit financial risks (Beidleman, 1990).

Partnerships. A partnership usually hold property of a project, operate it, and enter into financing arrangement in its own name. Partners are responsible for the liabilities that partnership assets cannot satisfy. To protect themselves, project sponsors form subsidiaries that enter into a partnership agreement, and enjoy tax benefits and limit their legal liabilities at the same time.

Joint Ventures. Joint venture agreement are used to minimize the obligation of each party. Sponsors are only liable to the extent of their investment. Joint ventures cannot borrow for their own account. Sponsors arrange separate financing of the undivided interests in the joint venture. An example of joint venture in BOT projects is the Alaskan pipeline project. The participants organized a new corporation to serve as operating agent of the pipeline. The facilities are held in proportion to expected use, and each sponsor is responsible for financing the project in proportion to his interest in the project facility.

Leasing of capital equipment. Third party leasing companies offer an outside source of funds for creditworthy projects. Leases are sometimes employed because of the low costs, cash flow improvement, and credit support they can provide to the project. A predetermined, fixed rent payment schedule permits lessees to predict future equipment financing costs and cash needs more accurately than they could if the equipment were owned.

2.5 Financial Engineering for BOT Projects

Financial engineering for BOT projects comes in two forms (Walker, 1995). The first form is structuring the various agreements related to a BOT so as to enhance the credit worthiness of the borrower. This reduces the risk to lenders and lowers the cost of borrowing to the project company. The second form is the development of innovative financial instruments that improve the viability of the project. This makes the project more attractive to investors and lenders.

In general in a BOT project, the project promoters and contractors try to place as much of the pre-completion risk onto the lenders as possible (Walker, 1995). An important issue is the completion risk and its allocation to the various parties. The standard structure for completion risk in a BOT project is a fixed-price, fixed-time construction contract with a reputable contractor with adequate penalties for delays and cost overruns. This contractor obligation is often accompanied by a completion guarantee from the shareholders to cover any cost overruns and delays that are not the responsibility of the contractor under the construction contract. By structuring the constrction contract in such manner, the shareholders' risk is minimize and the contractor takes most of the risk. The lenders are not taking direct technical completion risk which they are not able to accept (Walker,

1995).

From a lender's perspective, this is the ideal structure that covers completion risk. In practice, lenders are not so well covered against cost overruns and delay risks. In The Channel Tunnel project, the lack of shareholder support for completion risk placed that risk on the lenders as well as on shareholders. Refinancing from lenders was required due to lack of shareholder completion guarantees. Because of the large amount of financing required, a large amount of equity had to be raised from sources outside the contracting consortium. Shares were issued first in private placement and then in an initial public offering (IPO). The wide distribution of shares diffused power in the equity shareholders and gave control to contractors over the project company. This situation was remedied by imposing more management controls over Eurotunnel but only after cost overruns exceeded 100% of the original estimated cost of the project (Walker, 1995).

In some projects lenders are asked to take a part of the completion risk by funding a portion of the cost overruns up to a certain amount. Any cost above this amount would have to be financed by raising additional equity.

In BOT project, pre-completion risks are greater than post-completion risks. Some people view a BOT project as two distinct projects. The first phase of the BOT project is a high-risk construction project. The second phase is considered to be a relatively low-risk utility project. For investors, there is a high reward during the first phase due to large capital gain, and a lower reward in the second phase due to dividend payments.

To achieve a successful project financing, importance should be given to the structuring of debt and equity levels. Usually, the higher the debt ratio the higher is the return for shareholders. The less equity in a project, the greater the threats to the project cash-

flows (Walker, 1995). It is very important to improve the return to shareholder and at the same time protect against the risks of having an unstable cashflow. Innovative financing instruments and techniques can be used to achieve this goal. borrowers should consider many factors in order to determine the best capital market instruments to use. These factors include currency mix, the level of protection against interest rate changes, repayment profile, drawdown profile, and balance sheet structure (Walker, 1995).

Chapter 3

Risk Allocation and Management

The type and degree of risk in project financing vary by project and industry. Project finance requires the following measures:

a. Identifying the risks at each stage of the project.

b. Allocating each risk to the appropriate participant.

c. Arranging guarantees to cover risk components.

Each phase in the project has its own financial considerations, participants, and risks. The phases of the project are development (pre-investment and implementation), construction, and operation. The phases in a typical BOT project are shown in Figure 3.1.

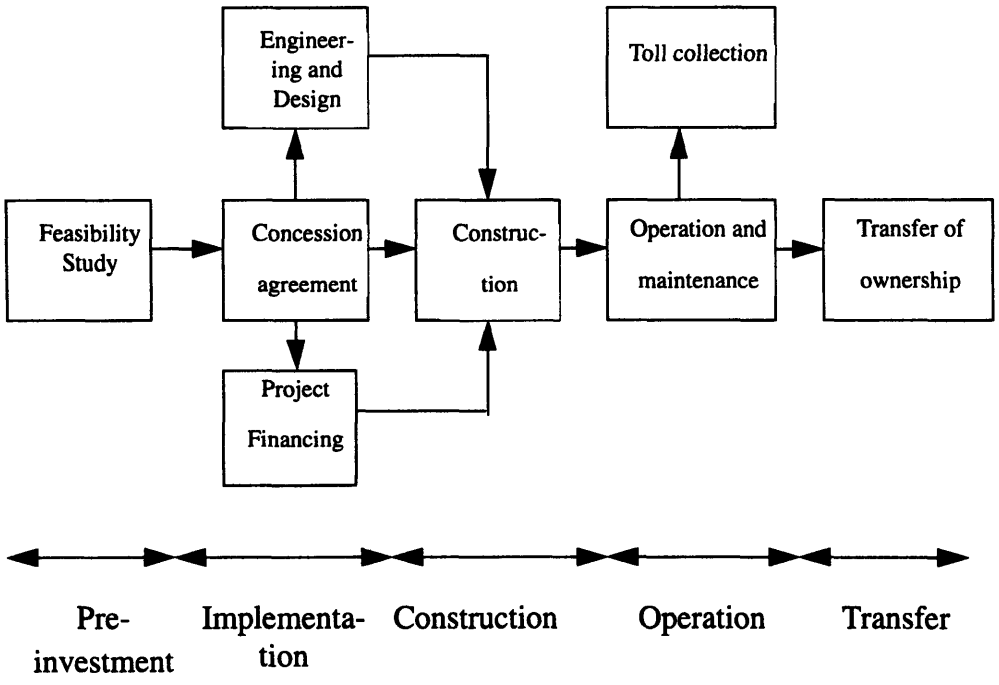

Figure 3.1: Phases in a BOT project

Risks are therefore grouped by project phase in this chapter. Each section discusses risks involved in a particular phase. Ongoing risks that may occur in different phases of the project are discussed in an independent section. In addition, political risks and environmental risks are discussed in separate sections.

3.1 Development Phase

Development phase usually takes from one to three years to complete. The development phase includes both pre-investment and implementation. Usually, developers and contractors take an equity position. Sponsors may retain equity until the project is completed. Financial advisors sometimes provide their services on a success fee basis, thus assuming a part of the risk that the project may not start. The risks associated with the development phase and the agreements that can allocate these risks to the participants include the following:

Technology risk

A new technology may not be economically viable or regulation regarding its use may change (Beidleman, 1990). Project sponsors have to assume the technology risk through equity participation.

Credit risk

The credit risk is related to the creditworthiness of the sponsor or the project. Credit is enhanced through letters of credit issued on behalf of developers by banks. This allocates credit risk away from the sponsor and ensure that the lenders need not rely only on the creditworthiness of an individual sponsor. In some situations, rating agencies, such as Standard and Poor, rate projects based on the credit strength of the sponsoring consor-

tium (Beidleman, 1990).

Bid risk

Any project involves the risk of not being launched successfully. Usually, this risk is assumed by project sponsors, as well as by financial advisors (Beidleman, 1990). Table 3.1 lists the major risks that are faced during the development phase in a BOT project along with potential solution to mitigate these risks.

Development phase	
Risks	Solutions
Technology risk	Equity or subordinated debt
Credit risk	Letters of credit credit rating agency
Bid risk	Equity Success fee

Table 3.1: Risks and solutions during development phase

3.2 Construction Phase

Any interruption in the construction delays the revenue flow and jeopardizes the repayment of debt. Construction phase risks include the following:

Completion risk

Projects can be delayed due many reasons, but poor interface coordination and late design changes are very common. For example, the Channel Tunnel project was delayed by late changes in the signalling system specification and the shuttle design. Out of the seven year construction contract, a delay of one year resulted. Because BOT projects rely on the income generated from operation to service their debts, the rolled-up interest from a

delayed project can be substantial and can seriously affect the project's profitability. At one time, financiers of the Channel Tunnel were reluctant to commit further loans when the delay resulted in substantial cost increase (Walker, 1995). Usually, the engineering and construction contractors assume the completion risk. Project sponsors can commit the contractors to lump-sum contracts, using proven technology and agreed schedules, which define contractually the timing and relationship of critical stages of the projects with payment incentives. Contractors could also be required to provide completion guarantees, that specifies a time frame and a minimum efficiency rate, and performance bonds. In this case the risk of cost increases due to late completion is born by insurance companies or banks, for which a premium is charged. Sometimes, the contractor allocate a part of this risk to equipment and material suppliers. It is also common to use performance incentives for work completed before the contractual deadline.

Construction difficulties

Unforeseen soil conditions and breakdown of equipment are common on construction site. Construction contracts under BOT arrangement are usually of the Design-Build type, which do not provide redress for contractors against adverse geological conditions. In lump-sum fixed-price contracts, contractors normally either include a substantial risk allowance in the price or they simply gamble and hope for the best (Walker, 1995).

Cost Overrun risk

When construction costs exceed original estimates, either due to inflation or excessive design changes, drawdowns from loans may not be able to match the payments due to contractors. This may cause lenders to question the viability of the project. Additional financing has to be arranged. In the case of the Channel Tunnel project, the construction

costs were priced partly on a lump sum, and partly on a target cost basis. The project ran over budget, with an estimated finale project cost of $15 billion, doubling the initial estimate of $7.4 billion. These cost overruns caused the financing banks to threaten to take over the franchise before it was eventually opened on May 1994 (Walker, 1995). Any cost overrun must be assumed by the sponsor or contractor, but it may be funded by lenders. Cost overrun risks can be covered by providing price escalation clauses in off-take contracts. Sometimes, completion bonds issued by indemnity companies can be used to limit this risk. Tiong suggested that cost overrun risk can be mitigated in the ways described below.

Additional capital injected by project sponsors. In the Channel Tunnel project, Eurotunnel was obliged to raise several equity offering to meet the increasing construction costs.

Standby credit facility from original lenders. The Malaysian government set aside 10% of the total investment cost as a standby element for their North-South highway project.

Fixed price contracts from contractors. Most BOT projects are based on lump-sum fixed-price turnkey contracts. The effectiveness of such contracts depend on the degree to which the host government can avoid uncertainty and changes to performance specifications and design standards. Table 3.2 lists the major risks encountered in A BOT project during the construction phase with potential solutions to mitigate these risks.

Construction phase	
Risks	Solutions
Completion delays	Turnkey contracts Penalties Completion guarantees Performance incentives and guarantees

Table 3.2: Risks and solutions during construction phase

Construction phase	
Risks	Solutions
Cost overruns	Fixe price contracts completion bonds Standby credit Increased equity
Force majeur	Insurance Government indemnities
Political risk	Insurance Export credit agency cover Joint venture with public partner

Table 3.2: Risks and solutions during construction phase

3.3 Operation Phase

The following are risks encountered during the operation phase of the project:

Income risks

This is the risk that the project may not meet revenue projections. This risk is sometimes called the tall revenue risk in transportation projects, and in general, the economic risk of the project or market risk. For any project, this risk include both price and demand for the output. Any fluctuation in future prices or any change in the demand for the product would affect the revenue level, and hence the profitability of the project. For transport projects, the initial traffic forecast may be overoptimistic, either due to wrong assumptions, or to the availability of alternative routes. Income from direct tolls may then fall short of expectations and hence the cash flows of the sponsors are jeopardized. Off-take agreements may guarantee that the purchaser pays for a product delivered over an extended term. Such agreements give lenders security because loan repayment is assured

in spite of a fluctuating market demand (Beidleman, 1990).

In the Channel Tunnel, the governments promised Eurotunnel, the promoter, that there would be no other fixed link across the English Channel before the year 2020 in order to avoid undermining the returns to investors. In the case of the Malaysian North-South highway, the Malaysian government undertakes to provide additional finance to the concessionaire in the event of a drop in traffic volume in the first 17 years of operation with cash flow problem (Walker, 1995). In power BOT projects, risk sharing is very important to cover risks. If the plant operation falls below specified expectations, the project company must face the threat of loss of earnings. Risk in respect long-term fuel price fluctuation, fuel supply, inflation, and foreign currency rate fluctuation should be shared in a way where benefits and losses above or below a certain level may be shared in accordance with formulae contained in the reference financial model of the power purchase agreement. For example, it may agreed that fuel price variation within a certain range of an agreed benchmark are not passed through but the effects of larger fluctuation are shared (David, 1995). Usually, the parties who share that risk are the government and the customer. In section 3.6, example of guarantees provided by the government are presented.

Equity resale risk

Because of the limited secondary market, the opportunity for the sponsors to sell their share in a project is very limited. Because of this limited secondary market, some sponsors prefer to use a subordinated loan for project capital. The sponsor lender can preserve the right of an equity stock position through stock conversion rights under the subordinated loan agreement (Beidleman, 1990). Table 3.3 summarizes risks encountered in the

operation phase with possible solutions.

Operation phase	
Risks	Solutions
Market	Market study Offtake agreements
Raw material supply	Feedstock agreements
Performance/technical	Performance guarantees Contractor's equity Proven technology
Operations/maintenance	Experienced operator
Liability risk	Insurance contracts
Equity resale risk	Subordinated debt
Foreign exchange	Central bank assurances Swaps Currency options Escrow accounts

Table 3.3: Risks and solutions during operation phase

3.4 Ongoing Risks

Serious financial-exposure risks are present throughout the project finance process and must be monitored on a continuous basis. This exposure is best handled through financial engineering. Financial engineering concerns include the following:

Interest rate risk

Fluctuations in interest rates affect the cash flows and market values of borrowers and lenders who use fixed income securities. Coupon swaps are used to limit interest rate risks. A coupon swap is an exchange of one coupon or interest payment for another that

has a different configuration but the same principal amount. Coupon swaps are essential to effectively manage long-term interest rate exposure. For shorter maturities, Treasury notes and Treasury bills interest rate future contracts can be used to cover interest rate exposure.

Currency risk

Foreign exchange rate fluctuations affect international projects in which project revenues or expenses are paid out in foreign currency. The income generated from operation is in local currency. On the other hand, the investment and the loans are in foreign currency, and repayment of foreign loans has to be made in foreign currency. Therefore, project sponsors have to seek convertibility guarantees from the host government. To limit this risk, short term transactions in major currencies can be hedged in the foreign currency forward or future markets. For much longer periods, it is possible to hedge with a series of long-date forward contracts or with a currency swap to limit the currency risk. Currency collateralized loans and foreign exchange options are used to convert the exposed cash flows into the desired currency. During the bidding stage of the project, options are used to cover uncertain future foreign exchange cash flows. The option to buy or sell the foreign currency would not be exercised should the bidding be unsuccessful.

To maximize the project chance of success, the sponsor of the project should try to obtain assistance and incentives from the host government. In the Malaysian North-South highway project, the government provided the project company with the guarantee that it would make up the shortfalls if exchange rate movement exceeds 15% on its debt, or if interest rate movement exceeds 20% on its floating rate debt. These guarantees gave confidence to the project funders (Walker, 1995).

3.5 Political Risks

Political risk is sometimes the most significant risk faced by foreign investors and lenders in developing countries because of the likelihood sudden political change. Such changes can jeopardize projects at a critical stage. Political risk is associated mostly with public sector projects. It includes the possibility that governments will not allow repatriation of funds, as well as regulatory or legislative changes that occur during project construction. Usually, political risks are difficult to control. Many developers involved in public sector transportation projects require the government to provide strong backing and expectations of high traffic flow. Providing tax-exempt financing is a commitment that the government can make to help mitigate this risk in domestic projects. Organizations like the Overseas Private Investment Corporation (OPIC) provide expropriation insurance to alleviate foreign political risk. Other organizations also provide insurance against political risk such as the MIGA (World Bank). Most European countries and Japan have also organizations which are similar to the U.S.'s OPIC organization. Two majors types of political risks are sovereign risks and instability risks (Walker, 1995).

Sovereign risks

This may be due to a change of government composition. One of the contributing factors to the abandonment of the Channel Tunnel project in 1975 was the 1974 change of government in the UK from Conservative to Labor, which left the project without any effective political sponsorship. Another sovereign risk is the possible change of legislation. These changes may arise due to domestic considerations, such as changes in economic policy, or they may be part of wider constitutional issues. Sponsors of BOT projects sometimes manage to obtain agreements from the host governments to restrict such

changes. However, governments are interested in having many project supported by the private sector, and they, therefore would not wish to loose potential future investments.

Instability risks

This type of risk can range from labor unrest and embargo of construction equipment to expropriation. Construction companies could be forced into bankruptcy by a political decision to stop work. The same can happen with war and hostility between countries. Tiong(1992) and Nevitt(1989) suggest the following ways in which investors can protect BOT projects in unstable countries. One way is to form a consortium of international investors and lenders so that expropriation of the project facility will result in default of a number of international loans and jeopardize the country's credit rating. Another way is to take a political risk insurance policy. Government agencies such as the Overseas Private Investment Corporation (OPIC) in the United States provide coverage for investments abroad. Insurance covers have also been made available to offer protection of initial costs against government non approval and delay in completion due to physical loss. Another way to limit this risk is to negotiate for a financial undertaking by the host government. Lenders normally ask the host governments to provide some coverage for outstanding debt and other financial obligations for uninsurable force majeure events.

3.6 Environmental Risks

Managing environmental risk is becoming a major part in risk management in BOT projects. Environmental risk mitigation can give companies and their financiers competitive advantage, and lower the risk of damage to the natural environment. Infrastructure projects can affect the environment through major hazards, emissions, and site

contamination. These impact may jeopardize the viability of a project, and therefore expose the companies and their financiers to risks. Potential losses to companies include civil and criminal labilities, plant closure, rejection or delay of contracts and permits, and increased cost of capital. Legal instruments are used to prevent the financial institution from assuming risk transmitted through the company, and using insurance to transfer risk to third parties (Bond, 1994).

3.7 Assistance and Incentives from the Host Government

To maximize the project's chances of success, the sponsors of the project should try to obtain assistance and incentives from the host government. According to McCarthy (1991) some of these are the following:

Offshore escrow account. The project sponsors should seek the government's cooperation in the establishment of an offshore escrow account for all the project revenues and foreign loans. An escrow account is a trust fund established by the sponsors, that reduces possible interferences in the project cash flow. It will also ensure that the flow of funds and revenues to all parties concerned is smooth during the entire concession period.

offtake agreement. In infrastructure projects, lenders have to examine the demand projections and revenue sensitivity to form their judgments about security and return. The government could support the project by guaranteeing a minimum demand volume or minimum operating income. Such contractual undertakings can serve as credit support to lenders.

Supply agreement. The risk of raw material being unavailable or unacceptable could be covered by a supply contract that guaranteed the supply of the required raw materials, e.g. gas or oil, at competitive prices to enable the facility to run smoothly and generate the nec-

essary revenues.

Retention of title. This is a provision that is used in loan agreements until the loan is paid. The reason why this is important is due to the fact that in most countries all the physical assets that are firmly attached to a plot of land belong to the landowner which is the host government in case of infrastructure projects. If the project fail, the assets revert to the government. Given this, the security available to lenders, which is usually the assets, is not enough. The project sponsors or the government must provide the lenders with additional guarantees as securities.

3.8 Project Cash Flow Pattern

After identifying the risks involved in a BOT project, it is very essential to look at the techniques for analyzing project cash flows. This is a major function in the risk management process.

In the previous sections, it was mentioned that different risks relate to different stages in a BOT scheme, and that any BOT infrastructure project can be viewed as two projects: a higher risk construction project and a lower risk utility project. Following is a description of the risk pattern that explain this distinction. After commencement of the construction work, the risk begin to increase as money is used to pay for material, labor, and equipment. Interest charges on loans start accumulating. Force majeur risks also increase during the construction and development phase. All these risks reach their peak value in the early operational years of the project because of the pressure due to maximum debt service when the highest interest burden occurs. When the operation phase starts, the revenues are collected from toll fees, and debts are paid. This pattern of risk distribution should be appreciated by all parties involved in the project. Investors should expect divi-

dend payments only after risks have levelled off. Lenders should expect repayment according to a progressive schedule. The government should also consider this risk pattern when structuring the concessionaires' obligations (Walker, 1995).

In general, reducing the risk to one party consists of passing this risk to other parties. The role of the project sponsors is to evaluate the risks and allocate them to the parties best able to assume them. The allocation of risk to parties like contractors will bring additional cost to the project. Also, coverage of risks by insurance companies increase the cost of the project.

As a conclusion, risk management is an important process necessary in order to achieve a successful project financing. The first three chapters discussed the BOT model, the various risks and their allocation to the parties of the project. The following chapter consists of a case study that illustrate in details how the model developed in the first part of the thesis can be applied to a specific project. The project that is described is the Channel Tunnel project. It is one of the most cited projects that have used the project finance model. The case study describes the project background, the project contract, the financing of the project, the risks involved in each phases, the method used to limit the risks, the problems encountered, the current status of the project, as well as an overall assessment of the success or failure of the project.

Chapter 4

The Channel Tunnel Project

4.1 Project History

The idea of a fixed link between Britain and the European mainland was first seriously considered in Napoleonic times. Since then, plan after plan has been suggested. A tunnel was even started in 1880, but it was stopped two years later after British fears of invasion. Nearly a century later, in 1975, another start was cancelled due to political reasons. In 1978, a group of European contractors combined to resurrect the promotion of a subterranean link between England and France. By 1982, several other groups were in existence with a variety of other schemes including bridges, tunnels, and even a combination of the two. The British and French government were still hesitant but they accepted the offer of a group of banks from both countries to carry out a study of the feasibility of a privately funded scheme. A historic meeting between banks and contractors took place on 9th March 1983, and the decision was taken to put forward a tunnel scheme with equal British and French involvement. As a result, the Channel Tunnel Group and Franche Manche were formed, each includes five contracting companies. The Banks reported to the two government on feasibility and favored a tunnel solution. However, it was not until the beginning of 1985 that the governments called for proposals for a concession to both construct and then operate the fixed link. During the same year, the Channel Tunnel group and France Manche assembled their team and developed their scheme. The need for non-contractor partner was also recognized. By the time the proposal was submitted in October 1985, the national Westminster and Midland Banks, Bank Indo-Suez and Credit Lyonnais

had join as full partners and Mobiloil and Granada were associates. The consortium's bid was successful and in January 1986, at a Ceremony in Lille, Prime Minister Margaret Thatcher and President Francois Mitterand, announced their backing for the present scheme. A month later, Britain and France signed the treaty of Canterbury. The formal concession agreement was subsequently signed in March 1986. From then on, the contractor was progressively separated from the prospective owner and both Eurotunnel and Transmanche-Link or TML were formed. Eurotunnel was thus able to concentrate on raising the finance, while TML, as the contractor, could prepare its own proposal to Eurotunnel for the design, construction, and commissioning of the system. On the 22nd April 1987, the French parliament gave its approval to the present project. The final hurdle was the British Channel Tunnel Bill, the passing of which was delayed when a general election was called in June 1987. However, it received Royal Assent on July 23rd and six days later the Anglo-French treaty was ratified at the Elysee Palace by Prime Minister Margaret Thatcher and President Francois Mitterand (Link Magazine, 1994).

4.2 Project Structure

Eurotunnel is a partnership between Channel Tunnel Group (CTG) and France Manche (FM) established in August 1986 to construct and operate the tunnel under a 55-year concession from the UK and French governments. This partnership is a subsidiary of Eurotunnel SA in France and Eurotunnel PLC in the UK. Eurotunnel Finance SA and Eurotunnel Finance Ltd. are the subsidiaries with responsibility for financing the project. Eurotunnel Developments SA and Eurotunnel Development Ltd. are the subsidiaries responsible for property development.

TML (Transmanche Link) is an Anglo-French consortium which is responsible for the design and the construction of the project under a contract with Eurotunnel. TML is a joint

venture between Transmanche Construction in France and Translink in the UK, each of which includes five domestic construction companies. The members of Transmanche Construction are Bouygues SA, Dumez SA, Societe Generale d'Entreprises SA, Societe Auxiliaire d'Entreprise SA, and Spie Batignolles SA. The members of Translink are Balfour Beatty Construction Ltd., Costain Civil Engineering Ltd., Tarmac Construction Ltd., Taylor Woodrow Construction Ltd., and Wimpey Major Projects Ltd (Takesue, 1991).

4.3 The System

The Eurotunnel system is composed of three tunnels and two terminal stations. It has been conceived to offer two different services: shuttle and railway systems. Road vehicles carrying passengers and freight will travel between the UK and French terminals on specially designed shuttles operated by Eurotunnel itself. The shuttle trains will consist of a number of specially designed wagons. These wagons will be well ventilated and will incorporate modern design and safety features. Different types of shuttles will carry passengers and freight vehicles. The ferry-trains, that is the shuttles, will depart every 12 minutes. Each train will be composed of 12 or 24 wagons. The trains will take 33 minutes to travel between the two terminals. Their average speed will be 117 Km/h and they can go as fast as160 Km/h.

British Rail and SNCF, the French national railway, will operate through trains for passengers and freight. The trip between Paris and London is planned to take around three hours.

4.4 Construction Contract

According to the contact between Eurotunnel and TML, the later has to design, construct, test, and commission the tunnel ready for operation by the target date of June

15, 1993. The contract is therefore a design-build type. Eurotunnel may require changes in the design or construction of the Tunnel. Eurotunnel is supposed to pay to TML the actual costs of the target works. If the actual costs exceeds the target cost, TML bears 30% of all costs of the target works above the target cost. TML shares equally with Eurotunnel the benefits of any saving if the actual cost falls below the target cost. TML is also entitled to a fee calculated as a percentage of the target cost. The lump sum works are paid by Eurotunnel on the basis of fixed prices without adjustment for the actual cost incurred by TML. The target cost and the lump sum price are subject to adjustment to reflect changes to performance criteria requested by Eurotunnel as well as adjustment for inflation.

An independent organization, Maitre d'Oeuvre was appointed to monitor the design and construction of the project. This organization is a joint venture between Societe d'Etudes Techniques and W.S. Atkins Consultants Limited. The duties of this organization include verification that the works are carried out by TML according to budget, time schedule, safety standards, quality, and performance required by Eurotunnel (Takesue, 1991).

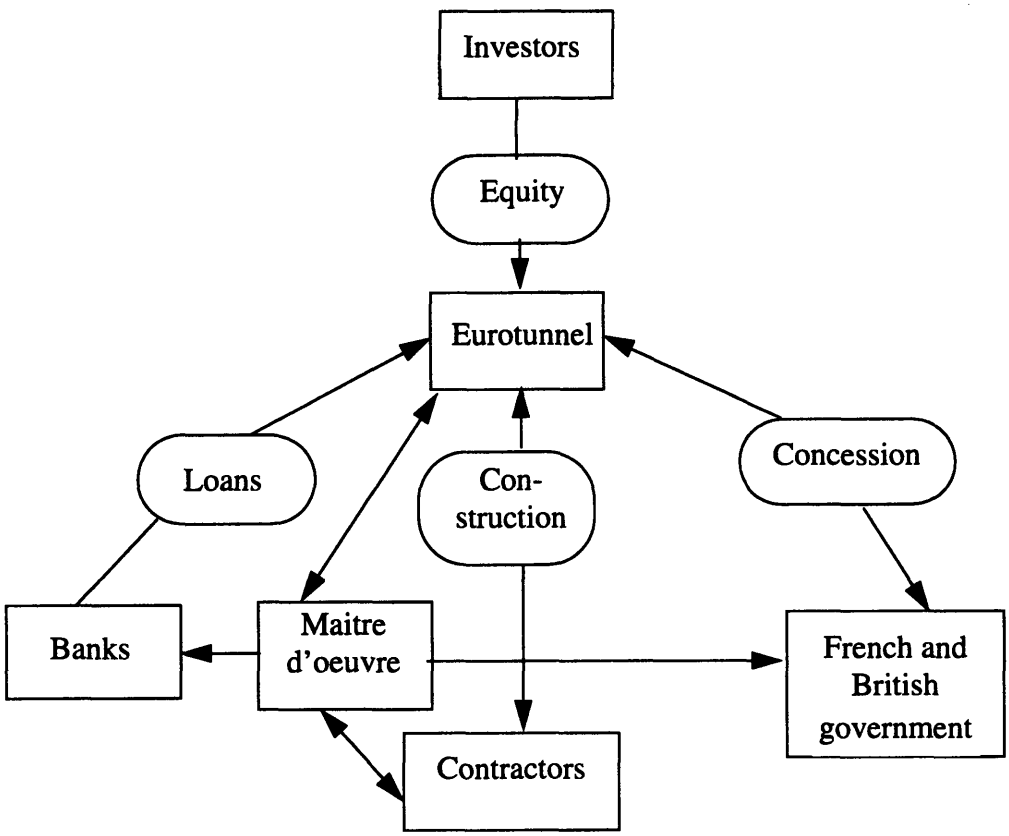

Figure 4.1: Project structure of Channel Tunnel

4.5 Financing Contract

The Eurotunnel project costs has been financed by equity issue and bank loans, credit facilities, provided by the syndicated banks which consists of 225 banks. The project costs, however have surpassed the initial estimates, and additional financial sources have been required. New equity and credit facilities were required.

4.6 Difficulty of financing the Project with Private Funds

The difficulties facing the financing of the project with solely private funds are: the

condition that have to be faced by the developers, the incentives that have to be offered to investors, the way to ensure a reliable financing package, and the ways to reconcile the interest of the public with the necessity of private financing (Roger, 1990).

The two governments tried to make the development of the link as easy as possible when they published official recommendations. They were concerned by the unity of the system and the length of the concession. The unity of the system must be preserved even if each half of it is managed by a country with different laws. The French and English governments have established the intergovernmental commission which draws regulations concerning the construction and operation of the tunnel such as safety, security, and the environment (Roger, 1990).

The financing of the link is based on the following principles concerning the percentage of capital required, the currencies, and the necessity to allow a refinancing. As it is the case in most project financing packages, the amount of equity requested is 20% of the total financing. The banks involved in the financing would not be willing to participate with a lower percentage. The amount of money needed (between 27 and 54 billion FFR) can not be raised on the French and British money markets only. As a result, the loans must be international and issued in different currencies.

If necessary the project should be able to be refinanced. The length of the repayment of the loans could be longer and reach 18 instead of 15 years that are common in project financing. The initial lenders could be replaced by new ones and the interest payments could be lowered. As new lenders would enter, there would be fewer risks involved in the project than during the first financing and the interest rates could be lower. This would minimize interest expenses (Roger, 1990).

4.7 The Financing Package of the Project

The project had to be financed with the project financing method. The revenues of the project are the only source to repay the loans and to pay dividends to the investor. The investors and the lenders bear most of the risks. In order to achieve a successful financing, the developers should convince the lenders and the investors that the projected revenues are reliable enough and the risks are limited and well covered.

The total financing requirement of the project were estimated at 48 billion FFR. This was to be funded by equity and credit facilities. It has been decided to raise this amount plus an additional 25% in order to cover the exposure to inflation and construction risks. The total amount to be raised was 60 billion FFR. The banks demanded a capital at least equal to 10 billion FFR. They also demanded that 7 billion FFR of this capital should be spent before any drawing on the credits could be done. Their goal was to commit the stockholders to the project. The stockholders required the approval of the loans by the banks before investing in the project. The solution was that the banks would sign the credit agreement before the stock were issued but no drawing on the credit was allowed before the subscription of the total capital (Roger, 1990).

The original owner consortium provided $84 million in the first of three equity tranches totalling $1 billion. The initial equity investment covered some of the credit of the project during the development phase. The owners subsequently obtained credit enhancement of the equity capital through a syndicated bank loan of $8.4 billion. approximately $1.68 billion of the loan is a standby agreement that could cover cost overruns or high inflation rates.

The equity and debt of the project were structured in a way to support one another.

The bank loan was arranged before the equity financing was raised so that investors had enough confidence that the remainder of the capital required for the project was available. Similarly, the equity raised gave the lenders confidence that the project was capitalized.

Financing	Sources	Amount ($M)	Remarks
Equity	Banks and contractors	80	Founders shareholders
	Private institutions	370	1st tranche (end 1986)
	Public investors	800	2nd tranche (end 1987)
	Public investors	275	3rd tranche (end 1988)
	Public investors	275	4th tranche (end 1989)
Debt	Commercial banks	6800	Main facility
	Commercial banks	1700	Standby credit
		Total=10.3 Billion	

Table 4.1: Sources of financing for the Eurotunnel project

The credit convention gives Eurotunnel loans and letters of credit in six parts for a total of 50 billion FFR of which 20% are a standby credit. The loan can be broken down as follows: 2.6 billion British pound, 21 billion FFR, and 450 million USD. Drawing was

allowed in other currencies.The countries of origin of the banks involved are listed in the following table.

Bank loans	
Country	Percentage of total loan
France and the UK	27%
Rest of Europe	39%
Japan	23%
Rest of the world	11%

Table 4.2: Countries involved in the project loans

In the agreement between Eurotunnel and the banks, a repayment schedule was prepared. Refinancing was allowed in the agreement. It was agreed that the interest will be computed on the basis of the market rates of the currency and the market involved and a premium will be added. This premium is a function of the progress made in the construction and the amount of the loan already drawn. The credit convention states that banking cases should be made periodically to check on the progress of the project and its existing and forecasted cash flows. Cash flow previsions have to be based on various factors such as expenses, traffic and revenues, taxes, inflation, interest rate, and other economic factors. The banking cases computes debt coverage ratios. One of the most important conditions of a bank loan is the debt coverage ratio (DCR). According to the agreement, Eurotunnel is not able to draw on its credits if this ratio is lower than 1.2, and is not able to refinance if this ratio is lower than 1.3, and is not able to pay dividends if this ratio is lower than 1.25. If the ratio is lower than 1 during 90 consecutive days, the banks have the right to take the project over.

Another important agreement was between Eurotunnel and the European Investment Bank. This bank provided a 10 billion FFR loan which is guaranteed by the banks that have signed the credit convention. The European bank of Investments bear less risks than the private banks since its loan is guaranteed by other banks until the refinancing if it occurs. This covers the period where the risks are highest which is the construction period and the beginning of the operation period.

The government of the two countries do not want to be financially or legally involved in the project. They decided not to give economical or financial help to the project. Different major issues had to be considered by the governments of the two countries (Roger, 1990).

4.8 Risk Analysis

To ensure the reliability of the financing package, risks have to be carefully considered. Following is an analysis of the risks encountered in the Channel Tunnel project.

Financing Risks

The financing risks were also considered. The international loans must be repaid in currencies different from the currencies of the revenues. The repayments are exposed to exchange rate movements. The floating interest rates of the loans are affected by an increase in real interest rates and can increase the cost of the financing. Currency and interest rate risks can be hedged with currency and interest rate swaps. Hedging should be done on the French and British bond markets since the expenses are half in British Pounds half in French Francs. The problem is that the length of the swaps offered is shorter than the maturity of the loans. The exchange rate risk that the Eurotunnel faces in meeting its currency requirements for servicing investors has been covered through a BP 1 billion

loan from the European Investment Bank, to be made available in British sterling and French francs. The loan was designed to drawn over several years and will be at the prevailing market interest rates for terms of up to 25 years.

Foreign Exchange Exposure

One of the most influential exchange rate for the Channel operation is the exchange rate of the British pound to the other European currency. The traffic going from the UK to continental Europe (2/3 of total traffic) is larger than the traffic going from continental Europe to the UK. If the UK pound appreciates against the European currencies, people in the UK will be encourage to travel and import from the continent. On the other hand, if the British pound depreciate, people in the continent import from countries in the continent, and the expected traffic in the Channel is expected to decrease. Therefore, the traffic revenues will increase when the British pound appreciates, and decrease when the it depreciates. Since revenues are sensitive to exchange rate and since revenues are the major source of paying back the loans, careful consideration should be given to limiting foreign exchange exposure. It is expected that 2/3 of the revenues will be in British pound and 1/3 in other currency mostly in French francs. However, the initial investment is equally divided between the two currencies. This will cause foreign exchange exposure as mentioned above.

Banks are very concerned with the foreign exchange risk. Because of their exposure to foreign exchange rate, the Japanese banks, for example, will lose money when the Yen appreciates against the British pound, and they will make profit in the opposite case. Therefore, the Japanese banks' profit potential will change due to foreign exchange exposure. In order to avoid this risk, the banks usually manage it through hedging techniques using forward contracts, future contracts, currency swaps, and currency options. The

objective of buying a forward contract, for example, is not to make profits, but to avoid losing money as much as possible. The forward contract is effective for the banks to mitigate the foreign exchange risks, although they will lose the possibility of making profit when the Yen depreciates against the British pound.

Economic Conditions

The projected operating revenues of the Eurotunnel project depends upon the UK and France economic growth. Unification of the European community, eliminated trade barriers in continental Europe, and it will contribute to UK and France economic growth. The two governments should take appropriate monetary and fiscal policy to keep the operating and corporate costs stable, while the operating revenues are expected to increase by growth in the UK and French economies (Takesue, 1991).

Contractual Problems

The *relationship between the developer and the national railway companies* (BR and the SNF) is critical. Because the companies are subsidized by the states, if the network is not used at its full capacity by the railways, there will be a conflict of interest in assuming this traffic risk between the states and the developer if the companies have to pay a fixed price as a way to guarantee the developer against traffic risks.

The *relationship between the banks and the contractors* had to be carefully considered by the states. Since the contractor are clients of the banks, the states had to avoid any conflict of interest between the two parties that could lead to price rise. After some problems and disagreements initially occurred between the banks and the contractors, the future occurrence of such problems was avoided by selecting the manager of the project independent from the developers (Roger, 1990).

The loans are guaranteed by the assets of the developers. The banks may take over

as developers in case of bankruptcy. The two states are not liable.

Conflict of Interest

The contractors sometimes have to play a number of roles in project financing. These roles can lead to conflict of interest. In the Channel Tunnel project, the contractors were at the same time the founder shareholders of the project company, Eurotunnel. The construction contract was negotiated by the contractors with themselves. They failed to understand their difficult position as both suppliers and purchasers and this had a negative impact on the project in its start. It led to the separation between the founder banks and the contractors to avoid this conflict of interest (Tiong, 1990).

Disagreement between Different Parties

Each of the parties involved must remain interconnected by the term of the contracts and agreements with the project company. To protect the project from any disagreement between the parties during the construction phase, a supervisory body, Maitre D'oeuvre was formed to achieve the following:

1. Advise on all aspects of the construction contract.
2. Settle the disputes that could arise between the project company and the contractors.
3. Provides independent reporting to all the parties in the project.

The above supervisory body was more or less successful in protecting the project from many disagreements that occurred between the parties involved in the project.

Lender Risk

Another issue to consider in the project is to assure the lenders that the project revenues under the offtake agreement will be able to service the repayment under the loan agreement. For the Channel Tunnel project, the principal security for the banks takes dif-

ferent forms:

1. Fixed charges over concession, agreement, facilities, and fixed assets.

2. Assignment of insurance and revenues.

3. Charges on all bank accounts.

4. Assignment of project revenues.

The bank are very well in control of their interests. If their interests are threatened, they can take charge of Eurotunnel and sell its assets to partially cover their losses.. They can also replace the board of Eurotunnel with their own nominees to save the project (Tiong, 1990).

Political risk

Political risk was a major factor to consider in the project. It was difficult to consider the possibility that the French or the British government would abandon the project given the political and national prestige invested in it. One problem was the delay of legislation supporting the project in both countries. This was a reason why some investors were reluctant to purchase shares in Eurotunnel in the second equity tranche. To ensure the successful launching of equity two, the governments passed the legislation.

Completion Risk

Completion and operating risks in the project were assumed by the lenders and the equity investors in the project in return for the high potential payoff of the project. The trend in project finance is to assign this risk to the contractors. The contractors, in turn, allocate segments of the completion risk to equipment and material suppliers. Project sponsors prefer a turnkey arrangement in which the contractor assumes responsibility for completion of the entire project, but these arrangements are difficult to obtain. The con-

tractor obligation is often accompanied by a completion guarantee from the shareholders to cover any cost overruns and delays that are not the responsibility of the contractor under the construction contract. By structuring the constrction contract in such manner, the shareholders' risk is minimize and the contractor takes most of the risk. The lenders are not taking direct technical completion risk which they are not able to accept. From a lender's perspective, this is the ideal structure that covers completion risk. In practice, lenders are not so well covered against cost overruns and delay risks. In The Channel Tunnel project, the lack of shareholder support for completion risk placed that risk on the lenders as well as on shareholders. Refinancing from lenders was required due to lack of shareholder completion guarantees.

Construction Risk

Construction represents the highest risks. It is unlikely that the project should not be completed for technical reasons. However, cost overruns and construction delays are probable and are an important source of risk. The risk associated with the delays and overruns should be carried mostly by the contractors. Fixed price contracts and penalty for delays moves the risk from the operators to the contractors and the insurance company.

Construction risks were handled carefully at the beginning of the project. These risks include completion delays and cost overruns. To ensure on-time and in budget completion of the project, a structure of rewards and penalties was put in place. To control cost overruns, a number of measures were taken by project managers. They divided payment to contractors into a number of tranches, where each tranche reflects a different degree of risk. They added a profit margin of 12.36 percent to the target cost of the underground construction. The contractor receives 50 percent of the savings if the cost is under budget.

If the planned budget is exceeded, the contractor has to pay 30 percent of the overrun, up to a limit of 6 percent of the overrun. The rest of the construction was paid on a lump sum basis.

Some of the most important construction risks are flooding, fire and ground collapse. These risks are covered by insurances. In order to locate fissures ahead of the digging machines, systematic probing techniques were employed. The risk of fire was carefully considered and preventive measures were taken. The risk of ground collapse was also a major consideration. The ground in the UK side is more stable than on the French side.

Income risks

For transport projects, the initial traffic forecast may be overoptimistic, either due to wrong assumptions, or to the availability of alternative routes. Income from direct tolls may fall short of expectations and hence the cash flows of the sponsors are jeopardized. In the channel tunnel, the governments promised Eurotunnel, the promoter, that there would be no other fixed link across the English Channel before the year 2020 in order to avoid undermining the returns to investors

Off-take Risk

Off-take risks were also considered. Cash flow projections are extremely important in a successful project financing. Although economic analysis and traffic projections were favorable, they do note provide confidence to the sponsor. The railroad companies had to assume part of the revenue shortfall risk. Approximately 40% of the operating revenues are expected to be generated from payments by the railway companies. The railroads agreed to pay a minimum usage charge equivalent to the income generated by 60% of the

projected tunnel traffic per year for the first twelve years of the concession.

4.9 Reasons for the Construction Delays and Cost Overruns

There are several reasons for the construction delays. First, Eurotunnel and TML had problems in their organizational structure. Initially, each party had its own project's promoter. Each party had a completely different interest in the project. Eurotunnel interest was to operate the system during the concession period and to reduce construction costs in order to increase the NPV of the project. On the other hand, TML's interest was to construct and sell the project to Eurotunnel and to pursue the project only in the construction phase. Both organizations made decisions about design and construction at the same time. This lead to priority conflicts, duplication of effort, and wasting time. The problem was the undefined responsibilities of each side (Takesue, 1991).

The second cause for delay was the mechanical problems in the French side and the geological difficulties in the English side. In the UK side, the tunnelling often stopped for investigation of the ground conditions. In the French side the problem was the delay due to the exchange of equipment.

A third cause for project delay is due to the late financing. The bank did not invest BP 5000 million before BP 770 million were raised. That was in November, 1987. This date was only one month before the tunnel excavation began, and as a result, TML has corresponding delays in ordering equipment.

It should be added that, in addition to the above causes, the Channel Tunnel project was delayed by late changes in the signalling system specification and the shuttle design. Out of the seven year construction contract, a delay of one year resulted.

Construction cost is an important factor in cost overrun. Construction costs are

divided into three parts due to different construction work.

Target Work. The poor tunneling progress in the early stages of the project was a cause for the increase in the projected costs. The higher expected labor cost was another reason for cost overrun. In the UK side, significant cost increases were suffered as a result of inadequate cost controls by TML.

Lump Sum Work. A number of changes in the design of the system increased the forecasted cost. The forecast cost of the lump sum work reflects these changes. As a result, TML claims for additional payments.

Procurement Items. The procurement conducted by TML took longer than expected because of the long approval process by the two governments. The submission of bids were higher than the original provision of the construction contract.

Corporate cost is another factor in cost overrun. This was due to additional financing expenses, increases in the administrative costs, and additional cost due to the employment of project managers from Bechtel.

From the reasons explained above, one can say that Eurotunnel was not experienced enough to avoid these risks. The project was one of the largest international projects, and it is privately financed unlike most large public infrastructure projects directly financed by government. Eurotunnel underestimated the construction delays in the initial phase. They did not plan to deal with future unexpected difficulties. Usually, construction delays occur in the initial and final phase of the project. The initial delays are caused by learning curve effect and various arrangements to start the construction. The delays in the final phase are usually caused by various adjustments to finish the project. Between the two phases, construction work is usually done according to schedule and

delays are less frequent. In the Channel Tunnel project, delays were encountered mostly in the initial and final phase of the project as it should be expected. On the cost overrun side, the major cause was the underestimation of the construction cost. The project cost was influenced by high inflation rate in the UK, but this was not the main reason. The problem was that Eurotunnel did not consider contingencies in construction which is frequent in large infrastructure projects.

4.10 Current Situation of Eurotunnel

In the Channel Tunnel project, the construction costs were priced partly on a lump sum, and partly on a target cost basis. The project ran over budget, with an estimated finale project cost of $15 billion, doubling the initial estimate of $7.4 billion. These cost over-runs caused the financing banks to threaten to take over the franchise before it was eventually opened on May 1994.

Currently, after the Tunnel was officially opened, the project is still facing huge financial problems. The project is not producing the projected revenue yet. Eurotunnel has not started paying back its loans. They were obliged to refinance their debt, so they asked the banks for a refinancing plan. As of May 1996, Eurotunnel's leading banks have agreed an outline refinancing programme for the Channel Tunnel operator which could lead to the group's 225 banks owning nearly half the equity in the company. The six banks in the steering group which organizes the banking syndicate which is owed a total of BP8.4 billion ($12.68 billion) by the Anglo-French company, are expected to present the proposals to Eurotunnel shortly. However, Eurotunnel is opposing any restructuring plan that involved substantial dilution of shareholders. The proposals involve a large swap of both principal and interest by the banks, which could be between BP 2.5 and BP 3.5 billion. In

return the banks would receive up to 49 percent of the shares. A number of these banks want to receive more of the shares if they were to swap such large sum of debt. The six leaders in the steering group are National Westminster, Midland Bank, Banque National de Paris, Credit Lyonnais, European Investment Bank, and European Coal and Steel Community. The British side was keener to take a big stake in Eurotunnel and so dilute those of the small shareholders while the French banks had to be more solicitous of the interests of small shareholders because the latter were predominantly French - around 70%.

Eurotunnel has been in negotiation with its banks since September 1995, when it suspended interest payments on the BP 8 billion of debt after deciding that it could not meet its interest payments from revenues for many years. The company announced losses of BP 925 million for 1995, one of the largest deficits in UK corporate history.

Although the negotiations between Eurotunnel and its banks are due to restart, it is likely that a final solution is still a long way off. Any final plan to refinance the group BP 8.4 billion debts must be approved by all 225 banks and a majority of its shareholders. The French shareholders' group is not willing to back a refinancing which could leave the banks in control of the company.

Moreover, it turn out that financial restructuring plan due to be put to the company does not have the backing of all the creditor banks; and even the terms being mooted by the more conciliatory banks are likely to be rejected by shareholders - because, inevitably, they would mean substantial dilution. An offer to swap BP 2.5 to 3.5 billion of debt for just under half of the company's equity does not look ungenerous, considering that Eurotunnel is effectively bankrupt. It would reduce the company's remaining debt to a more manageable level of, say, BP 5.5 billion. The enterprise value of Eurotunnel's business is

estimated to be up to BP 6 billion. So the theoretical value left for shareholders would be BP 500 million, of which the banks would account for half. Existing shareholders' stakes would then theoretically be worth about BP 250 million, compared with Eurotunnel's current market capitalization of more than BP 650 million. The Financial Times describes the situation of Eurotunnel as follows: "It looks like with the shareholders and the banks in increasingly entrenched positions, the chances of a rapid solution to Eurotunnel's problems appear unlikely" (Financial Times, May 1996).

Chapter 5

Conclusion

5.1 Channel Tunnel Project Assessment

From the case study, it can be concluded that risk management is essential for the success of a BOT project. Some of the problems that faced the Eurotunnel project were the result of an unsatisfactory risk allocation and risk sharing. However, it should be noted that Eurotunnel did succeed in putting together the financial package that made the project feasible. The following is a list that summarizes the major problems of the project:

Underestimation of the cost of the project by the project company

Unbalanced sharing of risks between the banks and the project company

Lack of experience of Eurotunnel in large infrastructure projects

Inadequate allocation of the risks between the developer and the contractors

Lack of shareholders support for completion risk

Completion risks placed mostly on the lenders

Lack of completion guarantees from shareholders

Delays in the completion of the project

Conflict of interest between contractors and founders shareholders

Lack of completion guarantees from contractors

Technical problems during construction

Given the above problems, it should be emphasized that in spite of the problem that caused partial failure of the project, the project participant were able to allocate some of the project risks successfully among them. The interest rate and foreign exchange risks

were addressed in an efficient manner. The agreement between the railroad companies and the project companies is expected to cover partially the revenue shortfall risk. The major success of the project is the preparation of the complex financial package through both equity and debt financing. The different equity tranches that were raised and the timing between the raising of equity and the loan agreements with the banks were efficiently handled by the project company.

The Eurotunnel project was financed using the BOT project financed scheme. It was understood that the banks cannot bear the risks, and therefore the developer has to take some of these risks. Some of the major problems that faced the Eurotunnel was risk sharing between the banks and the project company in case of cost overruns. The banks were obliged to put additional financing to cover the additional costs. The banks tried to cover themselves from financial risk but they did not anticipate the project may run into 140% cost overrun. The Project company underestimated the cost of the project. They only anticipated 25% cost overrun and this was an optimistic estimate. One of the reasons was the lack of experience of Eurotunnel in large infrastructure projects. In order to avoid such problems between the developer and the banks, the developer should give a technical guarantee that will guarantee the cost overruns. Although the construction contract between the Eurotunnel and the contractors tried to allocate part of this risk to the contractors, clearly this was not enough, and the company was obliged to raise additional financing from the banks.

In general in a BOT project, the project promoters and contractors try to place as much of the pre-completion risk onto the lenders as possible. An important issue is the completion risk and its allocation to the various parties. From the previous BOT projects in various countries, the standard structure for completion risk in a BOT project is a fixed-price, fixed-time construction contract with a reputable contractor with adequate penalties

for delays and cost overruns. This contractor obligation is often accompanied by a completion guarantee from the shareholders to cover any cost overruns and delays that are not the responsibility of the contractor under the construction contract. By structuring the constrction contract in such manner, the shareholders' risk is minimize and the contractor and the supplier take most of the risk. The lenders are not taking direct technical completion risk which they are not able to accept. From a lender's perspective, this is the ideal structure that covers completion risk. In practice, lenders are not so well covered against cost overruns and delay risks. In The Channel Tunnel project, the lack of shareholder support for completion risk placed that risk on the lenders as well as on shareholders. Refinancing from lenders was required due to lack of shareholder completion guarantees. Because of the large amount of financing required, a large amount of equity had to be raised from sources outside the contracting consortium. Shares were issued first in private placement and then in an initial public offering (IPO). The wide distribution of shares diffused power in the equity shareholders and gave control to contractors over the project company. This situation was remedied by imposing more management controls over Eurotunnel but only after cost overruns exceeded 100% of the original estimated cost of the project (Walker, 1995).

Another conclusion that can be drawn is that, because BOT projects rely on the income generated from operation to service their debts, the rolled-up interest from a delayed project can be substantial and can seriously affect the project's profitability. At one time, financiers of the Channel Tunnel were reluctant to commit further loans when the delay resulted in substantial cost increase.

Another finding is that governments are averse to risks and they prefer not to give financial guarantees that will assure project promoters high return. At the same time, the

promoters are expected to provide guarantees against completion risk, cost overrun risks, performance risk, and financing risk. Promoters should be able to identify the residual risks, and provide the guarantees to government concerns. Promoters should be able to devise innovative financial and contractual proposals, and to retain the technical and commercial risks. The ability to achieve this depends on the strength of the consortium. As seen in the Channel Tunnel case, the project company did not assume the commercial and technical risks as much as they should and this caused disagreement with the banks.

5.2 Concluding Remarks

The financial package of the Eurotunnel project has been a success in some way. The package was innovative because shares were sold to the public for the first time in such kind of projects. The major problems of the project are due to completion delays and cost overruns, and therefore, the causes for these problems are mainly incorrect estimations. On the contrary, the innovative strategy that was used to finance the project is a success by itself, and it is a major achievement in project finance.

To the extent that the risks can be foreseen and thus conceptually controlled, the financing of Eurotunnel can be considered as viable. As the case study demonstrates, project finance is a viable way to meet the large capital commitments required to launch major projects in the world. In addition, the need for project finance is expected to grow. The growing number of project finance participants is an evidence that the technique is efficient. It is true that the risks are large, however they can be controlled and mitigated in an efficient manner. Therefore, the challenge for a successful project finance is a correct allocation of risks to the parties of the project that are best able to handle them.

In any BOT project, we should stress that a rigorous risk analysis is necessary before a project is embarked upon in order to establish the financial and technical feasibil-

ity. An understanding of the project risks leads to the formulation of better project plans. Knowing the magnitude of the possible impact of risk factors, the parties can seek better allocation of the risks through the agreement of suitable contract clauses and other risk measures.

In conclusion, the BOT model is successful and is increasingly used in various countries. One major issue that should be carefully handled in BOT project financing is risk management. This should be done on a project by project basis. The success or failure of any project is highly dependent on an efficient risk analysis, risk sharing, and risk mitigation.

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