Valuation of the Indiana Toll Road and Chicago Skyway Privatizations

by

Faiza Arshad

Master of Science in Finance
University of Manchester (2003)
United Kingdom

Submitted to the Department of Urban Studies and Planning
in partial fulfillment of the requirements for the degree of

Master in City Planning

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

February 2010

Author _____
Department of Urban Studies and Planning
(Date of signing)

Certified by _____
Professor Stewart C. Myers
Sloan School of Management
Thesis Supervisor

Accepted by _____
Professor Joseph Ferreira
Chair, MCP Committee
Department of Urban Studies and Planning

To Ammi (my mother),
Ali (my elder brother),
Mani (my younger brother), and
Abu (my father)

Valuation of the Indiana Toll Road and Chicago Skyway Privatizations

by

Faiza Arshad

Submitted to the Department of Urban Studies and Planning on February 15, 2010 in partial fulfillment of the requirements for the degree of Master in City Planning

ABSTRACT

This thesis analyzes the economics and financing of the recent purchases of the Indiana Toll Road and Chicago Skyway. Similar privatizations have been occurring around the world, but the economic motive for such transactions has been unclear. The analysis attempts to isolate the costs and benefits of such transactions as the transfer of the asset from public to private owner takes place. I examine whether the privatization would have been financially beneficial for the State of Indiana or the City of Chicago if it did not face budget constraints or political constraints on raising tolls. There seems to be significant disadvantage of such deals absent these constraints. I show this by computing value under various scenarios. After analyzing the results, I conclude by highlighting the policy implications for such privatization deals in future.

Thesis Supervisor: Stewart Myers, Robert C. Merton (1970) Professor of Financial Economics, Sloan School of Management

Thesis Reader: David Geltner, Professor of Real Estate Finance and Engineering Systems Division, Department of Urban Studies and Planning

DISCLAIMER NOTICE

This page has been removed by request of the author.

CONTENTS

LIST OF FIGURES AND TABLES

GLOSSARY OF ABBREVIATIONS

MIG	Macquarie Infrastructure Group
ITR	Indiana Toll Road
APV	Adjusted Present Value
ASX	Australian Stock Exchange
MIT (I)	Macquarie Infrastructure Trust I
MIT (II)	Macquarie Infrastructure Trust II
MEI plc	Macquarie European Infrastructure plc
MIIML	Macquarie Infrastructure Investment Management Limited
WACC	Weighted Average Cost of Capital
ETC	Electronic Toll Collection
IFA	Indiana Finance Authority
EBITDA	Earning before Interest, tax, depreciation, and amortization
INDOT	Indiana Department of Transportation
GAS	Government Auditing Standards
BS	Balance Sheet
P&L	Profit and Loss
CF	Cash flow statement
GASB	Government Accounting Standards Board
MD&A	Management Discussion and Analysis
ITRCC	Indianan Toll Road Concession Company
ITFA	Indiana Transportation Finance Authority
CPI	Consumer Price Index
GDP	Gross Domestic Product
PTFRC	Pennsylvania Transportation Funding and Reform Commission
TLCFs	Tax Loss Carry Forwards
NAB	Net Asset Back Security
DCF	Discounted Cash Flow
CAPM	Capital Asset Pricing Model
CF	Cash flow stream
MM	Modigilani Miller
FCF	Free Cash Flow
CAPEX	Capital Expenditures
NPV	Net Present Value
CEQ	Certainty Equivalent Method
CAFR	Comprehensive Annual Financial Report
SCC	Skyway Concession Company
MIP	Macquarie Infrastructure Partners
MCS	Monte Carlo Simulation

CHAPTER 1

INTRODUCTION

1.1 THESIS STRUCTURE

Chapter 1 begins with the preview of the Macquarie Infrastructure Group (MIG) and its long-term leases of the Indiana Toll Road (ITR) and the Chicago Skyway. I discuss the methodology employed to value the toll roads in the actual Macquarie Analyst's Package (2006). The chapter presents detailed past and present financial performance of the ITR. It investigates why the State of Indiana decided to go for the long-term lease even when the toll road operations were not experiencing any serious financial setback.

Chapter 2 explains various methods that I employed to value the ITR, including adjusted present value (APV) and Monte Carlo Simulation.

Chapter 3 evaluates the Chicago Skyway's financial performance. Chapter 4 values the Chicago Skyway by employing the same methods as for the ITR.

Finally, Chapter 5 concludes this thesis with a brief summary of the main issues addressed in the preceding chapters. It also discusses larger implications and consequences of correct valuation of such infrastructure assets.

1.2 Thesis Methodology

The research methodology to gather data for this thesis consisted of detailed review of actual Macquarie Model, personal interviews and a literature review of cost of capital and valuation. The other sources included scholarly articles, professional reports, government documents (testimony), and websites. The interviews engaged the State of Indiana officials and attendees at the International Transport Economics Conference held in Minnesota (June, 2009). I used Crystal Ball to calculate the Monte Carlo Simulation.

1.3 Thesis Research Question

In light of the aging infrastructure and budget constraints, several US state governments appear to follow the trend of opting for long-term leases of public infrastructure assets. According to the 2006 study published by the Reason Foundation, there are about $25 billion in projects that have been proposed or are in development (Robert Poole, 2006). A careful examination of the financial analysis of such deals has important implications for public policy decisions. By carrying out such critical evaluation of the earlier studies for the ITR and Chicago Skyway, I will add to existing literature on privatizing toll roads.

Figure 1: ***Contracting out of toll roads***

LOCATION	ROUTE	PROJECT	ESTIMATED COST, IN BILLIONS
San Antonio to Dallas	TTC-35	Build toll road	$7.2
Virginia	I-81	Rebuild, add toll-truck lanes	7.0
Dallas	I-635	Rebuild, add HOT lanes	3.0
Atlanta	I-75/575	Add HOT and toll-truck lanes	1.8
Portland, Ore.	3 new routes	Build toll roads	1.0
Northern Virgina	I-495	Add HOT lanes	0.9
San Diego	SR 125	Build toll road	0.6
San Antonio	Loop 1604	Add HOT lanes	0.6
Fort Worth	SH-161	Build toll road	0.5
Denver	C-470	Add HOT lanes	0.4

Source: Reason Foundation, 2006

In this chapter, I firstly aim to answer the questions that were raised during June 2009 when I presented this paper during the International Transport Economics Conference in Minnesota.

Small (2009[1]) argued that the thesis could benefit from a closer connection between the financial analysis and economic concepts like opportunity cost, in order to better understand what Indiana or Chicago is really giving up to monetize the future revenue streams. He further questioned that is r_a meant to describe this particular asset, or a market rate on "all securities"? I explained that I take into account the opportunity cost of capital or cost of capital while calculating the net present value of the toll road under various scenarios. As Kolbe (2004) in his testimony explains it clearly that the cost of capital is the expected rate of return in capital markets on alternative investments of equivalent risk. He further explains that "By the cost of capital, I mean the bare minimum rate of return necessary to attract the capital and to compensate the investors for a given level of risk, since that is what they could earn elsewhere without bearing any more risk" hence I do take into account the concept of opportunity cost of capital. In other words, it is the competitive market price for capital exposed to a given level of risk. To treat both investors and customers fairly, regulatory procedures should operate so that the company expects to earn the cost of capital on the assets its investors' money has bought.

Small (2009, p.5) argues that depreciation constituted a major deduction in the ITR and Chicago Skyway however, based on the Macquarie model, it does not appear for ITR. Small (2009, p.6) also defines the risk premium the way MIG does in the Valuation Policy 2006, according to his definition, the risk-premium varies with the stages of development of the toll road however for calculations; we need to use the market risk premium to calculate the risk premium. He further questioned whether there are limits on amount of federal tax-exempt bond financing available? No, there is as

[1] He was one of the attendees in the International Transport Economics Conference held on June, 15-16, 2009 in Minnesota.

such no limit on amount of federal tax-exempt bond financing available. However the State of Indiana remains careful about the effects of such debt issue on its credit rating.

When I started writing this thesis, I read all the MIG's presentation reports and it claimed that for the ITR and Chicago Skyway, the toll elasticity of demand is low. However after one year, I have doubts about this given assumption. Matas and Raymond (2003) find that the elasticity of demand varies for various sections of a same motorway and may be related to the quality of the alternative road.

Brown (2007), head of public finance for the West Region at Goldman, Sachs & Co hinted at the trend that the market for such PPPs was being fueled by the enormous amounts of cash that pension funds needed to invest in predictable, long-term cash flows. An interesting future question is how the role of institutions would evolve in this respect. For electricity provision, Henisz and Zelner (2002) tried to answer this question by comparing four countries including Thailand, the Philippines, Malaysia, and Indonesia. All these four countries undertook privatization roughly at the same time and these countries experienced the same shock in the form of the 1997 East Asian Financial crisis. Based on the results, the investors in Thailand and the Philippines fared considerably well following the crisis than did investors in Malaysia and Indonesia. The source of difference was that the investors in Thailand and the Philippines relied more heavily on contractual safeguards.

CHAPTER 2

IMPETUS FOR THE RECENT RESTRUCTURING FOR THE MACQUARIE MODEL

Barry (2009) argues with hindsight that the State of Indiana got the better financial deal, since the Macquarie Infrastructure Group (MIG) is currently losing money on four of its six North American toll roads, including the ITR and the Chicago Skyway. The MIG is experiencing declining traffic volumes and high interest expenses. Barry (2009) draws such conclusion on basis of incomplete information, however. The MIG usually finances the long-term leases at very high debt ratios. The MIG pays off the debt within eight or nine years after each transaction, so one cannot judge the performance of MIG on basis of current high interest expenses.

In August 2009, the MIG did announce plans for a financial restructuring, however. The original "Macquarie Model" constituted of two trusts and one company (see Appendix 1 at the end of the chapter). In 2009, the proposed restructuring called for split into two listed entities. According to Mcdonald and Sechler (2009), the split would be made on the basis of risk-return profiles of the toll roads.

Why did the MIG decide for the restructuring in 2009? Why do many investors and journalists come up with different conclusions about the same MIG model? In recent past, the MIG has gained considerable attention because of outbidding all other major investment banks for two public assets: the ITR (2006) and the Chicago Skyway (2005).

So far the debate has been mainly descriptive, centered on public finance and auction designs. I wanted to look at the deals from financial aspect.

The organization of the chapter is as follows: in light of relevant and recent literature, Section 1 describes the pros and cons of such lease agreements in the US.

Section II discusses whether the ITR was experiencing some serious financial setback. It also gives details about the Major Moves Initiative, Indiana Governor Daniel's ambitious plan that prompted the State of Indiana to look for sources for large, one-time cash injection. Section III gives detail about the ITR's performance in the post-lease period. Section IV critically evaluates some of the oft-cited earlier analyses of the ITR's valuation. Section V gives details about the organization structure and history of MIG and it highlights key restructuring steps that the MIG management has taken since 2000. By giving such details, it aims to answer the question how the valuation of these two deals (mainly the ITR) would have been impacted if the private investor had not been the MIG. The section also gives a summary of key developments such as a series of acquisitions and the Group's non-recourse loans in 2006. It also gives summary of the Analyst's Model used by MIG to arrive at the asset's value and bid price. In light of above discussion, Section VI concludes the chapter and highlights the larger implications and consequences of correctly valuing such infrastructure assets.

2.1. Section I: For and against the long-term lease agreements

The trend of selling infrastructure assets on long-term leases is gaining attention in the US. In my thesis, I am focusing on privatization of transportation assets such as toll roads. The concept of privatization denotes the transfer of traditionally public services such as toll roads to the private operator (Baxandall, 2009). Buxbaum et el. (2007) define the public private partnerships (PPPs) as any contractual agreement between the public sector and a private entity that allows for private sector participation in the delivery of transportation projects. The recent transactions include the Indiana Toll Road (ITR) (June 2006) and the Chicago Skyway (July 2005). When we discuss the financial aspects of such deals, the debate mainly centers on two questions:

a) Did the bidder pay the right price for the toll road?
b) And given that the toll road is a public good, is public interest compromised in such deals?

One motive behind such long-term lease agreements is that the PPPs result in increased efficiency. Geltner and Moavenzadeh (1987) and Bauxam et al. (2007) discuss potential economic justifications for privatizing highways. These include

a) Greater revenues in the form of tolls so that the states do not have to raise taxes

b) Increased efficiency associated with lower maintenance costs.

The supporters of such agreements argue that the multi-billion-dollar transactions are sources of revenues for the state governments. One economic argument for such deals is that toll roads under public entity ownership may not be generating sufficient operating surpluses (revenues minus operating expenditures). Supporters of the PPPs regard it as an example of progressive thinking on the part of the state to find additional sources to improve the toll road without raising gas taxes. Meckler (2006) said that according to the study published by the Fitch Ratings, a credit-rating company, concluded that "toll roads are good candidates for privatization" but cautioned that adding a profit incentive to the toll operations could lead to tolls that are so high that they may lead to traffic diversion.

The opponents of the PPPs insist on approaching the idea of private toll roads with caution, as they argue that the short-term benefits are likely to outweigh the long-term costs. They insist that by privatizing highways, the officials hand over significant control over to private operators who are accountable to their shareholders, not the public.

Such discussion is incomplete. The opponents of such arrangements do not analyze the complete financial picture of the state governments. The state governments have budget constraints and limited sources of revenues. Such sources of revenues include direct charges such as tolls, and indirect charges and taxes. However the policy actions related to such measures entail important political implications. Some empirical

evidence exists that the toll elasticity of demand is low for roads such as the ITR (Macquarie ITR presentation, 2008) but still the state governments appear averse to toll increases.

In an article on privatizing toll roads, Baxandall (2008) discusses the disadvantages of such deals. He questions the assumption under such concession agreements that the private operator can bring additional efficiency gains. He further argues whether the private operator will still go for such deals if the concession term is shorter than 75 or 99 years. The Chicago Skyway concession stretches 99 years; the ITR concession deal lasts for 75 years. He opposes such arrangements. According to him, if such deal is not performing well, the public cannot hold anyone accountable. He mentions the non-compete clause in the ITR concession agreement, which prevents Indiana from building a four-lane, divided highway more than 20 miles long or expanding a current highway to Interstate standards within 10 miles of the East-West Toll Road for at least 55 years without providing compensation to the toll road operator for the lost revenue.

The PPP deals entail high transaction costs and monitoring and legal costs for the state governments. Goldman Sachs was paid $20 million for financial advice on the Indiana privatization deal and $9 million for the Chicago Skyway (Statewide Mobility Partners LLC and Subsidiary financial statements, 2006). The opponents also mention that the decision-makers might use the money to provide short-term budget relief for programs not related to transportation, as was done in the Chicago Skyway lease.

In an article on deficit in federal highway funds, Kelderman (2007) argues that for states increasing tolls is not the only solution to solve the problem of lack of funds. He proposes that the state governments need to look for other sources of revenues such as raising the federal gas tax, an indirect charge that was raised 14 years ago. He questions whether the private operator provides services more competitively than the public entity. See also Geltner and Moavenzadeh (1987).

From the above debate, it is hard to conclude whether it is beneficial for the states to undertake these agreements. The main question emerges whether the state governments go for such deals because the PPPs offer additional efficiency in the form of higher toll revenues or reduced operating expenditures? Or is their sole motive for such transaction a one-time quick cash injection? Do the state governments weigh the short-term versus long-term implications associated with such deals?

2.2. Section II: Long-term lease of the Indiana toll road (ITR)

In my thesis, I will be focusing on the financial aspect of such transactions. Based on the financial data collected, I will look at two cases; the Indiana toll road (ITR) and the Chicago Skyway. This chapter will contribute to the existing literature by adopting such methodology:

a) What was the financial performance of the ITR before the long-term lease? More importantly, which measures did the Indiana Finance Authority (IFA) employ to measure the toll road performance? Was the asset really underperforming? If not, then why did the IFA still privatize the asset?
b) What did Macquarie Infrastructure Group (MIG) assume about the cost of capital for valuing the ITR? Partially, the answer to such question depends on the availability of the Macquarie financial model used to calculate the bid price of toll road. (I will address this question in detail in the next chapter when I describe the Macquarie Financial Model in detail).
c) What did the earlier published studies assume about the weighted average cost of capital (WACC) of the concessionaire? Did they make the correct assumptions?

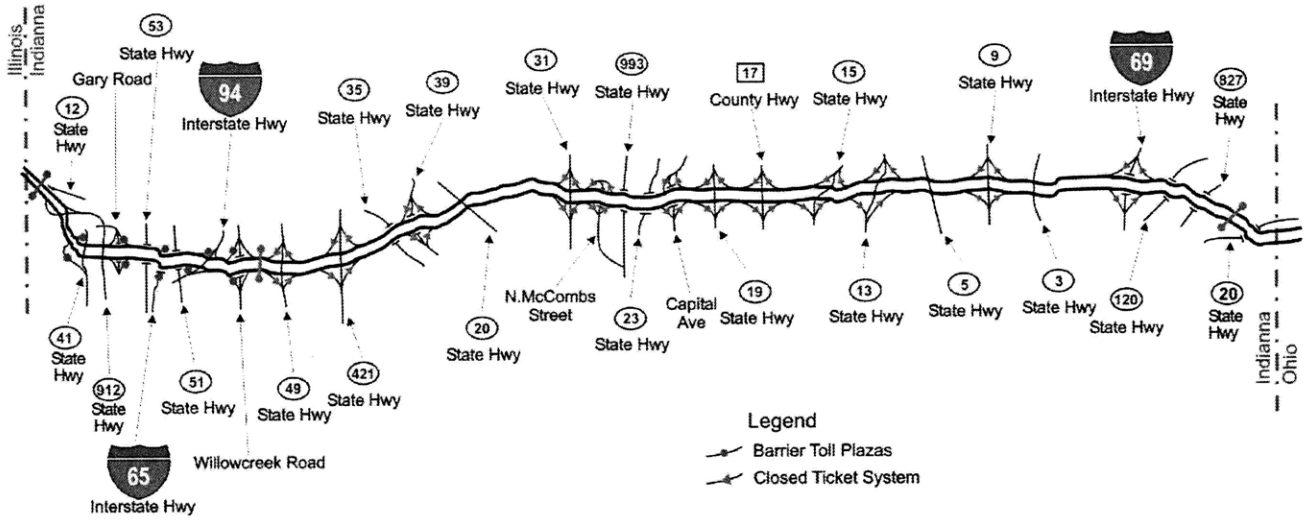
2.3. Description of the asset

The ITR, established in 1956, is 157 miles (252.7 kilometers) in length. The road spans northern Indiana, from its border with Ohio to the Illinois state line near Chicago, feeding directly into two toll roads at the state lines – the Chicago Skyway in the west and the Ohio Turnpike in the east.

Functioning as the primary connection between the Chicago skyway and Indiana's Ohio Border, the toll road has been referred to as the "Main Street of the Midwest". The road was opened to traffic in 1956. The ITR operates an electronic toll collection (ETC) and cash closed barrier tolling system on the western end and an ETC and cash ticket system on the eastern end. The IFA did not change the toll rates since 1985. The ITR has two toll collection systems, a barrier system and a ticket system.

The Barrier system is used in the first 23 miles of the western portion of the road. Under the barrier system, the customers pay their tolls at time of entry to the toll road, as well as at certain exit points within this portion. The ticket system is used from mile post 24 to the eastern end of the road. Under the ticket system, the customers obtain a ticket as they enter this section of the toll road and pay for the toll based on the rates stated on the ticket when they exit this section. Toll revenues are collected in four ways; cash collections, electronic toll collection (ETC), commercial charge account, and IFA reimbursement.

Figure 2: ITR Road Configuration

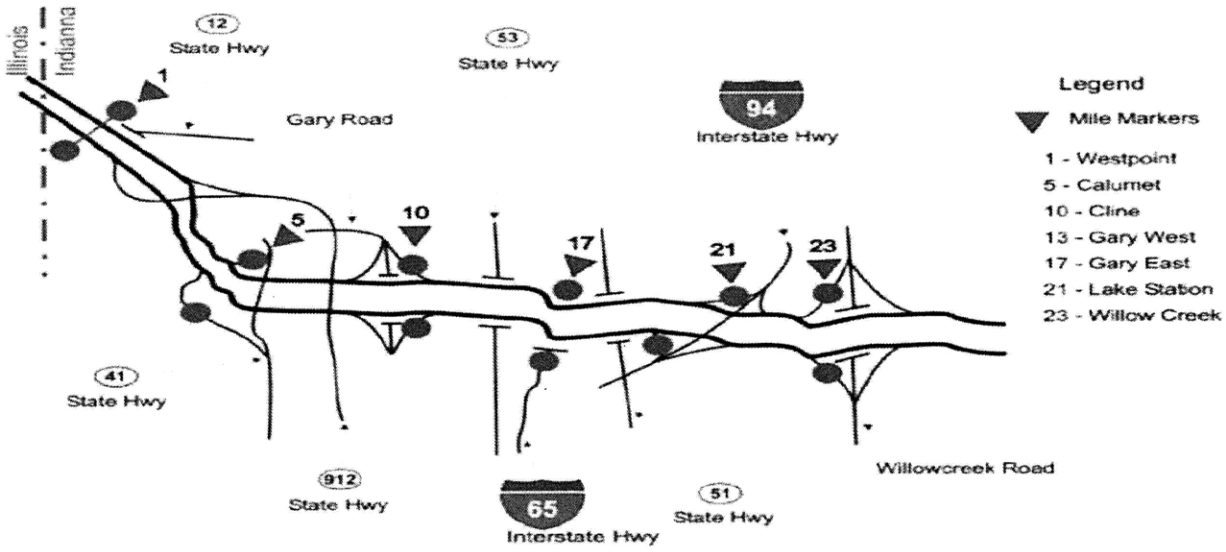


Source: The MIG presentation to the investors regarding the ITR, (2006, p.4)

There is commuter based traffic on the ITR barrier system. Electronic toll collection (ETC) was introduced to the barrier system in June 2007. It currently accounts for approximately 40 percent of transactions on the barrier system. The key features of traffic on barrier system are

a) Noticeable AM and PM peaks
b) Seasonality slightly skewed to stronger traffic months of June to September
c) Low demand elasticity (The MIG does not give detail how they have calculated the elasticity).

Figure 3: Barrier System (ITR)

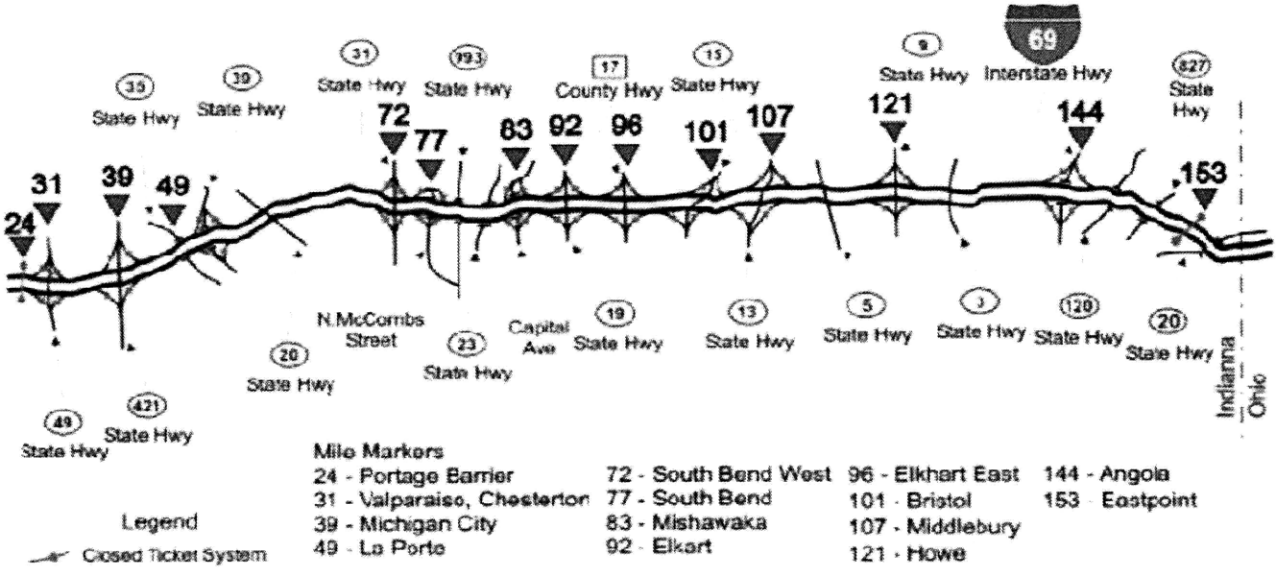


Source: The MIG presentation to the investors regarding the ITR, (2006, p.7)

The ticket system is characterized by freight based traffic. The key features of the traffic on such system are

a) Commercial traffic profile with no discernible daily peaks
b) Low elasticity of demand of truck traffic was observed on the adjoining Ohio Turnpike from price increases over the 1994-1999 periods
c) Tolls increased by 82percent over the period with an average growth in traffic of 1.8percent per year compared to 3.0percent per year since opening.
d) The estimated commercial vehicle toll elasticity is approximately –0.04 (MIG Presentation ITR, 2008). Again, MIG does not give any detail about how it calculated the toll elasticity demand.

Figure 4: ITR Ticket System



Source: The MIG presentation to the investors regarding the ITR, (2006, p.10)

2.4. Financial condition of the ITR up to 2006

The condition of the toll road is a primary factor in determining the financial health of the toll road (ITR balance sheet, 2002). To keep the toll road in good condition, the toll road management has to regularly make repair and renovation outlays. Before June 2006, the ITR management used such expense as a measure to determine the financial health of the toll road. It also used various other measures to measure the toll road performance. These measures included the ITR's toll revenues and the traffic volume.

The section below describes the key statistics about the vehicle traffic revenues, revenue growth (in percentage) etc.

2.4.1. Key ITR statistics before the MIG Lease

The vehicle traffic is comprised of two categories: passenger and commercial traffic. Based on the five-year period, overall the vehicle traffic (in million) is experiencing an increase. Based on the vehicle traffic volume, the percentage passenger traffic is almost the same. Based on table 1, the commercial traffic is going up.

Table 1: Key ITR's Traffic Statistics (2001-2005)

Vehicle Traffic - In millions					
	2001	**2002**	**2003**	**2004**	**2005**
Passenger	43	46	45	45	45
Commercial	9	9	9	9	10
Total Traffic	52	55	53	54	55
Vehicle Traffic - Percentage growth(In millions)					
	2001	**2002**	**2003**	**2004**	**2005**
Passenger		6%	-3%	1%	0%
Commercial		-1%	-6%	6%	8%
Total Traffic					
Revenue per Vehicle Trip (in dollars)					
	2001	**2002**	**2003**	**2004**	**2005**
Average passenger revenue per trip	0.75	0.76	0.78	0.78	0.77
Average commercial revenue per trip	5.4	5.28	5.54	5.48	5.48
Average revenue per trip based on vehicle mix	1.61	1.57	1.54	1.49	1.56

Source: Financial statements, the Indiana toll road, 2001-2005

As shown in above table, there is a large difference in the revenue per vehicle trip for the two categories of traffic. Financially it would make more sense for the ITR management to have a healthy mix of passenger and commercial vehicle traffic. Based on 2004 ITR's revenues, the ticket system constitutes 82 percent of toll revenues. Within that category, the commercial traffic subcategory comprises of major percentage.

Table 2: Ticket and Barrier Systems Toll Revenues 2004

			In $ million
Barrier System -ITR		**Ticket System -ITR**	
18 percent of toll revenue		82 percent of toll revenue	
Commercial	4.4	Commercial	45.2
Passenger	10.7	Passenger	24.7
	15.1		69.9

Source: The ITR's presentation to the investors, 2008

Table 3: Toll Revenues (in $ million)

Toll Revenues (In millions)					
	2001	**2002**	**2003**	**2004**	**2005**
Passenger vehicle	32	35	35	35	35
Commercial vehicle	49	48	47	49	53
Total toll revenue	82	83	82	84	88
Toll Revenue Growth(%)					
	2001	**2002**	**2003**	**2004**	**2005**
Passenger vehicle	1%	8%	0%	1%	-1%
Commercial vehicle	-6%	-3%	-1%	5%	8%
Average revenue growth based on vehicle mix	3%	1%	-1%	3%	4%

Source: Financial statements, the Indiana toll road, 2001-2005

The sluggish economy appears to be reflected in the toll road project's drop in commercial toll revenue in 2002. Substitution of car trips for airline trips may be the cause of that increase in passenger car revenues. In addition to the overall national economy, the toll road project provides a transportation corridor for two major industries, the steel industry in Northwest Indiana and the recreational vehicle industry in North Central Indiana. As those industries expand or contract, toll road project revenue is affected accordingly.

Most of the toll road operations use EBITDA as an indicator of the toll road operations. If we use such indicator as a measure of the ITR's profitability then the ITR still remains as a profitable operation.

The ITR's EBITDA upto 2006

	2002	2003	2004	2005	2006
EBITDA	21	22	32	24	31
EBITDA (Margin percent)	24	23	34	25	31

Source: ITR's P&L statements 2002-2006

According to Crowe Chizek (2005), the ratings of the toll road's highways and bridges were as follows:

Percentage in Good or Better Condition

	2003	2004	2005
Interstate Roads	92%	96%	91%
Interstate Bridges	100%	100%	100%

Source: Crowe Chizek (2005)

In both 2002 and 2003, 100 percent of the toll road projects were rated in good or better condition. In both years, 100 percent of the Toll Road Project's bridges were rated in good or better condition. The question remains why the ITR management did not consider it as indicator of good performance of a toll road?

Based on the above statistics, it appears that the toll road operations were not experiencing any major financial decline at the time till 2005 when the IFA decided to pursue the concession agreement. However, the IFA claimed that the financial performance of the toll road had fallen short of the level in which it was expected to perform. The Indiana department of Transportation (INDOT) claimed that "*While the financial performance of the ITR was less than desirable, it was clearly recognized that this asset could perform better*" (ITR financial statements, p.104, 2006). The table

below shows the toll comparison chart. Based on the 2005 statistics, the ITR passenger and commercial vehicle traffic tolls were lower as compared to other places.

Figure 5: Passenger Vehicle Toll Comparison Chart

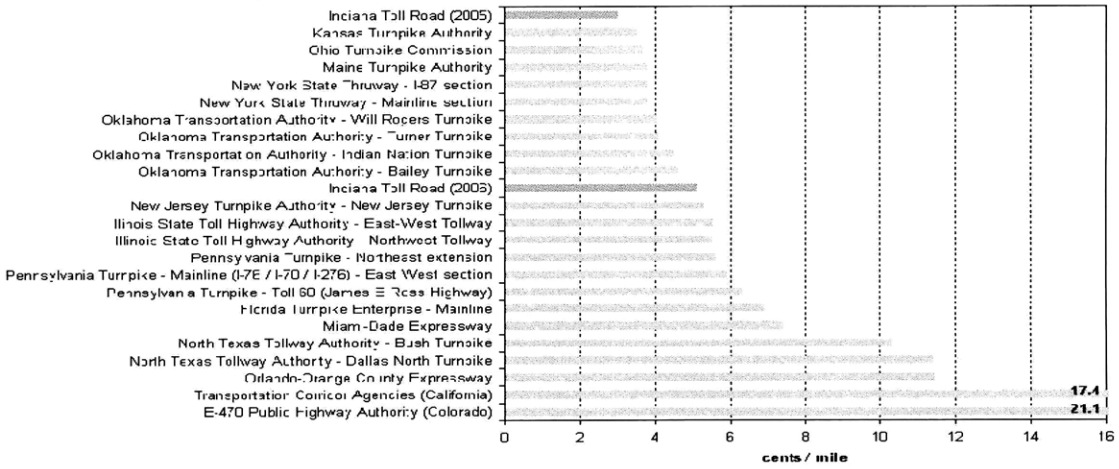
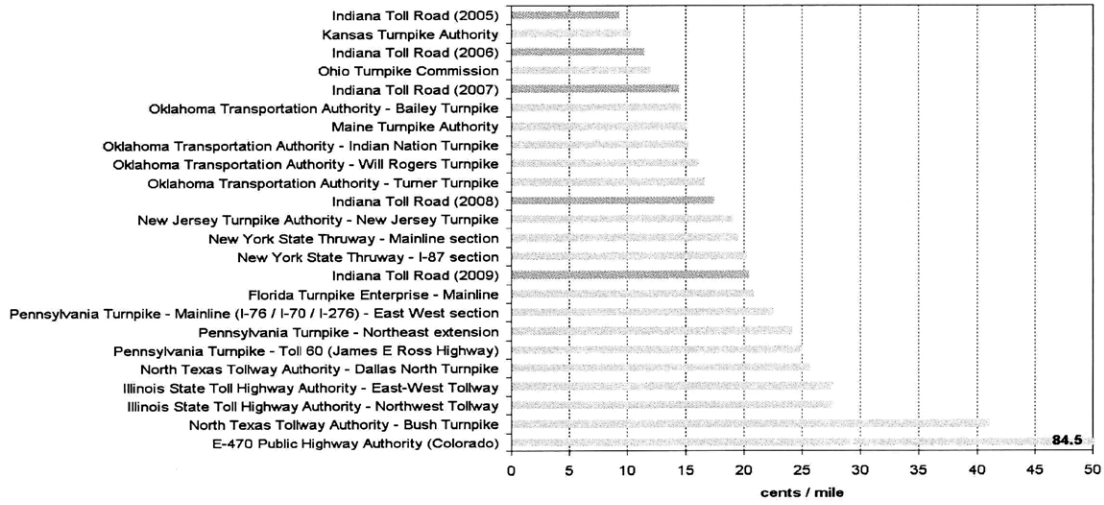


Figure 6: Commercial Vehicle toll comparison chart



Source: The ITR's presentation to the investors, 2006

Why is it important to establish that the ITR was not facing any serious financial setback? It is because some of the oft-quoted studies justify the sale of the toll roads on financial grounds. Such studies claim that the ITR management sold the toll road because it did not have sufficient funds to keep up the financial

health of the toll road. Hence it is equally important part of the analysis to investigate why the ITR was out for bid.

Table 5 exhibits detailed historical revenue figures broken down by vehicle type for the toll road. As shown in table below, the toll revenues increased from $38 million in 1984 to almost $85 million in 2004. Toll revenues compounded annual growth rates over the period 1984-2004 and 1994-2004 were 4.1 and 2.7 percent respectively.

Table 4: Historical Toll Revenue by Vehicle Type (1984-2004)

						($ Thousands)
Year	Passenger Car($)	Percent Change over previous year	Commercial Vehicle($)	Percent Change over previous year	Total Vehicles	Percent Change over previous year
1984	14687	-	23473	-	38160	-
1985	14703	0.1	23287	-0.8	37989	-0.4
1986	15935	8.4	28014	20.3	43949	15.7
1987	18208	14.3	30468	8.8	48675	10.8
1988	19399	6.5	32467	6.6	51866	6.6
1989	20703	6.7	33299	2.6	54002	4.1
1990	21762	5.1	33403	0.3	55173	2.2
1991	22764	4.6	32686	-2.1	55448	0.5
1992	23735	4.3	34382	5.2	58228	5.0
1993	24509	3.3	36785	7.0	61295	5.3
1994	25267	3.1	39469	7.3	64735	5.6
1995	26149	3.5	42998	8.9	69148	6.8
1996	27396	4.8	43166	0.4	70562	2.0
1997	29559	7.9	44780	3.7	74354	5.4
1998	31666	7.1	46695	4.3	78361	5.4
1999	32422	2.4	48892	4.7	81314	3.8
2000	32405	-0.1	52071	6.5	84476	3.9
2001	32651	0.8	49190	-5.5	81841	-3.1
2002	34881	6.8	47531	-3.4	82412	0.7
2003	34882	0.0	47164	-0.8	82046	-0.4
2004	35313	1.2	49593	5.2	84907	3.5
Compound Annual Growth Rate						
1984-2004		4.5		3.8		4.1
1994-2004		3.4		2.3		2.7
1999-2004		1.7		0.3		0.9
1984-2000		5.1		5.1		5.1
1990-2000		4.1		4.5		4.4

Source: Request for Toll Road Concessionaire Proposals, the ITR, September 28, 2005

As shown from above table, the toll revenues increased from $38 million in 1984 to almost $85 million in 2004. Toll revenue compounded annual growth rates over the period 1984-2004 were 4.1 percent. Excluding the years 2001 to 2004, when construction on I-65 and the Chicago Skyway contributed to traffic declines, toll revenue has been steadily growing.

2.5. Financial accounting before the MIG lease

The ITR's annual financial statements use Government Auditing Standards (GAS). The statements include; Statement of Net Assets (in a private corporation, such statement will be called a balance sheet (BS), which gives snapshot of the financial picture of a company at any given time), Statement of Revenues, Expenses, and Changes in Net Assets (in a private corporation, such statement will be called the profit and loss (P&L) statement) and the Statement of cash flows.

2.5.1. Statement of Net Assets

According to the Government's accounting standards, such statement represents the financial position of the toll road. It gives us an idea about the resources available to the Toll Road Project.

$ Million

Figure 7: Statement of Net Assets

Assets	2002	2003	2004	2005
Current Assets				
Cash and cash equivalents	60	38	34	37
Investments	35	65	73	73
Accounts Receivable		4	4	4
Inventories		2	2	1
Prepaid Expenses		1	1	1
Total Current Assets	95	110	115	117
Noncurrent Assets				
Restricted cash and investment	111	92	79	60
Property, Building, and equipment	239	242	259	280
Bond Issuance costs, net	9	2	1	1
Total noncurrent assets	358	335	339	341
Total assets	453	445	455	457
LIABILITIES AND NET ASSETS				
Current Liabilities				
Accounts Payable	8	7	7	7
Accrued salaries and related expenses		2	3	2
Liabilities payable from restricted assets	5			
Accrued interest payable		5	4	7
Current portion of revenue bonds payable		12	13	14
Total Current Liabilities	0	17	17	20
Long term portion of revenue bonds payable	228	206	196	185
Assets held on behalf of ITFA:				
Invested in capital assets, net of related debt	11	25	52	82
Restricted for future debt service	192	50	51	53
Restricted for transportation improvement		9	9	9
Restricted for construction		118	104	81
Unrestricted	9	10	15	17
Total Liabilities	212	213	231	243
Accumulated other comprehensive loss				
Total Liabilities and net assets	453	445	454	457

Source: ITR financial statements, 2002, 2003, 2004, and 2005.

2.5.2. Statement of Revenues, Expenses, and Changes in Net Assets

This statement reflects what revenues were generated and what expenses were incurred to generate those revenues. The excess of revenues over expenses, formerly known as the net income is reflected as a transfer to assets held on behalf of ITFA. According to the management discussion and analysis for the June 30, 2003, the change in the assets held on behalf of ITFA is an indicator of whether the Toll Road Project's financial health is improving or deteriorating (ITR financial statements, p. 2, 2006).

$ Millions

Figure 8: P&L ITR - Before Privatization

Items	2002	2003	2004	2005	2006
Operating Revenues					
Tolls	82	88	85	88	92
Concession Revenues and other revenues	7	7	8	8	8
Total operating revenues	89	95	93	96	100
Operating Expenses					
General Administration	29	2	2	3	3
Toll collection		9	10	25	26
Road operations		9	8		
Miscellaneous services		12	12	7	7
Major expense repairs and renovation	36	39	25	33	29
Depreciation expense	3	3	3	4	3
Total operating expenses	68	73	60	72	69
Operating income	21	22	32	24	31
Non-operating revenues (expenses)					
Interest and bond amortization expense	-17	-16	-15	-15	-14
Investment revenue	5	3	1	3	6
Transportation grants	-1	-2			-11
Change in net assets before transfer of assets held on behalf of ITFA	8	7	18	12	11
Transfers to assets held on behalf of ITFA-Net Loss	-8	-7	-18	-12	-11

Source: Profit and loss statements the ITR, dated 2002, 2003, 2004, 2005 and 2006.

The above table includes information about 2006, since the ITR was privatized in June, 2006. The above financial summary of the ITR shows that tolls form the largest source of revenue. Other revenues include concession revenues arising from lease contracts and investment income earnings. Total operating expenses include costs to repair and renovate aging infrastructure and general administration expenses. Non-operating expenses mainly consist of interest expenses.

The operating income is measured through EBITA (earnings before interest, tax, and amortization). A major part of the toll road's financial analysis judges the

profitability of the toll road operations by measuring EBITA or earnings before interest, depreciation, tax or amortization (EBITDA). For the ITR, the Indiana management measured it through calculating EBITA. As shown in table above, in 2006, the $11.7 million revenue surplus was possibly large because the state had earlier decided to delay capital improvement projects. Moreover, none of the ITR's surpluses were used to fund other state programs or capital projects (Johnson et al., 2007). During 2005 and 2006, the grant fund distributions from the restricted transportation improvement funds and unrestricted resources totaled $11.4 million.

2.5.3. Statement of Cash Flow

Such statement reflects the cash provided to the toll road project from its activities; operating activities, investing activities, and financing activities. The cash and cash equivalents category at the end of the year represents the ability of the toll road district to weather difficult economic times and to fund needed projects in future years.

The ITR's management breaks cash and cash equivalents into restricted and unrestricted cash. The restricted cash category comprises of two items; cash and short-term investments. Such items are set aside for future capital projects, transportation grants or bond payments. The unrestricted cash categories include the cash and short-term investments. Such funds cover emergencies and the operating cash requirements.

The largest segment of the capital assets is infrastructure. According to the Government Accounting Standards Board (GASB), the toll district no longer capitalizes expenditures that are made to infrastructure renovations. The increase in concession revenue can be because of many reasons: the increase because of the completion of renovations of fuel facilities at two travel plaza pairs. The operating expenses included insurance cost increases included fringe benefits and general administration expense.

($ million)

Figure 9: Cash Flow Statements - Pre ITR Privatization

	2002	2003	2004	2005	2006
Cash inflows (outflows) from operating activities					
Tolls	84	82	85	88	100
Concessionaires	7	6	8	7	
(Payroll and Benefits)	-21	-20	-23	-25	-28
(Contractors and suppliers)	-43	-48	-34	-42	-42
Net cash from operating activities	27	20	36	28	29
Cash Flows from investing activities					
Net Purchases of investments	80	-30	-8	0	73
Investment income	5	3	1	3	6
Net cash outflow from investing activities	85	-28	-7	3	79
Cash flows from capital and financing activities					
CAPEX (Capital expenditues)	-1	-6	-21	-24	-6
Principal payment on revenue bonds	-9	-12	-12	-13	-14
Interest paid on revenue bonds	-15	-14	-13	-10	-14
Transportation grants paid	0	-2			-11
Net cash from capital and financing activities	-25	-33	-46	-47	-45
Transfer of cash to the Indiana Finance Authority					-155
Net change in cash and cash equivalents	86	-41	-17	-16	-91

Source: Cash flow statements, the ITR dated 2002, 2003, 2004, 2005, and 2006.

The EBITDA is calculated by subtracting operating expenses from total operating revenues. The EBITDA margin, expressed as a percentage is a ratio of operating income and total revenues. For ITR's analysis, the EBITDA has not experienced major changes and has remained stable. Such operating surplus is eventually used for capital improvements, to pay off outstanding debt, or to offset other costs or cross-subsidize other expenditures.

On October 19, 2006, in a presentation "Infrastructure Privatization: The Indiana Toll Road", Charles E. Schalliol, the director of the Indiana office of Management and

Budget revealed that the state budget was in the deficit. He further disclosed that given the highway funding gap exceeded $2 billion, the IFA lacked funds to invest in the capital improvement projects. The details of the $2 billion deficit are given in the section below.

2.5.4. Major Moves Initiative Program

The Major Moves Program is a transportation program that is unique to Indiana. It is unique in that it is a fully funded ten-year program (2006 to 2015) for transportation, expansion and preservation projects throughout the State of Indiana. The Major Moves initiative is made up of two categories of work which are significant to the long-term plan. These two categories include the New Construction and Major Preservation programs. The New Construction program is a project specific, ten-year program that focuses on added capacity programs, new roadways, added travel lanes and bridges. The Major Preservation program, a project specific ten-year plan focuses on reconstruction and major road rehabilitation projects.

Figure 10: May 2005 Project Funding Analysis Identifying Transportation Funding Gap

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Annual Funding Gap	-40	-169	-152	-131	-168	-207	-250	-297	-349	-405
Cumulative Gap	-40	-209	-361	-492	-660	-867	-1117	-1414	-1763	-2168
Projected Total Preservation	489	499	509	519	529	540	551	562	573	584
Projected New Construction	300	158	204	257	256	255	253	251	249	247
Annual Total Construction	789	657	713	776	785	794	804	813	822	831

Source: The Major Moves Initiative Plan, 2006.

The revenues from the upfront payment of the MIG lease will be used to pay outstanding toll bonds and fund the "Major Move" transportation program. According to the plan, 34 percent of the funding going to the "Major Move" program will be invested in the seven counties where the facility is located to address equity concerns, based on

the fact that 66 percent of the traffic comes from out-of-state drivers, so those revenues can be invested in other areas of the state.

2.5.4.1. Background for the Major Moves Program

Figure 10 reveals a funding gap greater than $1.8 billion over the following ten years. The governor asked the department to review and prioritize projects on a set of criteria including safety, mobility, and economic development. In September 2005, a draft for a new legislature initiative; the Major Moves highway plan was made public. The plan included more than 200 new construction and 200 major preservation highway projects.

In addition to funding the gap for Indiana Department of Transportation (INDOT) highway projects, funds would be made available to counties for local transportation projects. At that time, an important question was how the State of Indiana would finance such plans. According to the Major Moves Program, a combination of federal and state gas tax revenues would help the state to achieve such objective. Another source of funding was the expected lease proceeds from the ITR. "While the Toll Road is a significant source of stable cash flows to the State, the State considers that a private entity may be able to derive more economic value from the asset while providing excellent service for Toll Road users." (Request for Toll Road Concessionaire Proposals, Indiana Toll Road (ITR), Sept.28, 2005, p. 12)

Johnson et al. (2007) primarily focus on the refinancing part for the ITR. The report quotes that "in the ITR, the debt payment has been repetitively deferred as a result of insufficient revenue flows to fund capital improvements."

Governor Mitch Daniel made toll financing part of his political campaign during the 2004 elections. To respond to information requests regarding the Major Moves Initiative, the IFA engaged Crowe Chizek and Company LLC (Crowe) to perform an independent analysis of toll road operations over a 75 period from 2006 through 2081.

2.6. Accounting for the ITR before June 2006

The Toll Road Project adopted the modified approach for recording information under Governmental Accounting Standards Board (GASB) statement No.34, Basic Financial Statements- and Management's Discussion and Analysis- for State and Local Governments. All expenditures made these assets (except for additions and improvements) are expensed in the period incurred. However as the ITR financial statement 2003 mentions that additions and improvements to eligible assets are capitalized when such improvements increase the capacity or efficiency of infrastructure assets rather than preserve the useful life of the assets".

It is important to mention that the depreciation in such accounts is computed using a straight-line method over the estimated useful life. The ITR Concession Company (ITRCC) adopted a different approach to calculate the depreciation expense which in return affects the ITR's profitability.

2.7. ITR Ownership Structure up to 2006

Prior to 2006, the Indiana East-West Toll Road Project was the result of a lease agreement between the Indiana Transportation Finance Authority (ITFA) and INDOT to finance and operate the Indiana East-West Toll Road as defined in the lease agreement between the two parties.

2.7.1. Bidding Process for Privatization

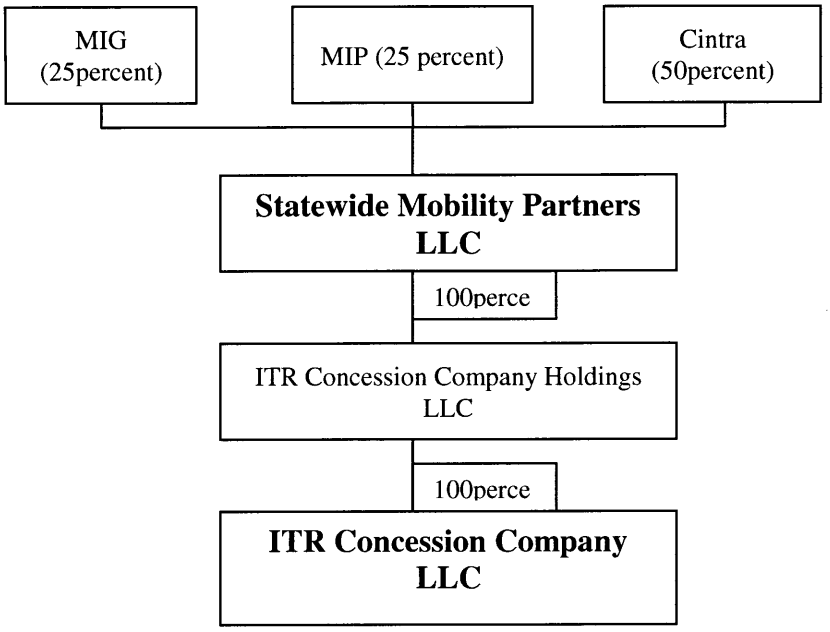
The 117-day bid process was the fastest in the country for what now is the largest agreement of its type for privatization of the ITR. On 23 January 2006, the 50:50 Macquarie Infrastructure Group (MIG)-Cintra consortium, the Statewide Mobility Partners LLC, was announced the preferred bidder for the ITR concession. The other bidders were: Morgan Stanley ($1.90 billion), Itinere ($2.520 billion), and Babcock & Brown LP ($2.84 billion). On March 14, 2006, the Indiana General Assembly House and Senate passed House Bill 1008, which allowed the Governor to lease out the ITR. The winning bid was $3.85 billion, "an enormous amount of money far beyond anything the state could generate on its own", as the Governor Mitch Daniels described the bid. The 75-year lease agreement was signed by the State and the concessionaire on April 13, 2006 and closed on June 30, 2006. The consortium created a project finance vehicle, the ITR Concession Company LLC (ITRCC). The ITRCC entered into a concession agreement with the IFA to operate the toll road for 75 years.

2.7.2. ITR ownership structure after privatization

In December 2006, MIG completed the divestment of 50 percent of its interests in its four US toll roads to Macquarie Infrastructure Partners (MIP) for a total amount of $825 million. The price paid for 25 percent of ITR was $197.8 million.

MIG has a 25 percent direct interest in the Statewide Mobility Partners LLC, which in turn has a 100 percent interest in the ITRCC. The Statewide Mobility Partners LLC is treated as a partnership for the US tax purposes. According to the financial statements, the company operates as a limited liability company and is a disregarded entity for federal and income tax purposes. The ITRCC is not liable for US federal income taxes since its members recognize their share of income and loss in their respective tax returns. Taxes are still paid upstream however.

Figure 11: The ITR Organization structure after the PPP



Source: Macquarie Infrastructure Group (MIG) Analyst Package, 2008

2.7.3. Financing Structure and Capital Structure

According to the Macquarie Bank Limited, the total funding requirement for the ITR was US$ 4.05 billion. The sources and uses are given below:

Figure 12: Sources for the ITR's concession money

Sources	US$ million	Percentage
Bank Debt	3278.5	81
Equity (MIG and Cintra)	770.1	19
	4048.6	

Source: MIG ITR Presentation, ITR 2006

Figure 13: Users of the ITR's concession money

Users	US$ million	Percentage
Purchase Price	3850	95.1
Reserves	100	2.5
Other Costs	98.6	2.4
	4048.6	

Source: The MIG ITR Presentation, 2006

Figure 14: Details about the ITR's financing facility

Financing	US$ million
Acquisition Debt	3278.5
Capex Facility	700
Liquidity Facility	100
Total	4078.5

Source: The MIG ITR's Presentation, 2006

From the above financing review, the tenor of the acquisition debt is nine years. According to the Macquarie's presentation (ITR), the favorable financing terms includes

commitments to fund estimated capital expenditure (Capex) requirement over the next nine years.

2.7.4. ITR's Toll-setting mechanism:

The logic behind the ITR's toll-setting regulations was that tolls, prior to the concessions, had been kept artificially low. The tolls had not kept with the increase in the cost of living. Hence, the mechanism was set such as in the early years of concessions, the tolls would be restored to a more appropriate level. Once this was accomplished, tolls would be adjusted annually by two factors:

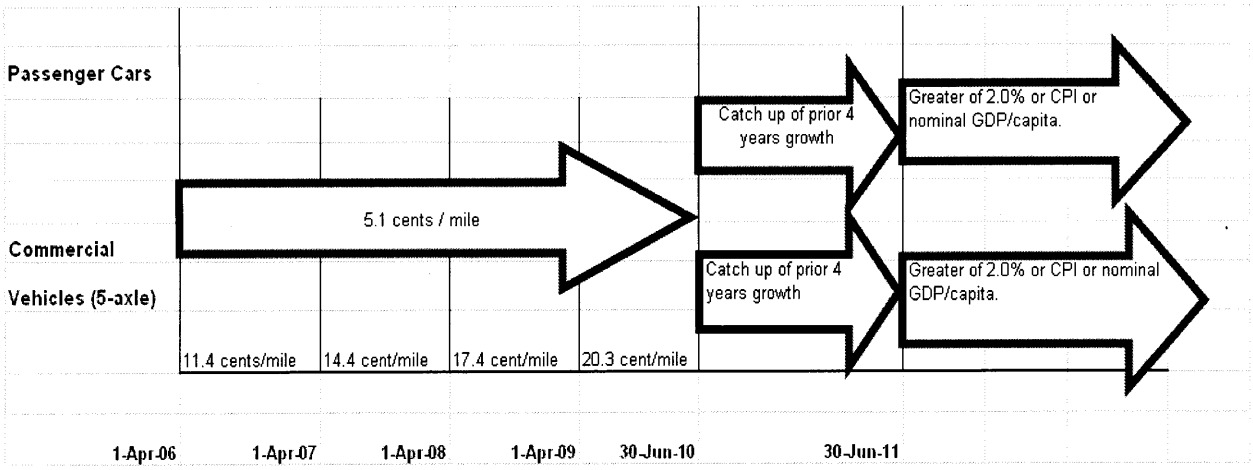
a) Inflation (consumer price index (CPI))
b) Or the ability to pay (gross domestic product (GDP)).

As stipulated in the Concession agreement, the Indiana announced the first toll increase since 1985, to occur on 1 April 2006.

a) Passenger car tolls to increase to 5.1 cents per mile, and will remain unchanged until 2010.
b) As shown in figure below, commercial vehicle tolls will increase. The toll schedule would remain same until 2010.
c) The concessionaire's ability to set tolls begins in 2010 with a maximum increase in 2010 to reflect the prior 4 years Consumer Price Index (CPI) or nominal gross domestic product (GDP) per capita growth
d) And maximum annual toll increase post 2010 is the greater of 2 percent, CPI and nominal GDP/capita.

The details of the toll-setting mechanism are attached below:

Figure 15: Toll-setting mechanism ITR



Source: Tolling Schedule, ITR Concession Agreement, 2006

The ITR Concession Company allocated $3.8 billion paid to the IFA and $23.64 million of other direct costs associated with entering into the Concession and Lease Agreement to the following assets based upon their relative fair values. The company used an outside independent appraiser to help determine the fair values of the various assets associated with the Concession and Lease Agreement.

Table 5: ITR's bid price- breakdown

Assets	Fair Value ($) In '000'
Concession rights	3027066
Bridges and Roads	680313
Buildings	22940
Leasehold interest on land	85530
Vehicles	3880
Machinery, tools and equipment	2895
Furniture, fixtures and office equipment	490
Materials (salt and fuel)	560
Total	3823674

Source: The ITR's financial statements, 2007-2008

2.8. Financial Performance of the ITR after 2006

In this section, I will employ the same financial measures to evaluate the financial performance of the ITR as we looked in earlier Section.

The ITR's EBITDA after 2006

	2007	2008
EBITDA	33	48
EBITDA (Margin percent)	22	31

Source: P&L statements, 2007&2008

($ million)

Table 6: P&L - Statewide Mobility Partners LLC and Subsidiary

	Statewide Mobility Partners LLC and subsidiary	Statewide Mobility Partners LLC and subsidiary
	December31,2007	December31,2008
Operating Revenues		
Tolls	144	147
Concession revenues	8	8
Total operating revenues	151	155
Operating Expenses		
General Administration	5	5
Toll collection	13	11
Administrative services	7	6
Major expense repairs and renovation	9	11
Depreciation expense	78	69
Misc. expense	6	
Total operating expenses	118	102
Operating income	33	53
Non-operating revenues (expenses)		
Interest and bond amortization expense	-239	-244
Gain (loss) on sale of fixed assets		-209
Derivative Gain(Loss)	32	
Change in net assets before transfer of assets held on behalf of ITFA	-173	-400
Transfers to assets held on behalf of ITFA-Net Loss	-173	-400

Source: Financial statements dated 2007 and 2008.

If I look at the transfers to assets held on behalf of ITFA as an indicator of the asset's financial performance then the ITR does not seem to be very profitable project. The interest and amortization expenses are really high. From the financial statements, it appears that the ITR management capitalized such expenses. It appears that it will take some time before the toll road operations become profitable. Similar financial situation is evident from the cash flow position of the asset in two years 2005 and 2006.

($ million)

Table 7: Balance Sheet for Statewide Mobility Partners LLC and Subsidiary

	Statewide Mobility Partners LLC and subsidiary	Statewide Mobility Partners LLC and subsidiary
Assets	**2007**	**2008**
Current Assets		
Cash and cash equivalents	5	4
Accounts Receivable	8	8
Prepaid Expenses	1	2
Current portion of toll freeze deposit	16	13
Total Current Assets	30	27
Noncurrent Assets		
Restricted cash and investment	78	51
Property, Building, and equipment	829	928
Advanced payments to contractors		20
Concession rights, net of amortization	3063	2926
Deferred financing costs		57
Other noncurrent assets		47
Total noncurrent assets	3970	4030
Total assets	4000	4057
LIABILITIES AND NET ASSETS		
Current Liabilities		
Accounts Payable	9	9
Accrued salaries and related expenses	8	12
Current portion of revenue bonds payable	16	13
Total Current Liabilities	33	37
Long term portion of revenue bonds payable	3402	3540
Assets held on behalf of ITFA:		
Invested in capital assets, net of related debt	204	
Due to IFA		47
Derivative Liability	344	1926
Total Liabilities	548	1978
Accumulated other comprehensive loss		-1519
Total Liabilities and net assets	4000	4057

Source: Financial statements dated 2007 and 2008.

Table 8: Cash Flow statement- Statewide Mobility Partners LLC and Subsidiary

($ millions)

Statewide Mobility Partners LLC and Subsidiary			
	2006	**2007**	**2008**
Cash inflows (outflows) from operating activities			
Net Loss	-99	-173	-405
Adjustments to reconcile net loss to net cash cash used in operating activities			
Amortization of deferred financing costs included in interest	5	9	9
Depreciation and amortization of property and equipment	22	38	29
Amortization of concession rights	20	40	40
Net unrealized loss in hedging activities	39	65	303
Changes to operating assets and liabilities			
Accounts Receivable	-6	-2	-3
Prepaid expenses and other current assets	-13	0	-1
Accounts Payable	1	-3	0
Accrued other liabilities	8	-1	-3
Due to related parties	2	-4	3
Accrued Interest	1	-1	0
Net cash used in operating activties	-19	-32	-27
Cash Flows from investing activities			
Payments to enter concession and lease agreement	-3820		
Advance Payments to contractors		-24	
Additional purchase of property and equipment	-3	-75	-111
Change in restricted cash and cash reserve accounts	-120	37	28
Net cash used in investing activities	-3943	-61	-83
Cash flows from financing activities			
Capital contributions	760		
Distribution and return of capital		-29	-29
Proceeds from Series A loan	3248		
Proceeds from Series B loan	16	29	28
Proceeds from Series C loan	16	93	110
Financing fees paid	-79	0	
Net cash flows provided by financing activties	3961	93	109
Net change in cash	-1	0	0
Beginning of Period	0	-1	-1
End of Period	-1	-1	-1
Cash paid during the period of interest	68	141	144
Purchase of property and equipment under liabilities		8	7
Net unrealized loss in hedging activities charged to other comprehensive income	-89	-152	-1278

Source: Cash flow statements dated 2007 and 2008.

2.9. Accounting for the ITR after 2006

For the Statewide Mobility Partners LLC and Subsidiary financial statements, effective January 01, 2008, the ITRCC changed its method of depreciation for highway-related property and equipment from straight-line method to modified units of production method which makes use of traffic volume over an asset's estimated useful life. Under the new depreciation method for ITRCC, the depreciation of an asset is a function of both time and usage.

Based on the traffic-based depreciation method, the depreciation expense for the highway-related assets was $25.3 million for the year ended December 31, 2008. Had the company continued using the straight-line method of depreciation for highway-related assets, depreciation expense for highway-related assets would have been $34.1 million for the year ended December 31, 2008.

The success of the transaction has also been Standard and Poor's upgraded Indiana's credit rating from "AA" to "AA+" on January 23, 2006. Such upgrading in the rating reflected the state's steadily improving financial position, which exceeds budgeted expectations, both driven by improved management and revenue growth.

2.10. How the traffic has evolved in 2008?

Given that the ITR concession agreement is ending in 2081, the MIG management announces the traffic results every year. Because of a number of factors such as weakening national and economic conditions, surge in retail fuel prices, the toll elasticity in connection with April 2007 and 2008 toll increases, the volume of traffic in 2008 has experienced a decrease.

Table 9: How traffic has evolved in 2008?

Ticket Traffic (Year to Date)			
Years	2006	2007	2008
Traffic	25717	22505	21535
Barrier Traffic (Year to Date)			
Years	2006	2007	2008
Traffic	95486	88069	71653
	Apr-June 2007	Apr-June 2007	
Average Daily Traffic			
All-Days-Tickets	25079	26413	
Days-Barrier	70474	98376	

Source: Granger, Indiana, June 23, 2008

In the above table, the Ticket System is reported in terms of full-length equivalent tolls and the barrier system is reported in terms of toll generating transactions.

2.11. Valuation of the ITR

The financial value of a toll road concession is the projected annual cash flow (CF) generated over the concession period. According to earlier studies, the key parameters of the concession include

a) The term of the concession
b) A projection of gross toll revenues, which is a function of future traffic and tolls
c) Operating costs and
d) And Capital expenditures.

Table 10: ITR performance in 2007

	USD in 000's	
	Actual	**Claims made by the MIG in 2007**
Tolling Revenues	143380	
Concession and miscellaneous Revenues	8086	
Total Revenues	151466	7.7 percent higher than 2006 revenues
Highway Operations		
Overhead Expenses	14677	
Highway Operations Expenses	26077	
Total OPEX	40724	3.1 percent lower than 2006 costs
EBITDA	110742	11.8 percent higher than 2006 level
Depreciation and amortization	78291	
EBIT	32451	
Interest and other expenses	205885	
EBT	-173434	

Source: The MIG's presentation to investors, 2007

It is important to note that many earlier studies do not include the toll elasticity of demand as an important factor in the analysis. The analysis below discusses some earlier approaches that have been employed to calculate the financial value of the ITR concession. However each of the study makes different assumptions about the weighted average cost of capital (WACC) from a concessionaire's viewpoint. I will be discussing their assumptions and how each of these analyses is deficient? In such way, I will contribute to the existing literature.

2.11.1.Crowe Analysis

When Governor Daniel initiated the Major Moves initiative, many doubts were raised about the short-term versus long-term benefits of privatization. In response to such queries, the IFA engaged the services of Crowe Chizek and Company LLC

(Crowe), the 9th largest accounting firm in the US. Crowe's analysis employed the net present value (NPV) method to calculate the financial value of the toll road. The NPV is the difference between a project's value and its costs. "Any asset creates wealth if the discounted value of the future cash flows exceeds the up-front costs" (Brealey, Myers, and Allen, 2008, p. 143).

The private bidders based their bids on future performance, especially guaranteed toll rate increases however; the Crowe's analysis is based on past and current performance of the toll road.

The Crowe's analysis makes key assumptions about traffic volume, operating expenditure growth, repairs and renovation expense growth based on toll road's historical trends etc. These assumptions include

a) The toll road's traffic assumptions as reported in study (Wilbur Smith Associates 2004).
b) The operating expense will grow at 5.1 percent and repair and renovation expense growth at 2.5 percent.
c) The study assumes that the State of Indiana would invest regularly into capital improvement $22.6 million per year from 2017 through 2081.
d) The financial analysis assumes a discount rate of 6 percent which the report claims is the market cost of capital for the State of Indiana debt. According to the Crowe's analysis, the 6 percent derived from the 20-year historical average weekly rate of the 30-year Municipal Market Data of 5.8 percent plus 20 basis points based on the current market. These 20 basis points reflect an adjustment for Indiana credit ratings and the risk of lease revenue backed debt.

2.11.2. Limitations of the Crowe's Analysis

The government valued the asset based on the present and future performance of the ITR. According to the report, "it was less than the full productive use of the toll road" (Johnson et al., 2006)

The limitation of such study is that it incorrectly assumes the cost of capital for the project is the State of Indiana's cost of debt. Brealey, Myers and Allen (2009) point out that "the company needs to forecast the project's cash flows and discount them at the opportunity cost of capital to arrive at the project's NPV" (Chapter 07, p.143).

For a corporation, the opportunity cost of capital is calculated as the weighted average cost of capital (WACC) which is the average rate of return demanded by investors in the company's debt and equity. The opportunity cost of capital depends on risk and it is not equal to a borrowing rate.

Another noted study also supports the above assertion that the Crowe's analysis does not assume a correct discount rate. The study was carried out by the bipartisan Pennsylvania Transportation Funding and Reform Commission (PTFRC). Such study is unique in a sense that it identified the key limitations in a Morgan Stanley Report (2007) that looked at three scenarios of valuing the Pennsylvania Turnpike.

During the same time period when Governor Mitch Daniel was trying to garner political support for the Major Moves Initiative, Prof. Roger Skurski, University of Notre Dame analyzed the Crowe's analysis. His study has also been part of a court testimony. His stance is that the Crowe's analysis is using an over-estimated cost of capital estimate i.e. 6 percent versus 4.8 percent. He also argues that the Crowe's analysis makes very conservative estimate about the traffic growth. According to him, keeping the operating expense growth constant (5.10 percent), if the IFA's analysis assumes 4.42 percent versus 2.84 percent for toll rate growth and discount the cash flows by 4.80 percent versus 6 percent then for IFA, the value of the ITR would $11.38

billion. The key limitation of his analysis is that he assumed the cost of debt to be 4.8 percent which is lower than that of Crowe's. Skurski's testimony also ignores opportunity cost of capital issue.

Figure 16 Roger Skurski Analysis regarding ITR, 2006

	Toll Rate Growth 2011-2081	**Traffic Growth 2031-2081**	**Discount Rate 2007-2081**	**Operating Expense Growth 2006-2081**	**Toll Road Value NOV (billions)**
Crowe Chizek	2.84 percent	0.55 percent	6.00 percent	5.10 percent	$1.92
Crowe Replication: Table 1	2.84 percent	0.55 percent	6.00 percent	5.10 percent	$1.95
Crowe Adjusted: Table 1A	2.84 percent	0.55 percent	4.80 percent	5.10 percent	$4.12
Crowe Adjusted: Table 1B	2.84 percent	1.10 percent	4.80 percent	5.10 percent	$4.73
Crowe Adjusted: Table 2	4.42 percent	0.55 percent	6.00 percent	5.10 percent	$5.35
Crowe Adjusted: Table 2A	4.42 percent	1.10 percent	6.00 percent	5.10 percent	$6.11
Crowe Adjusted: Table 2B	4.42 percent	1.10 percent	4.80 percent	5.10 percent	$11.38

In the table above, 4.80 percent is based on a debt capacity analysis of Ryan Kitchell, Public Finance Director, Indiana Finance Authority (Critical evaluation of the Crowe's Analysis, 2007). Roger Skurski's testimony again misses the point about the opportunity cost of capital.

a) Enright (2007), in a study carried by the NW Financial Group highlights two drawbacks of the same Crowe's analysis conducted in 2006. These limitations are

a) Reduce operating expenses from 5.1 percent to 3.0 percent.
b) Reduce the costs of capital from 6 percent to 5.3 percent. It assumes 5.3 percent as the tax-exempt rate for IFA.

The above mentioned study again misses the key point regarding the opportunity cost of capital.

2.12. The Macquarie Financial Model – Indiana Toll Road

In the Macquarie financial model, the equity value of an investment is derived by discounting future cash flows to equity by an appropriate equity discount rate. The discount rate is calculated by adding a risk premium (6.0 percent) to a US risk-free rate (4.07 percent). The cash flows available to equity holders for toll road assets can be determined using a cash flow cascade as outlined in table below.

Table 11: Cash Flow Cascade (MIG Model)

Cash flow cascade	
	Revenue
-	Operating costs
=	Net operating cash flow (i.e. EBITDA)
-	Debt service obligations
-	Tax Payments
-	Capital expenditure
+	Debt drawings
=	Cash flow available to equity holders

Source: The MIG's Analyst Package 2006, p. 25

For the ITR, the Macquarie-Cintra consortium (the bidder) projected the toll road's revenues and expenditures for the period 2006 through 2081. Foote and Bell (2008) give details of the financial model utilized in determining the toll road value. To project the toll road's cash flows, the inputs include the term of the concession, a projection of gross toll revenues, operating costs and capital expenditures. In the

Macquarie model, the gross toll revenues are a function of future traffic volume and tolls as stated in the Indiana toll road concession and lease agreement (April 12, 2006) between the IFA and ITR concession company.

2.12.1. How can we calculate the cost of capital for the ITR?

Brealey, Myers, and Allen (2008) explain the steps involved in calculating the opportunity cost of capital, which is the rate of return the MIG would have gotten if it would have invested $3.8 billion in some other project of the same risk.

It is the sum of the risk-free rate (r_f) and a premium of risk ($r_m - r_f$) so for the ITR, the opportunity cost of capital would be r_m (2006) = r_f (2006) + beta * market risk premium ($r_m - r_f$). According to the Brattle Group, the beta of a toll road is 0.42. While calculating the above formula, the critical assumption is that there is a normal, stable risk premium on the market portfolio hence the expected future risk premium can be measured by the average past market risk premium.

2.12.3. Changes in accounting principles and MIG's Valuation Policy 2006

Until 30 June 2005, the MIG used Australian Generally Accepted Accounting Principles (AGAAP). After 30 June 2005, the MIG adopted International Financial Reporting Standards (IFRS). In view of IFRS accounting standards, the preparation of financial statements requires "the use of certain critical accounting estimates" (MIG financial statements, 2006). Such estimation is related to investments in financial assets. For example, in determining the interests in unlisted companies and trusts, the analysts use the discounted cash flow (DCF) analysis. According to the MIG's valuation policy 2006, MIG values its toll road investments using the DCF. MIG revalues its toll road investments every six months. These revaluations become part of the directors'

valuation which in turn, is used to calculate MIG's Net Asset Backing (NAB) per security unit. The change in NAB shows the change in the directors' valuation of each MIG stapled security. The table below explains how the MIG calculates the NAB.

Table 12: MIG Net Asset Backing Security Reconciliation

	NAB Reconciliation
	Portfolio Valuation (Directors valuation)
	Market value of non-concession investments at MIG Board valuation
Plus	Cash at balance date
Minus	Base and performance fees payable at balance date
Plus/Minus	Sundry debtors/creditors
Equal	Value of MIG Equity
Divide	No. of securities
Equal	Net Asset Backing

Source: The MIG's Valuation Policy 2006

The directors' valuation relates to determining the risk-premium for various toll roads. The MIG's accounting policy gives the directors' discretion to do so. They can carry out re-valuation of the asset in the same case. As shown in table below, a small change in risk premium brings about relatively greater change in the NAB value per security unit.

Figure 17: Net Asset Backing Security, 2008

Asset	30 June 2008 Risk premium	Risk premium Change (%)	30 June 2008 A$m	31 Dec 2007 A$m
407 ETR	4.25%	0.75%	3,295	3,770
M6 Toll	5.25%	0.75%	2,188	3,026
APRR	6.00%	-	982	1,079
Westlink M7	5.00%	-	802	776
Dulles Greenway	8.50%	1.50%	398	468
Indiana Toll Road	6.00%	-	344	355
Chicago Skyway	6.00%	0.50%	236	307
Lusoponte	4.00%	1.20%	188	236
South Bay Expressway	9.50%	2.50%	133	187
Warnow	7.00%	2.00%	2	3
Transtoll	n/a	-	2	1
Portfolio Risk Premium	**5.16%**	**0.63%**	-	**4.53%**
Portfolio valuation	-	-	**8,569**	**10,209**
Non-investment balances	-	-	897	1,121
Distribution (6 months)	-	-	(240)	(242)
Portfolio valuation	-	-	**9,226**	**11,088**
Net Asset Backing per security			**$3.84**	**$4.59**

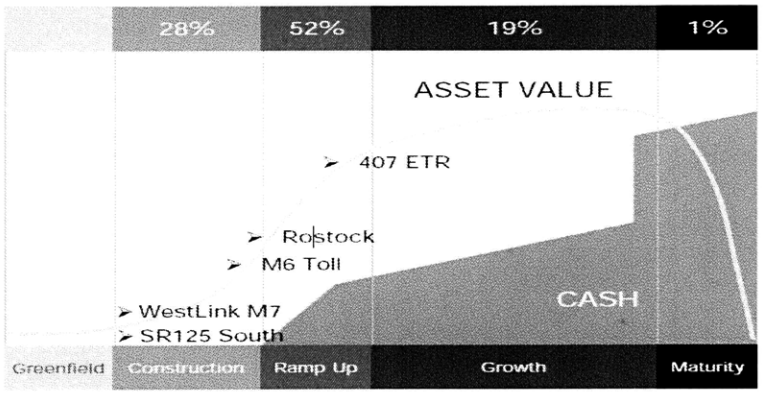
Source: The MIG's financial statements, 2008.

For the DCF, one important aspect is estimating the discount rate. The discount rate is calculated as the sum of risk free rate and a risk premium. Based on the Analyst's model (2006) and as shown in table above, it appears that the MIG does not use a constant market risk premium. According to the MIG's Analyst's Package (2006), "*the risk premium reflects the uncertainty associated with the cash flows*". These risk-premiums vary with the stage of development of the toll roads.

According to MIG's analyst's package, 2006, p.9, "The risk premium for each asset is individually determined by the Board and reflects the uncertainty associated with the road's cash flows".

Figure 18: The varying risk-premiums of the toll roads (a)and (b)

Asset	Stage in Toll Road Life Cycle	Risk Premium
Dulles Greenway	Ramp-up	7.50%
South Bay Expressway	Construction	7.50%
Chicago Skyway	Ramp-up	6.00%
Warnow Tunnel	Ramp-up	6.50%
Westlink M7	Ramp-up	5.50%
M6 Toll	Ramp-up	5.00%
407 ETR	Ramp-up	4.00%
Vasco de Gama Bridge	Ramp-up	3.00%
25th April Bridge	Growth	2.50%
APRR	Growth	18.00%
Indiana Toll Road	Ramp-up	7.80%



Source: The MIG Analyst's package 2006

As in later chapters, we will value the Chicago Skyway, for which the MIG assumes relatively smaller risk-premium than the average market risk-premium. The result is a higher asset value and thus higher quoted bid price.

2.13. Macquarie Infrastructure Group in 1996

MIG was formed to enable private investors to participate in the growth associated with infrastructure assets. According to the MIG's Advisory Deed (2009),

"MIG's principal investment policy is investment in infrastructure assets in OECD and OECD equivalent countries; and non-infrastructure assets where ancillary to a major infrastructure investment or acquisition. However MIG has a stated focus on toll road investments, both greenfield and mature."

The OECD stands for Organization for Economic Co-operation and Development.

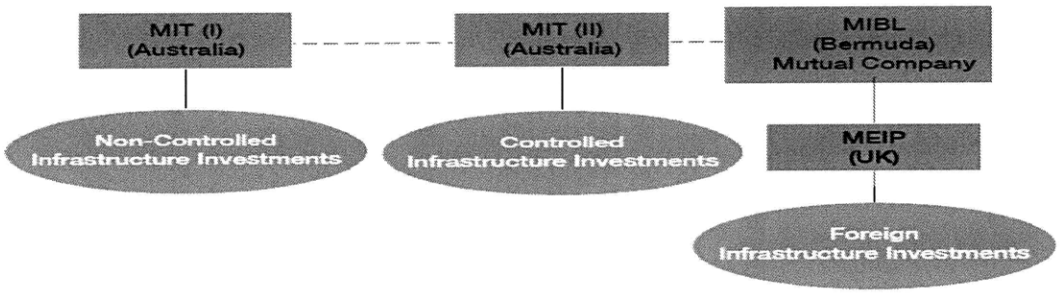
The Macquarie Bank created MIG in December 1996. In that year, MIG listed on the Australian Stock Exchange (ASX) at $1.00 per security unit, a stapled security. According to MIG Financial Report (2009), the MIG defines stapled securities as two or more investments that are quoted and traded as if they are a single instrument. The securities consisting of one or more investment vehicles managed by a third party are registered in Australia under the Managed Investment Acts and must trade together on the ASX. Prior to 21 September, 2000, MIG was a dual-stapled structure comprised of a unit in Macquarie Infrastructure Trust I (MIT (I)) and a unit in Macquarie Infrastructure Trust II MIT (II), with MEI plc being a wholly owned company of MIT (II). In 21 September 2000 MIG became a triple-stapled structure. It consists of a unit in MIT (I), a unit in MIT (II), and a share in Macquarie Infrastructure Group International Limited (MIGIL). For 2005-2006, MIG was a triple- stapled security. The two trusts, MIT (I) and MIT (II) are managed by Macquarie Infrastructure Investment Management Limited (MIIML). The MIIML is a wholly owned subsidiary of Macquarie Bank Limited (MBL).

The group has gone through a series of restructurings. It is important to provide a summary of such restructurings because they show how taxes play an important role for MIG. This fact has an indirect bearing on the valuation of the toll roads.

2.13.1. Restructuring of the Macquarie Infrastructure Group in 2005

Since its inception in 1996, the MIG in 12 January 2005 restructured its corporate structure. Under such corporate arrangement, the investors' shareholding in Macquarie European Infrastructure plc (MEIP) was replaced by shareholdings in Macquarie Infrastructure Bermuda Limited (MIBL). According to the details in Management Report (2005), the MIG proposed such restructuring to achieve three objectives. Firstly, such structure would enable the distribution of proceeds from the sale of Cintra. Cintra is a subsidiary of listed Spanish construction company, Ferrovial Group. Secondly, the restructuring would also enable more timely and efficient distributions from MIBL. Most importantly, Bermuda is a more appropriate holding company jurisdiction since it does not impose taxes on dividends and capital gains. Details are attached below:

Figure 19: The triple-stapled security in 2005-2006



Source: The MIG's presentation to Investors, "MIG Corporate Structure 2005"

Table 13: Tax Benefits entailed in new organization structure:

	UK	Bermuda
Receipt of Dividends	Underlying tax credits required, otherwise 30 percent UK tax	Tax Exempt
Payment of Dividends	Subject to corporate law distributable reserve restricts	Subject only to a solvency test
Capital Gains	UK Capital Gains Tax exemption may not apply	Tax Exempt
Australian Accruals taxation for Australian Investors	Exempt Foreign Investment Fund	Exempt Foreign Investment Fund

Source: The MIG presentation to the investors, 2006.

According to the MIG Management Report (2009), the market value (MV) of the funds is calculated as the volume weighted average (VWA) market capitalization over last 10 Australian stock exchange trading days of each quarter plus fund level borrowings and Index in any financial year firm commitments for future investments less cash or cash equivalents. If MIG index outperforms the Standard and Poor (S&P)/ASX 300 industrials Accumulation then according to the MIG Management Report (2009), the performance fee is payable.

According to the MIG's Advisory Deed (2009), the manager calculates base fee as follows:

a) 1.25 percent per annum of market value of the funds up to $3 billion and
b) And 1 percent per annum of market value of the funds in excess of $3 billion.

2.13.2 Key Developments in 2006

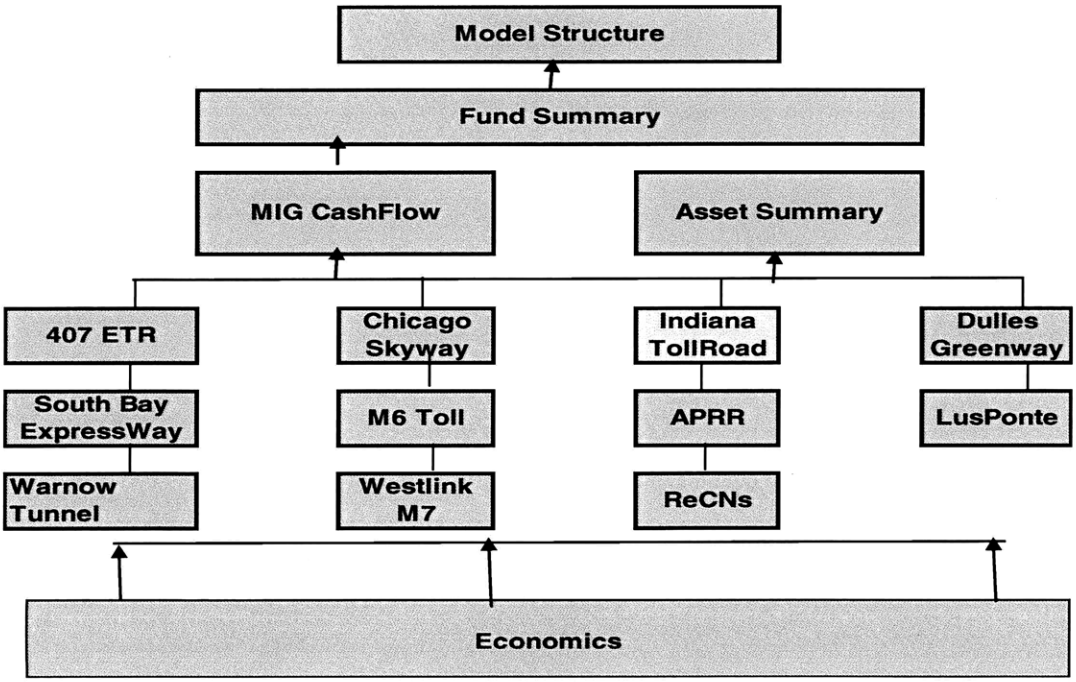
A series of deals took place during 2006. It may not be wrong to infer that through a series of such deals, MIG consolidated its position as one of leading toll road developers. The nature of such deals included refinancing and institutional placements. It is important to give a short summary of such deals, since the later chapters will attempt to value the ITR and the Chicago Skyway at the time when the sale took place i.e. in 2006. The summary of such events might help in investigating how the valuation of the two toll roads had been impacted if the investor were other than MIG.

On 17 August 2005, MIG announced the refinancing of debt for Chicago Skyway. Such financing structure provided an immediate return of US$168.2 million of cash to MIG. On 9 September 2005, MIG invested US $153.7 million to acquire the General Partner, Shenandoah Greenway Corporation. On 29 September 2005, MIG acquired a further 13.3 percent interest in Toll Road Investors Partnerships II, L.P. (TRIP II) from Kellogg, Brown, and Root (KBR) for US$ 84.5 million. On 1 September 2005, MIG raised A$667.5 million, net of transaction and underwriting costs from an institutional placement of 174.4 million MIG stapled securities. On 16 December 2005, MIG exercised its fixed price option to acquire an additional 5percent equity interest in Westlink M7 for A$47.4 million. During this time, MIG also had access to new non-recourse loans. These loans included US$ 150 million ED funding Trust (EDFT), M5 Holdings Funding Trust (M5FT) US$125 million, a term-debt facility $515 million etc. It is relevant to mention that the MIG did not invest much in the leasehold improvements during 2005-2006.

2.14. MIG's Analyst Package 2006

The Macquarie Model includes various sections: economics, valuation of toll road assets, the asset summary, and fund summary. The economics sheet includes information about key parameters such as consumer price index (CPI), floating interest rates, risk-free rates in respective countries etc. The asset summary provides information about operating cash flows and returns to equity regarding each toll road. Lastly, the fund summary provides consolidated operating cash flows of all toll roads.

Table 14: The MIG's Analyst Package, 2006



Source: The MIG's Analyst Package, 2006

In the above table, APRR refers to Autoroutes Paris-Rhin-Rhone and ReCNs refers to Reset Convertible Notes.

2.15. Summary

From above analysis, it becomes evident that the ITR was not facing any serious financial setback right before the lease took place in 2006. Most of the oft-cited prior literature does not correctly estimate the cost of capital.

CHAPTER 3

INDIANA TOLL ROAD – VARIOUS APPROACHES TO THE ITR VALUATION

In Chapter 2, I critically reviewed the various analyses employed to calculate the ITR's value from the concessionaire's viewpoint. From the previous chapter, it becomes evident that given the toll rates and the term of concession is 75 years for the ITR, there are two key drivers for the discounted cash flow (DCF) analysis. These variables include

a) The ITR's traffic volume in response to the given toll rates. The toll schedule is given in the ITR's concession agreement. It is the toll elasticity of demand.
b) The cost of capital.

Once the traffic forecast is set, then the cost of capital becomes the key driver in the DCF analysis. If we have the cost of capital determined then it will be interesting to see how the value of the same toll road changes when the ownership of the asset changes.

The purpose of this chapter is to analyze a couple of questions. First, if we are employing the discounted cash flow (DCF) valuation technique to determine the ITR's value, then how does the ITR's value change under various scenarios? When the IFA submitted the request for the toll road concessionaire proposals dated September 25, 2008, it stated the rationale for such deal, "*While the Toll Road is a significant source of stable cash flows to the State, the State considers that a private entity may be able to derive more economic value from the asset*" (The Indiana toll road concessionaire proposal, September 25, 2005).

For my thesis, I define the economic value of the ITR as the financial value of the toll road. To calculate the ITR's value, firstly I employ the net present value method (NPV) as the Macquarie Infrastructure Group (MIG) adopted such methodology in arriving at the ITR's value. I use the cash flow (CF) stream in the Macquarie financial model. Brealey, Myers and Allen (2009) mention four steps of such procedure:

a) Forecast after-tax CFs, assuming all-equity financing. When we analyze the project as if it were all equity-financed, it means that all CFs as coming from the stakeholders and all cash inflows as going to them.
b) Assess the project's risk.
c) Estimate the opportunity cost of capital.
d) Calculate the NPV using the opportunity cost of capital.

It is important to mention that the value of the cost of capital changes under each approach. In the previous chapter, I identified the way by which we can calculate the cost of capital by using the capital asset pricing model (CAPM). The equation is given by

CAPM = risk free rate at 2006 (r_f) + β * (market risk premium)

Where the risk free rate r_f is = 4.52 percent, β = 0.42 (the Brattle Group, Inc. 2009) and the market risk premium for the ITR is given by 7.6 percent. For the calculation, I assumed the values of such variables at the time of the transaction, 2006. I have calculated the opportunity cost of capital using the above equation.

For the discounted cash flow (DCF) analysis, I analyze the following scenarios:

a) **Scenario 1**: The IFA keeps the toll road by itself. I assume the same toll agreement schedule for the IFA as for the concessionaire.
b) **Scenario 2**: The IFA sells the toll road to a private operator (the MIG). Being a private operator, the MIG has to pay both federal and state taxes. To determine the value of such scenario, I consider three cases: firstly I determine the value of the toll road using the after-tax WACC. It is inclusive of interest-tax shields. For such analysis, I am assuming that the concessionaire is rebalancing the debt to value ratio continuously. Secondly, I argue that the adjusted present value (APV) method is a better way to calculate the value than NPV based on WACC. I also show APV results using the risk neutral valuation and Monte Carlo Simulation.
c) **Scenario 3**: The State of Indiana finances the purchase of the toll road with tax-exempt debt. For such scenario, I assume that the purchase value of the toll road is $3.956 billion, the bid price which the MIG paid for the ITR.
d) **Scenarios 4 and 5**: I define efficiency as in Geltner and Moavenzadeh (1987). The MIG is more efficient if it can reduce operating expenditures or increase toll revenues.

3.1. Assumptions of the Macquarie Financial Model

Before I calculate the ITR's value under each approach, I will mention the key assumptions about barrier and ticket systems under the Macquarie financial model. The key assumptions include, for the barrier system

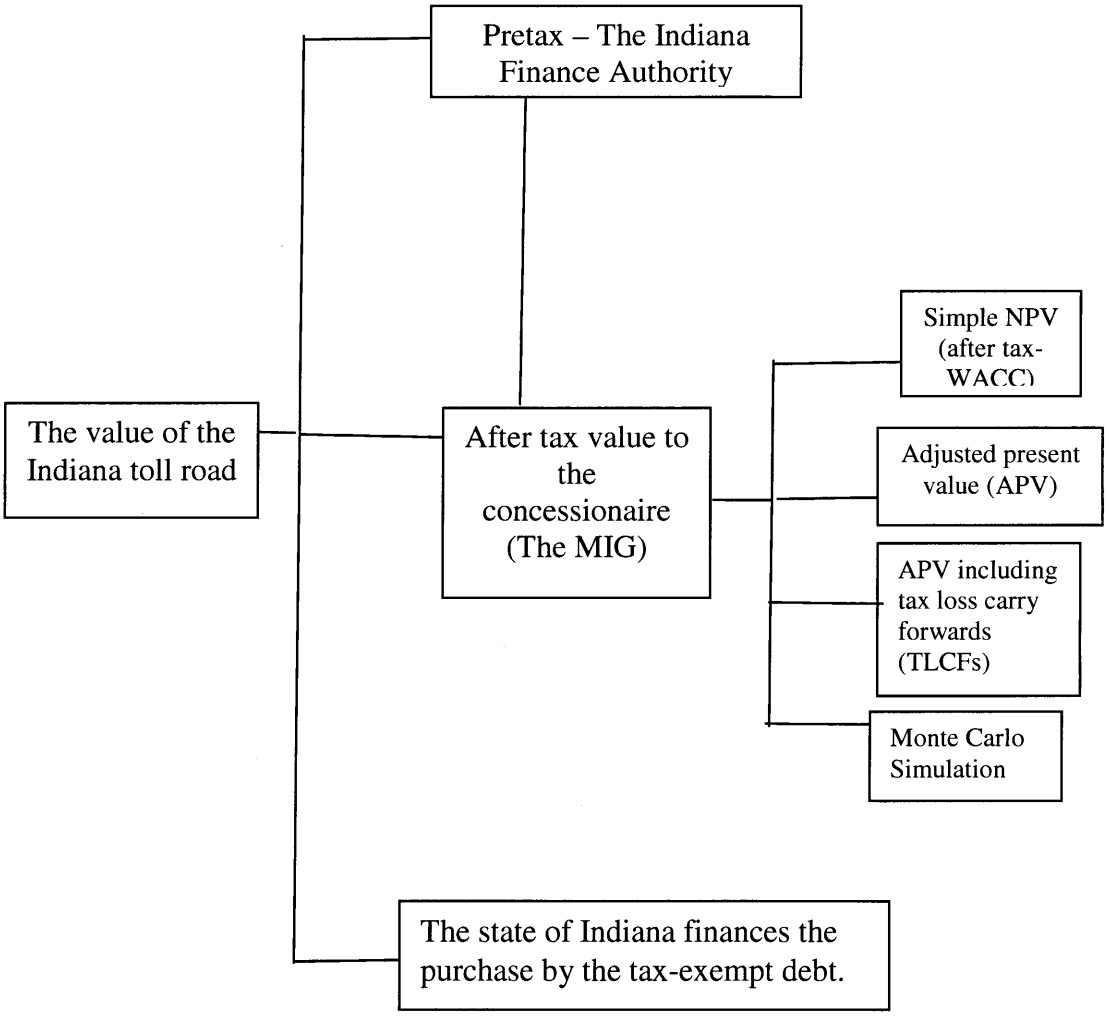
a) The traffic growth is 2 percent.
b) The traffic mix is 80 percent/20 percent, the proportion of the cars and trucks. In view of the changing economic conditions, such assumptions need to be flexible, however.

For the ticket system, that the assumptions are

a) The traffic mix is 80 percent/20 percent.

In 2006, when the MIG prepared the financial model, it assumed the US nominal GDP rate to be 4 percent. In view of the present weak economic conditions, this percentage is liable to change. Before proceeding to calculating the value of the toll road, I present my approach of calculating the toll road value in form of a conceptual diagram.

Figure 20: Various Approaches to value the Indiana toll road



3.2. Discounted Cash Flow (DCF)

For the ITR's analysis, I will use the cash flows prepared by the MIG. The impetus for such deals is that the private operator can derive more financial value from the toll road operations as compared to the IFA, the public entity. One interesting way to approach such problem is to see how the ITR's value changes when the ownership of the toll road changes. Such analysis will provide answers to following questions:

a) Is the ITR of greater financial value when the Indiana Finance Authority keeps the toll road by itself?
b) When the state leases the toll road to a private operator, the taxes are triggered. The calculated value of the toll road will represent the ITR's value to the MIG.

By comparing the above two scenarios (a) and (b), we will be able to determine whether the ITR's value is greater when the IFA keeps the toll road by itself or when the MIG acquires and operates the toll road for 75 years.

Scenario 3 refers to the scenario when the IFA decides to utilize its tax-exempt debt to finance the purchase of the toll road. The MIG financed the ITR's purchase by taxable debt. Such scenario is telling us what the state of Indiana is giving up by losing the advantage of being able to borrow at the tax-exempt rate.

The ITR's management 2008 claimed that under its operations, the toll road had started operating more efficiently with at decreased operating expenses and higher toll revenues. Scenarios 4 and 5 analyze by what percentage the MIG has to raise the toll revenues so that the toll road becomes financially valuable. So that the financial value of the toll road to the IFA given that we assume the same toll increases according to the ITR's management is $3.956 billion. Similarly by what percentage the MIG has to reduce the operating expenditures so that for the MIG, the value of the toll road also becomes $3.956 billion. I will summarize the five scenarios for the ITR's valuation at the end of the section.

3.2.1. The value of the Indiana toll road (ITR) in MM's world (no taxes):

Such scenario is applicable to the IFA/INDOT if they operate the toll road using the toll rates mechanism as stipulated in the concession agreement. The IFA being a public entity does not have to pay either state or federal taxes. Such scenario resembles the perfect world of Modigliani Miller (MM) where the financing does not matter. MM's proposition 1 says that the value of the ITR does not depend how the ITR assets are financed.

Balance sheet (Market value) - ITR

Assets	Liabilities
ITR (present value of after-tax cash flows)	Debt
	Equity
Total assets	Total value

Under such scenario, we can calculate the toll road's value by discounting the free cash flows (FCF) using the unlevered cost of capital. We can calculate the FCFs as:

Free cash flow (FCF) = Total revenues – total operating expenditures - depreciation – capital expenditure (CAPEX) + depreciation.

In absence of taxes, we determine the cost of capital r_a by using the capital asset pricing model (CAPM),

$$r_a = r_f + \beta(r_m - r_f)$$

$r_a = 4.52 + 0.42 * 7.6 = 7.7$ percent

And $(r_m - r_f)$ = market risk- premium. The long-run average risk premium at the time of the transaction is 7.6 percent which I use in my calculations below (see Brealey, Myers and Allen, 2008).

Table 15: Value of the ITR to IFA

Cash Flows (In millions)	2006-2015	2016-2025	2026-2035	2036-2045	2046-2055	2056-2065	2066-2075	2076-2081	Total Gross Cash Flows
Revenues	2,325	4,159	6,680	10,735	17,244	27,713	44,514	34,840	151,483
Operating Expenditures	877	1,437	2,354	3,857	6,321	10,357	16,972	12,197	56,929
Operating Profit	1,482	2,758	4,363	6,917	10,964	17,398	27,587	22,666	94,858
Capex	0	0	0	0	0	0	0	0	2
Depreciation	34	36	38	39	41	43	45	28	304
FCF	1,516	2,793	4,401	6,956	11,005	17,441	27,632	22,694	95,160

NPV@ 7.7 percent = $3.956 billion

Such is the toll road's value to the IFA given the toll increases as stipulated in the concession agreement. Since the IFA does not have to pay taxes hence we regard the $3.956 billion as the pretax value of the ITR.

3.2.2. Normal Net Present Value (NPV) – After tax WACC

The after-tax weighted average cost of capital is

After-tax $WACC = r_d * (1 - T_c) * \frac{D}{V} + r_e * \frac{E}{V}$

These are the values of the variables at the time the transaction took place in 2006.

ITR's financing arrangement (a)

Sources	US$
Bank Debt	3278 (81 percent)
Equity	770 (19 percent)
Total	

ITR's financing arrangement (b)

Uses	US$
Purchase Price	3850 or 95.1 percent
Reserves	100 or 2.5 percent
Other Costs	98.6 or 2.4 percent
Total	4048

r_e = The cost of equity

r_d = The cost of debt

r_a = the return on assets

r_f = The risk free rate

$WACC$ = Weighted average cost of capital

Debt (D) = the market value of debt

Equity (E) = the market value of equity

$$r_e = r_a + (r_a - r_d) * \frac{D}{E}$$

$$r_e = 7.74 + (7.74 - 6.7) * \frac{3.3}{0.78}$$

$r_e = 12.14$ Percent

After-tax WACC=6.70 * (1-0.40) * 0.80+12.14 * 0.20 =6 percent

The after-tax cost of debt captures the interest tax shields. The cost of debt (r_d) is the market interest rate on its existing debt and on any new borrowing. The cost of equity (r_e) is the expected rate of return demanded by investors for ITR. The above formula assumes that the concessionaire, the MIG is constantly rebalancing its debt. Under such scenario, I will calculate the ITR's value using the after-tax WACC. This value is after tax, but includes interest tax shields.

Brealey, Myers and Allen (2008) explain that when we consider taxes, the debt policy becomes relevant. For the ITR's analysis, taxes constitute an important factor. Other capital structure determinants such as information or incentive problems do not matter for the ITR. When the IFA sells the asset to the MIG, the pie gets divided. There is a third slice, the government's. The expanded balance sheet (in market values) becomes as explained below:

Expanded Balance Sheet (ITR)

Expanded Balance Sheet (ITR) – The Government's Slice	
Pretax Indiana toll road value (PV of pretax cash flows)	Debt
	Equity
	The government's claim (the present value of future taxes).
Total pretax assets	Total pretax value

Anything that the concessionaire can do to reduce the size of the government's liability will make the stockholders better off. One way to achieve such objective is to borrow money, since the interest is tax deductible. Hence by doing so, the concessionaire will reduce its tax bill.

For the ITR's analysis, we have assumed the permanent debt in the MIG's deal i.e. ($3.28 billion) for 75 years. Brealey, Myers and Allen (2009) mention the downside of this assumption. The firm's ability to carry the debt changes over time as the profits and firm value changes. The firm cannot use the interest tax shields unless there will be future profits to shield and there always remains great uncertainty about the firm's future profitability.

Addressing the discussion under Scenario 2, when the IFA sells the asset to the MIG (2009) then taxes are triggered. The MIG has to pay both the federal and the state taxes, equal to 40percent. When the project uses debt, the interest that the company pays is a tax deductible expense and the tax shields become valuable. The after-tax value of the project goes up by the present value of tax shields. The magnitude of the tax shields depends on two factors: the corporate tax rate (T_c) and the ability of the ITR's project to earn enough to cover interest payments.

For such scenario, the after-tax WACC calculated above no longer is the correct approach to calculate the cost of capital of the toll road. It is because certain assumptions do not hold, then the after-tax WACC fails to give an accurate estimate such as in the project ITR since it does not have the same risk or capital structure as the MIG has. For such scenario, Brealey, Myers, Allen (2009) recommend that the adjusted present value (APV) is the correct approach of computing net present value (NPV), rather than after-tax WACC.

Brealey, Myers and Allen explain such method as "*Once the base-case value is set, then each financing side effect is traced out, and the present value of its cost or benefit to the firm is calculated. Finally, all the present values are added together to*

*estimate the project's total contribution to the value of the firm". (*Brealey, Myers, Allen, 2008, p. 546)

Value of the ITR project = After-tax value of the all equity-financed project + the present value (PV) of tax shields.

I have assumed the cost of debt $r_d = 6.7$ percent. It is the yield on the Baa corporate utility bond yield at the time the transaction took place (2006). I assume that the PV of the all-equity financed project is represented by the PV (2). Let PV (2) be the after-tax value of the all equity-financed project. Then, the APV equation becomes APV = PV (2) + PV of taxes saved by deducting $r_d D_t$ at r_d = 6.7 percent. The PV (2) = $ 2.350 billion, the value of an all-equity financed project being discounted at the opportunity cost of capital while the present value of tax shields is $1.322 billion. The value of the asset comes out to be $ 3.77 billion. As the taxes are triggered, despite the increases in the toll rates and the traffic volumes, the value of the toll road goes down by $0.186 billion. It turns out that interest tax shields affect almost all of the ITR's tax liabilities.

Cash Flows (In millions)	**2006-2015**	**2016-2025**	**2026-2035**	**2036-2045**	**2046-2055**	**2056-2065**	**2066-2075**	**2076-2081**	**Total Gross Cash Flows**
Revenues	2,325	4,159	6,680	10,735	17,244	27,713	44,514	34,840	151,483
Operating Expenditures	877	1,437	2,354	3,857	6,321	10,357	16,972	12,197	56,929
Operating Profit	1,482	2,758	4,363	6,917	10,964	17,398	27,587	22,671	94,858
CAPEX	0	0	0	0	0	0	0	0	2
Taxes	579	1,089	1,730	2,751	4,369	6,942	11,017	9,057	36,221
Depreciation	34	36	38	39	41	43	45	28	304
FCF	936	1,705	2,670	4,205	6,636	10,499	16,615	13,641	57,338

NPV @ 6 percent = $ 3.77 billion

3.2.3. Simple Adjusted Present value (APV)

Under the standard normal APV procedure, we move towards simpler adjusted present value (APV). Unlike the WACC calculation assumed that the debt will be maintained at a constant, we do not have to keep debt at a constant proportion of value. The toll road value is $3.73 billion.

APV Components	Total ($ billion)
PV (2)	2.410
PV of tax shields	1.322
	3.732

Under above approach, while calculating the tax shields, I do not take into account TLCFs.

3.2.4. Adjusted Present value (APV) with tax loss carry forwards (TLCFs)

The toll road value is $3.54 billion. The results are reported in Appendix 1. It is at the end of the chapter.

3.2.5. Monte Carlo Simulation

It is a more sophisticated way of calculating APV with tax loss carry forwards (TLCFs). For such analysis, the two scenarios include

a) The pretax value of the ITR
b) And when taxes are triggered.

One way to investigate the project financing of the ITR is by using the Monte Carlo Simulation. Due to the path–dependent nature of such particular investment, and the complication of some underlying variables, it is useful to use simulation in order to generate a probability distribution of possible outcomes. The scenarios include

a) Pretax value of ITR
b) When taxes are triggered

3.2.6. Risk Neutral Valuation

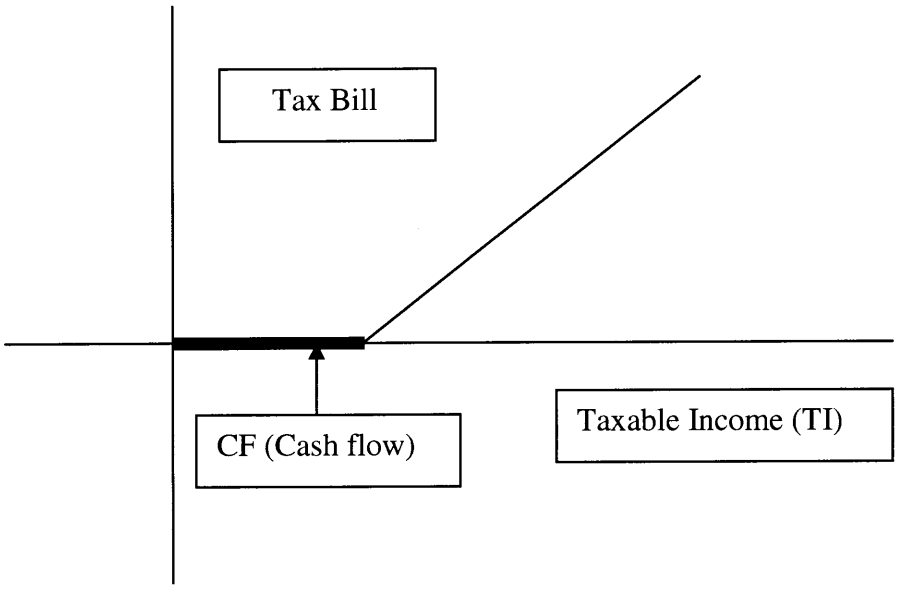
The toll road's value in pretax scenario is $3.95 billion. The detail is in Appendix 02.

3.2.6.1. Monte Carlo Simulation

In Table 1, I model risky corporate investment under a system of the tax carry forwards of operating losses. The earlier analytical and empirical studies suggest that treatment of such losses is important for investment. For setting up the simulation, I define the project's tax bill as

a) It pays positive taxes only if taxable income exceeds its total stock of carry forwards.
b) It pays zero taxes if taxable income is positive and less than its total stock of carry forwards.

Figure 21: Firm with tax loss carry forward (TLCF)



In 1985 and 1987, Myers and Majd investigated the impact of tax asymmetries. The tax asymmetries refer to the lack of full loss offsets. They modeled the government's tax claim on the firm's pretax cash flows as a series of path-dependent call options. In their paper, they explained the method of valuing such call options by the option pricing procedures and the Monte Carlo Simulation. Such analysis becomes important in for the ITR's analysis where we are dealing with a stand-alone project.

Under the certainty equivalent method (CEQ), the model specification can be listed down as:

Figure 22: Specification of the model

Specification of the model		
1	Revenues	Simulated for both types of traffic – barrier and ticket systems.
2	Operating expenditures (Opex)	Fixed costs (FC), Variable costs (VC) = A* traffic volume where A is a certain percentage
3	Operating income	
4	Taxable income	=(3)-depreciation-interest
5	Tax [t = 40 percent]	
6	FCF (Available to both debt holders and equity holders)	=(3)-(5) +depreciation

For running such simulation, we need to address two questions:

a) What is the direction due to the tax asymmetry, magnitude?
b) How the answers change if the change is up or down or how the debt policy changes?

In light of Myers and Majd (1985) paper, the null hypothesis is that as the variance increases, the present value of taxes ought to increase. As we look at the table below, we get the same results for the ITR. We regard ITR as a stand-alone project.

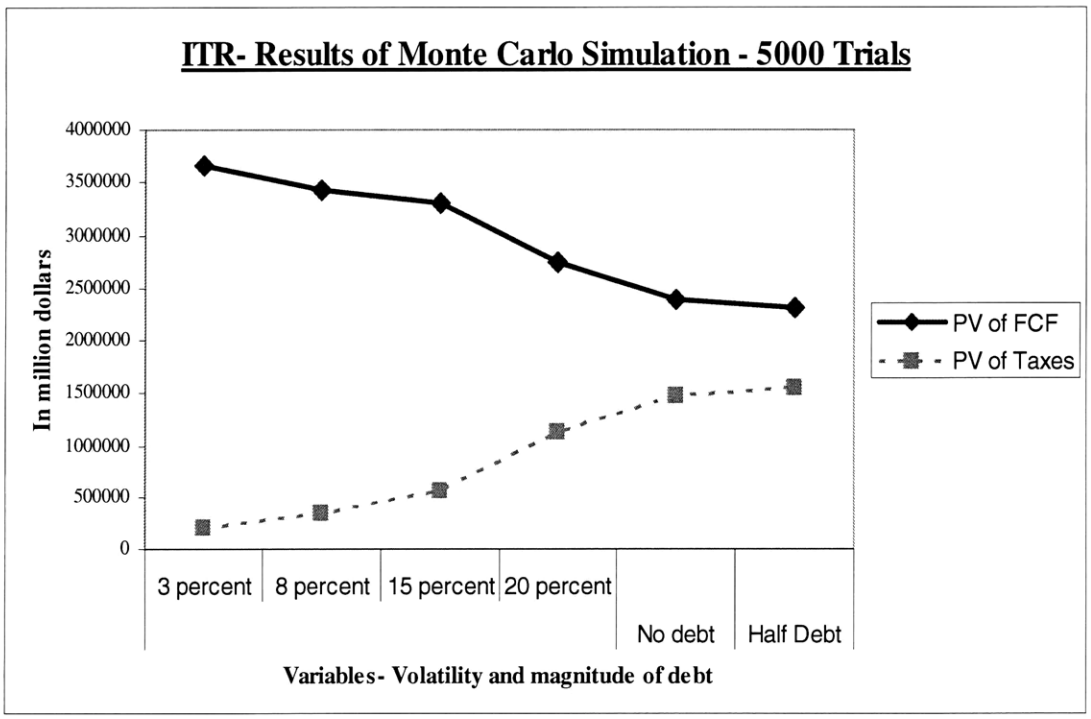
($ thousands)

Figure 23: ITR Monte Carlo Simulation Results 5000 trials

ITR- Results of Monte Carlo Simulation – 5000 trials						
	3 percent	8 percent	15 percent	20 percent	**No debt**	**Half Debt**
PV of FCF	3657814	3431460	3302927	2736663	2387094	2313759
PV of Taxes	207294	343639	562181	1128445	1478014	1551349

From above table, we can calculate the value of interest tax shields:

1478014-207294 = 1270720 or $ 1.27 billion.



3.2.6.2. Scenario 03: When the state of Indiana finances the purchase of toll road with the tax-exempt debt

Under such scenario, I will calculate by how much value the State of Indiana could have achieved by retaining the ITR and fully utilizing its debt capacity by issuing tax-exempt debt. For such scenario, I use 4.45 percent as the tax-exempt rate. This rate is the interest rate for BBB bonds in 2006. The maturity of such bonds is 20 years. Since the term of the concession is 75 years hence I am using the bond rate with longer maturity. The below NPV calculation explains how much this opportunity is worth. As explained in table below, the opportunity is worth $ 1.217 billion.

Cost of tax-exempt debt=4.45 percent

The pretax value of the toll road is $ 3.956 billion. This is the value of the toll road to IFA. I assume that the IFA can borrow against 80 percent of the toll road value hence it comes out to be $ 3.956 * 0.80 = $ 3.165 billion. For such option, the debt advantage comes out to be $ 1.217 billion. As we add the pretax value of the toll road to the above calculated value, the value of ITR comes out to be $ 5.173 billion.

Table 16 - Calculating the debt advantage of $1.217 billion

									$ Thousands
	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Debt	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408
Interest	0	140861	140861	140861	140861	140861	140861	140861	140861
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Debt	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408
Interest	140861	140861	140861	140861	140861	140861	140861	140861	140861
	2024	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Debt	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408
Interest	140861	140861	140861	140861	140861	140861	140861	140861	140861
	2033	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Debt	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408
Interest	140861	140861	140861	140861	140861	140861	140861	140861	140861
	2042	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**
Debt	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408
Interest	140861	140861	140861	140861	140861	140861	140861	140861	140861
	2051	**2052**	**2053**	**2054**	**2055**	**2056**	**2057**	**2058**	**2059**
Debt	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408
Interest	140861	140861	140861	140861	140861	140861	140861	140861	140861
	2060	**2061**	**2062**	**2063**	**2064**	**2065**	**2066**	**2067**	**2068**
Debt	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408	3165408
Interest	140861	140861	140861	140861	140861	140861	140861	140861	140861
	2069	**2070**	**2071**	**2072**	**2073**	**2074**	**2075**	**2076**	**2077**
Debt	3165408	3165408	2848867	2532326	2215786	1899245	1582704	1266163	949622.4
Interest	140861	140861	140861	126775	112689	98602	84516	70430	56344
	2078	**2079**	**2080**	**2081**					
Debt	633081.6	316540.8	0						
Interest	42258	28172	14086						

When we discount the interest payment stream at 6.7 percent then the debt advantage comes out to be $ 1.217 billion. So the total value of ITR comes out to be $ 5.173 billion.

3.2.6.3. Scenario 4 – When the operator becomes more efficient by lowering the operating expenditures

The operating expenditures are reduced by thirty percent.

Cash Flows (In millions)	2006-2015	2016-2025	2026-2035	2036-2045	2046-2055	2056-2065	2066-2075	2076-2081	Total Gross Cash Flows
Revenues	2,325	4,159	6,680	10,735	17,244	27,713	44,514	34,840	151,483
Operating Expenditures	616	1,009	1,654	2,710	4,440	7,276	11,922	8,568	40,073
Operating Profit	1,743	3,185	5,064	8,065	12,845	20,480	32,637	26,295	111,713
CAPEX	0	0	0	0	0	0	0	0	2
Taxes	684	1,260	2,010	3,210	5,121	8,175	13,037	10,507	44,563
Depreciation	34	36	38	39	41	43	45	28	304
FCF	1,093	1,961	3,091	4,894	7,764	12,348	19,645	15,816	66,692

3.2.6.4. Scenario 5 – When the operator becomes more efficient by levying higher tolls

In case, the private operator can charge higher tolls, i.e. eleven percent.

Cash Flows (In millions)	2006-2015	2016-2025	2026-2035	2036-2045	2046-2055	2056-2065	2066-2075	2076-2081	Total Gross Cash Flows
Revenues	2,578	4,611	7,406	11,903	19,119	30,726	49,355	38,629	171,176
Operating Expenditures	877	1,437	2,354	3,857	6,321	10,357	16,972	12,197	56,928
Operating Profit	1,735	3,210	5,090	8,085	12,840	20,412	32,428	26,460	110,259
CAPEX	0	0	0	0	0	0	0	0	2
Taxes	680	1,270	2,021	3,218	5,119	8,148	12,953	10,573	**45,699**
Depreciation	34	36	38	39	41	43	45	28	304
FCF	1,088	1,976	3,106	4,906	7,761	12,307	19,520	15,915	66,579

($ Thousand)

Table 17: Comparison of various scenarios

Scenarios		Value of the toll road (In billion dollars)	Weighted average cost of capital (WACC)	The variables (in the Free Cash Flow)			
				Total Revenues	Total Operating Expenditues	Total Operating Profit	Taxes
In the absence of Taxes	The value of the Indiana toll road to the IFA (the public entity)	3.956	7.7 percent	151,483,341	56,928,576	94,858,419	
When the taxes are triggered.	Normal NPV - After-tax WACC	3.771	6 percent	151,483,341	56,928,576	94,858,419	36,221,985
	Normal APV	3.732	Cost of equity - 7.7 percent, the cost of debt=6.78 percent	151,483,341	56,928,576	94,858,419	37,821,906
	Normal APV with TLCFs	3.541	Cost of equity - 7.7 percent, the cost of debt=6.78 percent	151,483,341	56,928,576	94,858,419	37,821,906
If the State of Indiana finances the tollroad via tax-exempt debt.The value of the toll road is reduced to		5.173	The cost of debt is the tax-exempt debt worth 4.45 percent.				
In the case, the private operator can be more efficient	By APV (TLCFs)- (The operating expenditures are reduced by 30 percent)	3.956	Cost of equity - 7.7 percent, the cost of debt=6.78 percent	151,483,341	40,073,459	111,713,536	44,563,953
	By MonteCarlo Simulation -(The operating expenditures are reduced by 11.2 percent)		risk-free rate 4.52 percent				
In the case, the private operator can charge higher tolls.	By APV (TLCFs)- (The private operator has to increase tolls by 11 percent)	3.956	Cost of equity - 7.7 percent, the cost of debt=6.78 percent	171,176,176	56,928,576	109,703,546	45,699,040
	By MonteCarlo Simulation -(The private operator has to increase tolls by 6.2 percent)		risk-free rate 4.52 percent				

APPENDICES

Appendix 1

Tax rate	0.4
1-Tax rate	0.6

3280000	1	3280000000 2	3280000 3	4	5
	2,006	**2,007**	**2,008**	**2,009**	**2,010**
In Thousands					
Debt	3280000	3280000	3280000	3280000	3280000
Interest	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**
Cost of debt	**0.0665**				
Tax rate	**0.40**				
TcD	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**
Scenario: With Taxes					
Total Revenues	77208	150993	191959	217069	241038
Total Operating Expenditures	69500	73018	76715	80599	84679
Total Operating Expenditures(w/o Dep.)	66183	69683	73361	77227	81289
Operating Profit	11025	81310	118598	139842	159749
Tax (40%)	4410	32524	47439	55937	63900
Interest	218120	218120	218120	218120	218120
Net Income [Operating Income-Interest]	-207095	-136810	-99522	-78278	-58371
Tax	0	0	0	0	0
Tax Indiana is actually paying					
Tax Loss Carry forward	-207095	-343905	-443428	-521705	-580076
Interest tax shield	4410	32524	47439	55937	63900
	87248	87248	87248	87248	87248
From the view of Macquarie Bank	**1132704**				
Interest tax shield/Interest	2.02%	14.91%	21.75%	25.65%	29.30%
Capex (Additions)	280	0	23	23	23
Taxes Paid(Tax rate 35%+4%-1%)=38% Inclusive of depreciation tax shield	3083	31190	46098	54588	62544
Add back depreciation	3317	3336	3354	3372	3390
FCF	10979	53456	75831	88603	100572

	interest tax shield as fraction of amount of debt less than 40 percent				
	TcD	Long life	30 percent		
APV	1	2	3	4	5
The Income	6615	48786	71159	83905	95849
Principal payments	172404	311691	333293	356394	381095
Potential Interest Payment	142610	227910	205692	181875	156344
	137461.18	219506.55	197903.62	174803.43	150102.18

6	7	8	9	10	11	12	13	14	15
2,011	**2,012**	**2,013**	**2,014**	**2,015**	**2,016**	**2,017**	**2,018**	**2,019**	**2,020**
3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000
218,120	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**
1,312,000	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**
262400	275836	288508	302513	317203	333445	348764	365693	383451	403086
88966	93470	98202	103173	108396	113884	119649	125706	132070	138756
85558	90044	94758	99711	104916	110386	116133	122172	128518	135186
176842	185792	193750	202802	212287	223059	232631	243521	254933	267900
70737	74317	77500	81121	84915	89224	93052	97408	101973	107160
218120	218120	218120	218120	218120	218120	218120	218120	218120	218120
-41278	-32328	-24370	-15318	-5833	4939	14511	25401	36813	49780
0	0	0	0	0	1976	5804	10160	14725	19912
					0	0	0	0	0
-621354	-653682	-678052	-693370	-699203	-694264	-679753	-654352	-617539	-567759
70737	74317	77500	81121	84915	89224	93052	97408	101973	107160
87248	87248	87248	87248	87248	87248	87248	87248	87248	87248
32.43%	34.07%	35.53%	37.19%	38.93%	40.91%	42.66%	44.66%	46.75%	49.13%
23	23	23	23	23	23	23	23	23	23
69374	72946	76123	79736	83523	87824	91646	95995	100552	105732
3408	3426	3444	3462	3480	3498	3516	3534	3552	3571
110854	116249	121049	126505	132222	138711	144479	151038	157911	165716

16	17	18	19	20	21	22	23	24	25	26
2,021	**2,022**	**2,023**	**2,024**	**2,025**	**2,026**	**2,027**	**2,028**	**2,029**	**2,030**	**2,031**
3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000
218,120	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**
						10,706	**4,282**			
1,312,000	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**
421604	442069	463536	487271	509656	534396	560346	589038	616099	646006	677376
145781	153161	160915	169061	177620	186612	196059	205985	216413	227369	238879
142192	149554	157290	165418	173959	182933	192362	202269	212679	223617	235110
279411	292515	306246	321852	335697	351463	367984	386769	403420	422389	442266
111765	117006	122498	128741	134279	140585	147194	154708	161368	168955	176906
218120	218120	218120	218120	218120	218120	218120	218120	218120	218120	218120
61291	74395	88126	103732	117577	133343	149864	168649	185300	204269	224146
24517	29758	35250	41493	47031	53337	59946	67460	74120	81707	89658
0	0	0	0	0	4282	59946				
-506468	-432073	-343947	-240215	-122637	0	0				
111765	117006	122498	128741	134279	136303	87248	87248	87248	87248	87248
87248	87248	87248	87248	87248	87248	87248	87248	87248	87248	87248
51.24%	53.64%	56.16%	59.02%	61.56%	62.49%	40.00%	40.00%	40.00%	40.00%	40.00%
23	23	23	23	23	23	23	23	23	23	23
110329	115563	121048	127284	132815	139114	145715	153221	159875	167455	175399
3589	3607	3625	3643	3661	3679	3697	3715	3733	3751	3769
172648	180536	188800	198189	206521	216006	225944	237240	247256	258662	270614

27	28	29	30	31	32	33	34	35	36	37
2,032	**2,033**	**2,034**	**2,035**	**2,036**	**2,037**	**2,038**	**2,039**	**2,040**	**2,041**	**2,042**
3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000
218,120	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**
1,312,000	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**
712060	744773	780925	818847	860775	900320	944023	989865	1040550	1088354	1141184
250972	263678	277026	291051	305785	321266	337530	354617	372570	391431	411247
247185	259872	273203	287209	301926	317388	333634	350703	368638	387481	407279
464875	484900	507723	531638	558850	582932	610389	639162	671912	700873	733905
185950	193960	203089	212655	223540	233173	244156	255665	268765	280349	293562
218120	218120	218120	218120	218120	218120	218120	218120	218120	218120	218120
246755	266780	289603	313518	340730	364812	392269	421042	453792	482753	515785
98702	106712	115841	125407	136292	145925	156908	168417	181517	193101	206314
87248	87248	87248	87248	87248	87248	87248	87248	87248	87248	87248
87248	87248	87248	87248	87248	87248	87248	87248	87248	87248	87248
40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%	40.00%
23	23	23	23	23	23	23	23	23	23	23
184435	192438	201560	211118	221996	231622	242597	254099	267192	278769	291975
3788	3806	3824	3842	3860	3878	3896	3914	3932	3950	3968
284205	296246	309964	324339	340691	355166	371665	388954	408630	426031	445876
278925	290940	304634	318983	335310	349759	366234	383497	403147	420524	440343

38	39	40	41	42	43	44	45	46	47	48
2,043	**2,044**	**2,045**	**2,046**	**2,047**	**2,048**	**2,049**	**2,050**	**2,051**	**2,052**	**2,053**
3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000
218,120	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**
1,312,000	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**
1196600	1257871	1315658	1379523	1446513	1520580	1590436	1667639	1748620	1838156	1922602
432067	453940	476921	501065	526431	553082	581082	610499	641406	673877	707992
428080	449936	472898	497024	522373	549005	576987	606386	637274	669728	703824
768520	807935	842760	882499	924140	971575	1013449	1061253	1111345	1168429	1218778
307408	323174	337104	352999	369656	388630	405380	424501	444538	467371	487511
218120	218120	218120	218120	218120	218120	218120	218120	218120	218120	218120
550400	589815	624640	664379	706020	753455	795329	843133	893225	950309	1000658
220160	235926	249856	265751	282408	301382	318132	337253	357290	380123	400263
87248	87248	87248	87248	87248	87248	87248	87248	87248	87248	87248
87248	87248	87248	87248	87248	87248	87248	87248	87248	87248	87248
40.00%	40.00%	40.00%	40.00%	2.66%	2.66%	2.66%	2.66%	2.66%	2.66%	2.66%
23	23	23	23	23	23	23	23	23	23	23
305813	321572	335495	351383	368033	386999	403742	422856	442886	465712	485844
3986	4004	4023	4041	4059	4077	4095	4113	4131	4149	4167
466670	490345	511265	535134	560144	588630	613780	642487	672568	706843	737078

49	50	51	52	53	54	55	56	57	58	59
2,054	**2,055**	**2,056**	**2,057**	**2,058**	**2,059**	**2,060**	**2,061**	**2,062**	**2,063**	**2,064**
3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000	3280000
218,120	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**
1,312,000	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**
2015929	2113823	2222059	2324142	2436960	2555299	2686140	2809543	2945924	3088978	3247146
743834	781490	821053	862619	906289	952170	1000374	1051018	1104225	1160127	1218858
739648	777287	816832	858380	902032	947894	996080	1046706	1099895	1155779	1214492
1276281	1336536	1405227	1465762	1534928	1607404	1690060	1762838	1846029	1933199	2032654
510512	534614	562091	586805	613971	642962	676024	705135	738411	773280	813062
218120	218120	218120	218120	218120	218120	218120	218120	218120	218120	218120
1058161	1118416	1187107	1247642	1316808	1389284	1471940	1544718	1627909	1715079	1814534
423264	447366	474843	499057	526723	555714	588776	617887	651163	686032	725814
87248	87248	87248	87248	87248	87248	87248	87248	87248	87248	87248
87248	87248	87248	87248	87248	87248	87248	87248	87248	87248	87248
2.66%	2.66%	2.66%	2.66%	2.66%	2.66%	2.66%	2.66%	2.66%	2.66%	2.66%
23	23	23	23	23	23	23	23	23	23	23
508838	532933	560402	584609	612268	641251	674307	703410	736679	771541	811315
4185	4203	4221	4240	4258	4276	4294	4312	4330	4348	4366
771605	807783	849024	885370	926895	970406	1020025	1063716	1113656	1165984	1225682

60	61	62	63	64	65	66	67	68	69	70
2,065	**2,066**	**2,067**	**2,068**	**2,069**	**2,070**	**2,071**	**2,072**	**2,073**	**2,074**	**2,075**
3280000	3280000	3280000	3280000	3280000	3280000	**172,404**	**311,691**	**333,293**	**356,394**	**381,095**
						142,610	**227,910**	**205,692**	**181,875**	**156,344**
218,120	**218,120**	**218,120**	**218,120**	**218,120**	**218,120**	**142,610**	**227,910**	**205,692**	**181,875**	**156,344**
						315,014	**539,600**	**538,985**	**538,269**	**537,439**
1,312,000	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**1,312,000**	**68,962**	**124,676**	**133,317**	**142,557**	**152,438**
3396322	3561186	3734117	3925319	4105651	4304947	4513995	4745130	4963124	5204044	5456753
1280563	1345391	1413502	1485060	1560242	1639229	1722215	1809402	1901003	1997241	2098351
1276179	1340989	1409082	1480622	1555785	1634754	1717722	1804891	1896474	1992694	2093786
2120143	2220197	2325036	2444697	2549866	2670193	2796273	2940239	3066650	3211350	3362966
848057	888079	930014	977879	1019946	1068077	1118509	1176096	1226660	1284540	1345186
218120	218120	218120	218120	218120	218120	142610	227910	205692	181875	156344
1902023	2002077	2106916	2226577	2331746	2452073	2653663	2712329	2860958	3029475	3206622
760809	800831	842766	890631	932698	980829	1061465	1084932	1144383	1211790	1282649
87248	87248	87248	87248	87248	87248	57044	91164	82277	72750	62538
87248	87248	87248	87248	87248	87248	57044	91164	82277	72750	62538
2.66%	2.66%	2.66%	2.66%	2.66%	2.66%	33.09%	29.25%	24.69%	20.41%	16.41%
23	23	23	23	23	23	23	23	23	23	23
846304	886318	928246	976104	1018164	1066287	1116712	1174291	1224849	1282721	1343360
4384	4402	4420	4438	4456	4475	4493	4511	4529	4547	4565
1278201	1338259	1401187	1473010	1536136	1608358	1684031	1770436	1846308	1933153	2024148

71	72	73	74	75	76	
2,076	**2,077**	**2,078**	**2,079**	**2,080**	**2,081**	**Total**
407,508	**435,752**	**465,954**	**498,248**	**217,662**	**-**	
128,976	**99,638**	**68,189**	**34,476**	**3,844**	**-**	
128,976	**99,638**	**68,189**	**34,476**	**3,844**		
536,484	**535,390**	**534,142**	**532,724**	**221,505**		
163,003	**174,301**	**186,381**	**199,299**	**87,065**	**-**	
5736160	5999683	6290919	6596406	6934169	3282956	#########
2204580	2316187	2433444	2556637	2686067	0	54371346
2199997	2311586	2428825	2552000	2681412	-4673	54067693
3536163	3688097	3862094	4044406	4252757	3287630	94141573
1414465	1475239	1544838	1617763	1701103	1315052	37656629
128976	99638	68189	34476	3844	0	
3407187	3588459	3793906	4009931	4248914	3287630	
1362875	1435384	1517562	1603972	1699565	1315052	
51590	39855	27275	13790	1537	0	
51590	39855	27275	13790	1537	0	
12.66%	9.15%	5.85%	2.77%	0.71%		
23	23	23	23	23	23	1952
1412632	1473398	1542990	1615908	1699241	1313182	37535168
4583	4601	4619	4637	4655	4673	303653
2128091	2219277	2323701	2433113	2558149	1979098	56908106

Monte Carlo Simulation

I assume that the traffic volume follows a geometric Brownian motion. I can define such procedure as

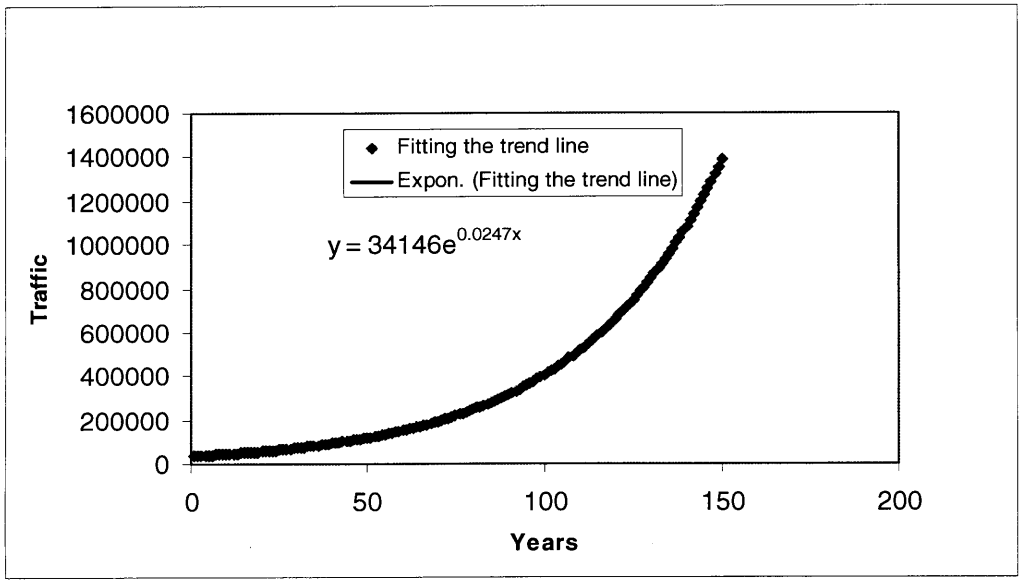
$volume_{(t+1)} = vol_t * (1 + drift) * (1 + \tilde{\chi}_{(t+1)} * volatility)$ Where we are assuming that volatility = 3 percent, drift = 1 percent so volume (t+1) becomes

$volume_{(1)} = 100 * (1 + 0.01) * (1 + (-0.1713 * 0.03)$ Where we assume that $vol_0 = 100$.

The simulation works as follows:

The output per iteration = FCF_{t+1}. For each period t, we project the mean simulated FCF $_t$. We discount FCF_t at the risk free rate 4.52 percent. I assume the volatility is 3 percent.

Figure 24: Fitting the trend line



Through the careful inspection of ITR documents and the Macquarie financial model, I have set up a simple model to represent the possible cash flows over the 75 years concession period. This portion of the chapter details the setup of such model and it further explains the incorporation of the model into the Monte Carlo simulation. The Monte Carlo Simulation is a better way of calculating the APV.

Under the DCF analysis, a clear need is established for a more sophisticated valuation model in order to accurately estimate the value of interest tax shields. The analysis below explains that the Monte Carlo Simulation is presented as a very viable solution. Such type of sensitivity analysis would be of particular interest to the investors who are faced with the challenge of trying to evaluate the potential cash flows of a similar type of investment.

According to the MIG's financing experience, the debt was incurred in the initial period of the investment and it was paid off annually through the ten years. The interest payments were a fixed percentage of the remaining principal each year. An important consideration is the determination of tax that the concessionaire has to pay over the concession period. The above problem can be explained in three equations:

a) If $4 <= 0, (5) = 0, (5A) = (5A)_{(t-1)} + (4)$

b) If $4 > 0$, and $(4) < -(5A)_{t-1}$, $(5) = 0$, and $(5A) = (5A)_{t-1} - (4)$

c) If $(4) > 0$, and $(4) >= (-(5A)_{t-1})$, $(5) = 0$, $\text{tax} = 0.40 * ((4) - (5A_{t-1}))$

Where the (4) = taxable income, 5 = tax, and 5A = Tax loss carry forward (TLCF)

The above specified conditions demonstrate the challenging issue of path – dependence. The concessionaire would pay the tax if and only if the above conditions would be satisfied. The future tax stream is directly dependent on all previous cash flows. The project model focuses on the NPV of the pretax value of the project as well

as the PV of the taxes in the post-tax scenario. For such analysis, I look at two main input values: the variance of cash flows and the magnitude of the firm's debt

The simulations were rerun with each of these quantities varied. For such case, the Monte Carlo Simulation enables us to more accurately determine the value of interest tax shields, once the taxes are triggered. Since the stream of future cash flows relies directly on knowledge of all prior cash flows hence the path dependence is difficult to value because certain criteria are evaluated with each forthcoming cash flow. Such evaluation directly involves the series of the previous cash flows. At each point in time, the criteria determine whether or not the series is continued based on the current cash flow, as well as the previous stream of cash flows. A critical aspect of the project is that it establishes a path- dependent investment opportunity. In general, the use of Monte Carlo Simulation provides the means to avoid difficulties that would arise in a complicated setting.

Structure and Input Variables:

Before running the Monte Carlo Simulation, the project model was set up to portray the series of cash flows extending from year zero to seventy-five years. Each cash flow node is a simple estimation of revenue minus fixed costs. I have assumed the risk free rate to be 4.52 percent indicating the safe return of a US treasury bond. The standard deviation represents the degree of uncertainty of cash flows. Initially, the standard deviation was set up at 3 percent. I assume that the cash flows follow a Geometric Brownian (GB) motion (we also call it the random walk). The mathematical form for the GB motion is

$dS = \mu S dt + \sigma S dz$ Where S is the stock price, μ is the expected return on the stock, σ is the volatility of the stock price, and dz is the basic Wiener process. We assume the drift rate to be 1 percent per annum and the volatility is assumed to be 3 percent.

Appendix 2

Risk Neutral Method

The pretax value of the ITR is $3.956 billion.

Risk free rate = 4.52 percent

CEQ refers to the certainty equivalent ratio = $(1+0.0452)^t / (1+0.078)^t$

Cash flows (CFs) @ 4.52 percent = $3.956 billion

Table continued

$ Thousands

	1	2	3	4	5	6	7
	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Volume	70865	144073	183232	207211	229786	250601	263464
Concession Revenues	5634	6146	7752	8757	9995	10480	10990
Other Revenues	709	773	975	1102	1257	1318	1382
Revenue	77208	150993	191959	217069	241038	262400	275836
Certainty equivalent revenues	**74858**	**141944**	**174965**	**191832**	**206533**	**217996**	**222185**
Fixed Costs	35000	36772	38633	40589	42644	44803	47071
Variable Costs	34500	36247	38082	40009	42035	44163	46399
Costs	69500	73018	76715	80599	84679	88966	93470
Costs w/o depreciation	66183	69683	73361	77227	81289	85558	90044
Costs	**64169**	**65507**	**66867**	**68248**	**69652**	**71080**	**72530**
CAPEX	280	0	23	23	23	23	23
	271	0	21	20	19	19	18
Depreciation	3317	3336	3354	3372	3390	3408	3426
	3217	3136	3057	2980	2905	2831	2760
FCF	**13626**	**79573**	**111132**	**126541**	**139762**	**149725**	**152392**
CEQ	**0.970**	**0.940**	**0.911**	**0.884**	**0.857**	**0.831**	**0.805**

	8	9	10	11	12	13	14
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Volume	275536	288911	302940	318489	333082	349250	366210
Concession Revenues	11523	12082	12669	13285	13929	14606	15315
Other Revenues	1449	1520	1594	1671	1752	1837	1926
Revenue	288508	302513	317203	333445	348764	365693	383451
Certainty equivalent revenues	**225322**	**229071**	**232886**	**237362**	**240713**	**244718**	**248794**
Fixed Costs	49454	51958	54588	57352	60255	63305	66510
Variable Costs	48748	51215	53808	56532	59394	62401	65560
Costs	98202	103173	108396	113884	119649	125706	132070
Costs w/o depreciation	94758	99711	104916	110386	116133	122172	128518
Costs	**74005**	**75504**	**77028**	**78578**	**80154**	**81756**	**83386**
CAPEX	23	23	23	23	23	23	23
	18	17	17	16	16	15	15
Depreciation	3444	3462	3480	3498	3516	3534	3552
	2690	2622	2555	2490	2427	2365	2305
FCF	**153984**	**156166**	**158391**	**161252**	**162963**	**165304**	**167690**
CEQ	0.781	0.757	0.734	0.712	0.690	0.669	0.649

	15	16	17	18	19	20	21
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Volume	385006	402647	422192	442693	465415	486740	510367
Concession Revenues	16059	16839	17656	18514	19414	20355	21344
Other Revenues	2020	2118	2221	2329	2442	2560	2685
Revenue	403086	421604	442069	463536	487271	509656	534396
Certainty equivalent revenues	**253575**	**257155**	**261433**	**265788**	**270896**	**274720**	**279291**
Fixed Costs	69877	73415	77131	81036	85139	89449	93977
Variable Costs	68879	72366	76030	79879	83922	88171	92635
Costs	138756	145781	153161	160915	169061	177620	186612
Costs w/o depreciation	135186	142192	149554	157290	165418	173959	182933
Costs	**85043**	**86729**	**88444**	**90189**	**91964**	**93769**	**95606**
CAPEX	23	23	23	23	23	23	23
	14	14	13	13	13	12	12
Depreciation	3571	3589	3607	3625	3643	3661	3679
	2246	2189	2133	2078	2025	1973	1923
FCF	**170755**	**172592**	**175099**	**177655**	**180935**	**182902**	**185585**
CEQ	0.629	0.610	0.591	0.573	0.556	0.539	0.523

	22	23	24	25	26	27	28
	2027	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**
Volume	535151	562618	588397	616959	646918	680122	711285
Concession Revenues	22380	23468	24607	25802	27055	28369	29746
Other Revenues	2815	2952	3095	3245	3403	3568	3742
Revenue	560346	589038	616099	646006	677376	712060	744773
Certainty equivalent revenues	**283943**	**289400**	**293485**	**298368**	**303338**	**309168**	**313532**
Fixed Costs	98735	103733	108985	114502	120299	126389	132787
Variable Costs	97324	102251	107428	112866	118580	124583	130890
Costs	196059	205985	216413	227369	238879	250972	263678
Costs w/o depreciation	192362	202269	212679	223617	235110	247185	259872
Costs	**97475**	**99377**	**101312**	**103281**	**105285**	**107325**	**109400**
CAPEX	23	23	23	23	23	23	23
	11	11	11	10	10	10	10
Depreciation	3697	3715	3733	3751	3769	3788	3806
	1873	1825	1778	1733	1688	1644	1602
FCF	**188318**	**191826**	**193929**	**196797**	**199718**	**203465**	**205711**
CEQ	0.507	0.491	0.476	0.462	0.448	0.434	0.421

	29	30	31	32	33	34	35
	2034	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Volume	745812	782028	822167	859838	901576	945356	993878
Concession Revenues	31190	32705	34294	35958	37705	39536	41457
Other Revenues	3923	4114	4314	4523	4743	4973	5215
Revenue	780925	818847	860775	900320	944023	989865	1040550
Certainty equivalent revenues	**318748**	**324057**	**330286**	**334948**	**340521**	**346193**	**352846**
Fixed Costs	139510	146572	153993	161789	169979	178584	187625
Variable Costs	137517	144479	151793	159477	167551	176033	184945
Costs	277026	291051	305785	321266	337530	354617	372570
Costs w/o depreciation	273203	287209	301926	317388	333634	350703	368638
Costs	**111513**	**113663**	**115851**	**118078**	**120346**	**122654**	**125003**
CAPEX	23	23	23	23	23	23	23
	9	9	9	8	8	8	8
Depreciation	3824	3842	3860	3878	3896	3914	3932
	1561	1520	1481	1443	1405	1369	1333
FCF	**208774**	**211893**	**215893**	**218290**	**221558**	**224885**	**229153**
CEQ	0.408	0.396	0.384	0.372	0.361	0.350	0.339

	36	37	38	39	40	41	42
	2041	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**
Volume	1039417	1089872	1142796	1201452	1256502	1317494	1381471
Concession Revenues	43468	45579	47793	50115	52547	55099	57774
Other Revenues	5468	5733	6012	6304	6610	6931	7267
Revenue	1088354	1141184	1196600	1257871	1315658	1379523	1446513
Certainty equivalent revenues	**357827**	**363781**	**369840**	**376948**	**382269**	**388629**	**395102**
Fixed Costs	197124	207103	217588	228603	240176	252335	265109
Variable Costs	194308	204144	214479	225337	236745	248730	261322
Costs	391431	411247	432067	453940	476921	501065	526431
Costs w/o depreciation	387481	407279	428080	449936	472898	497024	522373
Costs	**127395**	**129830**	**132309**	**134833**	**137402**	**140018**	**142681**
CAPEX	23	23	23	23	23	23	23
	7	7	7	7	7	6	6
Depreciation	3950	3968	3986	4004	4023	4041	4059
	1299	1265	1232	1200	1169	1138	1109
FCF	**231708**	**235193**	**238740**	**243292**	**246013**	**249727**	**253507**
CEQ	0.329	0.319	0.309	0.300	0.291	0.282	0.273

	43	44	45	46	47	48	49
	2048	**2049**	**2050**	**2051**	**2052**	**2053**	**2054**
Volume	1452378	1518925	1592655	1669994	1755710	1836155	1925284
Concession Revenues	60582	63521	66606	69840	73235	76788	80517
Other Revenues	7620	7990	8378	8785	9212	9659	10128
Revenue	1520580	1590436	1667639	1748620	1838156	1922602	2015929
Certainty equivalent revenues	**402696**	**408380**	**415175**	**422090**	**430202**	**436275**	**443534**
Fixed Costs	278530	292631	307446	323010	339362	356543	374593
Variable Costs	274551	288451	303053	318396	334514	351449	369241
Costs	553082	581082	610499	641406	673877	707992	743834
Costs w/o depreciation	549005	576987	606386	637274	669728	703824	739648
Costs	**145393**	**148154**	**150966**	**153828**	**156743**	**159711**	**162733**
CAPEX	23	23	23	23	23	23	23
	6	6	6	5	5	5	5
Depreciation	4077	4095	4113	4131	4149	4167	4185
	1080	1051	1024	997	971	946	921
FCF	**258359**	**261255**	**265210**	**269236**	**274408**	**277487**	**281699**
CEQ	0.265	0.257	0.249	0.241	0.234	0.227	0.220

	50	51	52	53	54	55	56
	2055	**2056**	**2057**	**2058**	**2059**	**2060**	**2061**
Volume	2018776	2122393	2219640	2327384	2440402	2565659	2683216
Concession Revenues	84427	88530	92825	97333	102059	107020	112212
Other Revenues	10620	11136	11676	12243	12838	13462	14115
Revenue	2113823	2222059	2324142	2436960	2555299	2686140	2809543
Certainty equivalent revenues	**450921**	**459588**	**466075**	**473830**	**481722**	**490980**	**497911**
Fixed Costs	393556	413480	434413	456405	479510	503785	529289
Variable Costs	387934	407573	428207	449885	472660	496588	521728
Costs	781490	821053	862619	906289	952170	1000374	1051018
Costs w/o depreciation	777287	816832	858380	902032	947894	996080	1046706
Costs	**165811**	**168945**	**172136**	**175386**	**178696**	**182066**	**185499**
CAPEX	23	23	23	23	23	23	23
	5	5	5	4	4	4	4
Depreciation	4203	4221	4240	4258	4276	4294	4312
	897	873	850	828	806	785	764
FCF	**285984**	**291493**	**294766**	**299249**	**303809**	**309676**	**313154**
CEQ	0.213	0.207	0.201	0.194	0.189	0.183	0.177

	57	58	59	60	61	62	63
	2062	**2063**	**2064**	**2065**	**2066**	**2067**	**2068**
Volume	2813463	2950084	3101502	3243612	3401060	3566216	3749258
Concession Revenues	117661	123375	129371	135648	142235	149142	156390
Other Revenues	14800	15519	16273	17063	17891	18760	19672
Revenue	2945924	3088978	3247146	3396322	3561186	3734117	3925319
Certainty equivalent revenues	**506195**	**514626**	**524517**	**531921**	**540771**	**549778**	**560345**
Fixed Costs	556085	584237	613813	644888	677535	711835	747872
Variable Costs	548141	575890	605045	635675	667856	701666	737188
Costs	1104225	1160127	1218858	1280563	1345391	1413502	1485060
Costs w/o depreciation	1099895	1155779	1214492	1276179	1340989	1409082	1480622
Costs	**188994**	**192554**	**196179**	**199871**	**203631**	**207461**	**211361**
CAPEX	23	23	23	23	23	23	23
	4	4	4	4	3	3	3
Depreciation	4330	4348	4366	4384	4402	4420	4438
	744	724	705	687	668	651	634
FCF	**317923**	**322774**	**329021**	**332714**	**337786**	**342946**	**349595**
CEQ	0.172	0.167	0.162	0.157	0.152	0.147	0.143

	64	65	66	67	68	69	70
	2069	**2070**	**2071**	**2072**	**2073**	**2074**	**2075**
Volume	3921047	4111378	4311027	4532298	4739965	4970048	5211394
Concession Revenues	163978	171941	180290	189053	198225	207851	217944
Other Revenues	20626	21628	22678	23780	24934	26145	27414
Revenue	4105651	4304947	4513995	4745130	4963124	5204044	5456753
Certainty equivalent revenues	**568255**	**577709**	**587332**	**598620**	**607070**	**617170**	**627450**
Fixed Costs	785733	825511	867302	911210	957340	1005805	1056724
Variable Costs	774508	813718	854912	898192	943663	991436	1041628
Costs	1560242	1639229	1722215	1809402	1901003	1997241	2098351
Costs w/o depreciation	1555785	1634754	1717722	1804891	1896474	1992694	2093786
Costs	**215333**	**219379**	**223499**	**227695**	**231969**	**236322**	**240756**
CAPEX	23	23	23	23	23	23	23
	3	3	3	3	3	3	3
Depreciation	4456	4475	4493	4511	4529	4547	4565
	617	600	585	569	554	539	525
FCF	**353516**	**358909**	**364395**	**371471**	**375632**	**381365**	**387196**
CEQ	0.138	0.134	0.130	0.126	0.122	0.119	0.115

	71	72	73	74	75	76
	2076	**2077**	**2078**	**2079**	**2080**	**2081**
Volume	5478877	5729916	6008053	6299804	6623152	3282956
Concession Revenues	228537	239625	251261	263463	276267	0
Other Revenues	28747	30142	31605	33140	34751	0
Revenue	5736160	5999683	6290919	6596406	6934169	3282956
Certainty equivalent revenues	**639509**	**648536**	**659327**	**670309**	**683191**	**313613**
Fixed Costs	1110220	1166425	1225476	1287515	1352696	0
Variable Costs	1094360	1149762	1207969	1269122	1333372	0
Costs	2204580	2316187	2433444	2556637	2686067	0
Costs w/o depreciation	2199997	2311586	2428825	2552000	2681412	(4673)
Costs	**245272**	**249871**	**254556**	**259327**	**264187**	**(446)**
CAPEX	23	23	23	23	23	23
	3	2	2	2	2	2
Depreciation	4583	4601	4619	4637	4655	4673
	511	497	484	471	459	446
FCF	**394726**	**399140**	**405233**	**411430**	**419441**	**314483**
CEQ	0.111	0.108	0.105	0.102	0.099	0.096

CHAPTER 4

THE LONG-TERM LEASE OF THE CHICAGO SKYWAY

In light of the ITR's analysis, I will evaluate the financial aspects of the Chicago Skyway transaction based on following questions:

1. What was the financial performance of the toll road operations before the long-term lease (Jan, 2005)? What measures did the City of Chicago employ to measure the toll road performance? Was the asset facing some serious financial setback at the time of transaction? If no, then why did the City of Chicago still privatize the toll road?
2. What did the Macquarie Infrastructure Group (MIG) assume about the cost of capital for valuing the toll road operations? I will analyze this question in light of the actual Macquarie financial model.
3. What did the earlier published studies assume about the weighted average cost of capital (WACC) of the concessionaire? Did they make the correct assumptions?

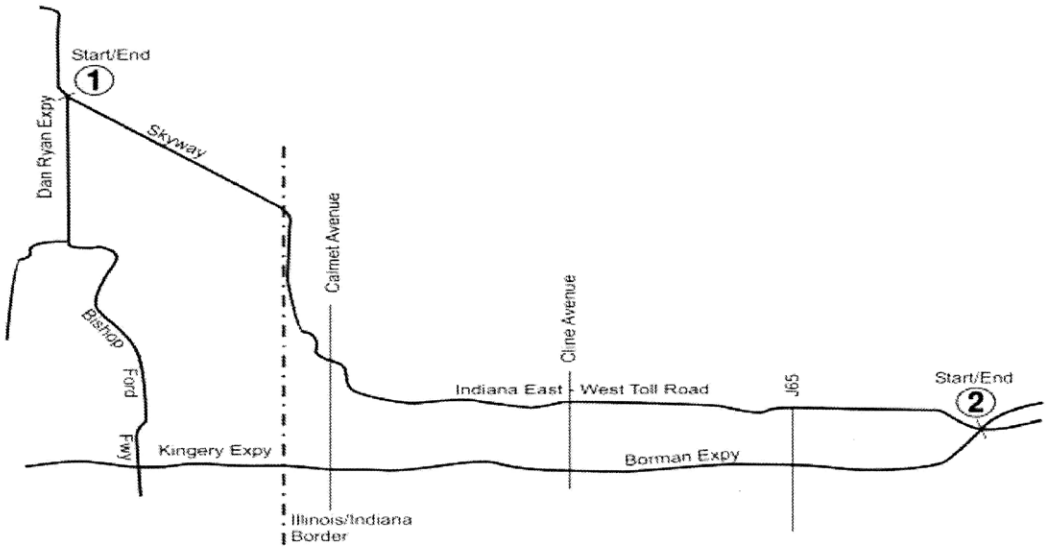
In light of above questions, I have organized the chapter as follows:

Section 1 describes the toll road operations before the lease in detail. It discusses whether the Chicago Skyway toll road operations were facing some serious financial setback before the lease. It explains the ownership structure up to the lease period. Section 2 gives details about the toll road's performance in the post-lease period. Section 3 critically evaluates some of the oft-cited earlier analyses of the Chicago Skyway valuation. Section 4 concludes the chapter.

4.1. Section 1: Description of the toll road

The Chicago Skyway is a 7.8 mile, six-lane divided toll bridge facility. It links Interstate Route 90 from the Illinois-Indiana state line near 106th Street, over the Calumet River, and into the junction with the Dan Ryan Expressway (Interstate Route 94) near 63rd Street. Like the ITR, the Skyway features a barrier system of toll collection. According to the CAFR report (2004), there are eight active toll collection lanes in each direction. The construction of the Skyway was financed with the proceeds of bonds. It commenced its toll road operations in 1958. The Skyway road configuration is :

Figure 25: Chicago Skyway road configuration



Source: The MIG's presentation to investors, 2005, p. 6

4.1.1 Key statistics before the lease

In light of the financial statements and the MIG's presentations to the investors (2005 and 2006), this section discusses the vehicle traffic (volume), the seasonality of the traffic, etc. Based on the ten-year period (1995-2004), the vehicle traffic in volume was experiencing an increase.

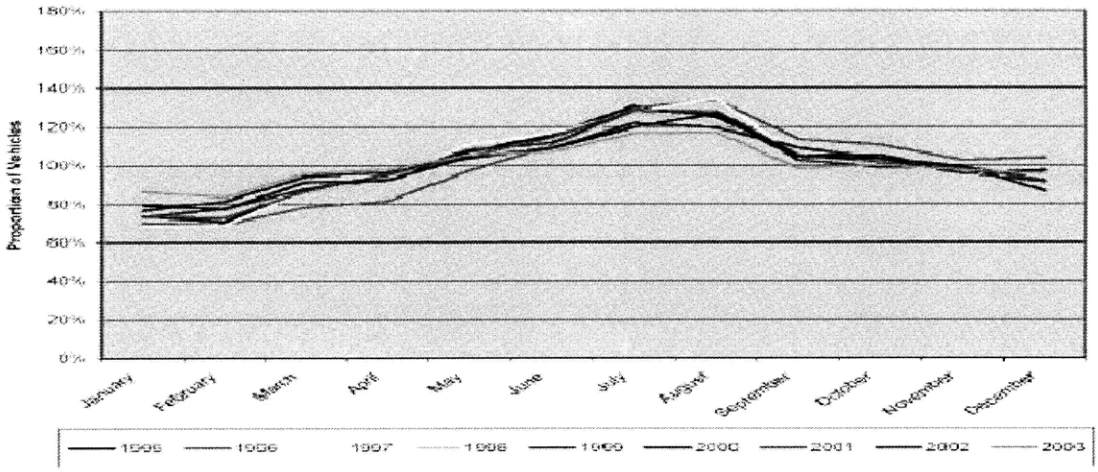
Table 18: Vehicle Traffic (in millions)

	2-Axles		3-Axles or More		Total Vehicles	
Volume in Thousands- Unaudited						
Year	**Volume**	**Percent Change From Prior Year**	**Volume**	**Percent Change From Prior Year**	**Volume**	**Percent Change From Prior Year**
1995	9628	7%	1099	7%	10727	7%
1996	10625	10%	1187	8%	11812	10%
1997	13075	23%	1628	37%	14703	24%
1998	13947	7%	1703	5%	15650	6%
1999	14537	4%	1782	5%	16319	4%
2000	14821	2%	1695	-5%	16516	1%
2001	16908	14%	1809	7%	18717	13%
2002	17106	1%	1605	-11%	18711	0%
2003	16046	-6%	1376	-14%	17422	-7%
2004	15642	-3%	1753	27%	17395	0%
Annual Annual Percent Change						
1995-2004		5.5%		5.3%		5.5%
1999-2004		1.5		-0.3		1.3

Source: The Chicago Skyway Financial statements, 1994 - 2005.

According to the 2002/2003 statistics, the nature of the traffic is seasonal. There is relatively strong traffic on weekends (see MIG's presentation to investors, 2004).

Figure 26: The seasonal nature of traffic (Chicago Skyway)



Source: The MIG's Presentation to investors, 2005

Over the years, it appears that the traffic is stronger during the second half of the calendar year. Seasonally, the traffic peak occurs in July/August.

Table 19: Chicago Skyway - Toll revenues upto the lease period (2005)

Year	2-Axles	Percent Change From Prior Year	3-Axles or More	Percent Change From Prior Year	Gross Revenues	Commercial Discount	Total Vehicles Revenues	Percent Change From Prior Year
Revenues in Thousands- Unaudited								
1995	18843	7%	6615	7%	25458	62	25396	7%
1996	20812	10%	7154	8%	27966	62	27904	10%
1997	25597	23%	9810	37%	35407	76	35331	27%
1998	27284	7%	10293	5%	37577	87	37490	6%
1999	29192	7%	10115	-2%	39307	93	39214	5%
2000	29641	2%	9619	-5%	39260	84	39176	0%
2001	33817	14%	10228	6%	44045	81	43964	12%
2002	34212	1%	9051	-12%	43263	76	43187	-2%
2003	32093	-6%	7694	-15%	39787	71	39716	-8%
2004	31284	-3%	9947	29%	41231	91	41140	4%
Annual Annual Percent Change								
1995-2004		5.8%		4.6%		5.5%		
1999-2004		1.4		-0.3		1.3		

Source: The Chicago Skyway financial statements from 1994 to 2005.

If we measure the toll road performance by the total gross revenues over the ten year period, 1995-2004, then it becomes evident that revenue wise and volume wise, the toll road operations were not experiencing any significant decline. As shown in above table, for '3-Axles or more category', the volume experienced an increase of 29percent, the total vehicles revenues also experienced 4percent increase.

Why is it important to establish that the toll road operations of Chicago Skyway were not experiencing any serious financial setback? It is because some of the oft-quoted studies justify the sale of the toll roads on financial grounds. Such studies claim that the City of Chicago sold the toll road because it did not have sufficient funds to keep up the financial health of the toll road or make capital improvements.

4.2. Financial condition of the Chicago Skyway upto Jan 2005

One way to measure the extent of capital improvements made over the years is to analyze the previous financial performance of the toll road operations. Such information is available in the financial statements of the toll road. For the Chicago Skyway, the statements include statement of net assets. The other statements include the statement of revenues, expenses, and changes in net assets (in private corporation, such statement will be called the profit and loss (P&L) statement) and the statement of cash flows.

4.2.1. Statement of Revenues, Expenses and Changes in Net Assets

Such statement reflects what revenues were generated and what expenses were incurred to generate those revenues. The excess of revenues over expenses, formerly known as the net income is reflected as a transfer to assets. According to the Management Discussion and Analysis (MD&A) for June 30, 2003, the change in the assets held is an indicator of whether the toll road's financial health is improving or deteriorating (the Chicago Skyway financial statements, p. 2, 2006).

Table 20: The consolidated financial summary - Chicago Skyway (1995-2004)

The Chicago Skyway- Summary of financial position										
(In thousands dollars)										
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Toll revenues	25,396	27,904	35,331	37,490	39,214	39,176	43,964	43,187	39,716	41,140
Concession and other revenues	34	39	47	42	38	38	40	45	54	51
Interest expense	3,277	2,395	2,562	3,300	3,408	3,994	3,745	1,811	1,620	(261)
Total revenues	28,707	30,338	37,940	40,832	42,660	43,208	47,749	45,043	41,390	40,930
Total Operating Expenses	6,292	6,562	7,222	7,361	8,152	7,896	9,106	10,050	11,417	12,213
Operating reserve deposit (2)		1,400								
Net Profit	22,415	22,376	30,718	33,471	34,508	35,312	38,643	34,993	29,973	28,717
Debt service coverage requirement greater of:										
Annual debt service requirement			8585	8903	10223	17466	17387	17532	20497	
Debt service coverage requirement greater of:			1.2	1.2	1.2	1.2	1.2	1.2	1.2	
120% of annual debt service requirement			10302	10684	12268	20959	20864	21038	24596	
Debt service account			8585	8903	10223	17466	17387	17532	20497	
Capital Improvement account								6682	61589	
Total			8585	8903	10223	17466	17387	24214	82086	
Debt service coverage			**3.9**	**3.9**	**3.5**	**2.2**	**2.0**	**1.2**	**0.3**	

Source: The Chicago Skyway financial statements, 1995-2004

The above financial summary shows that over the period 1995 to 2004, the toll revenues increased, but however because of the high interest expense, the net profit declined. The total operating expenses constituted 29 percent of total revenues in 2004 versus 24 percent of total revenues in 1995. Because of the capital improvements and debt service requirements, the debt service coverage ratio (DSCR) fell from the benchmark ratio of 1.2 to 0.3 in 2004.

According to the CAFR (2004), the City of Chicago had covenanted to maintain tolls at such levels as would produce the toll road operations sufficient in revenues each fiscal year to provide an amount of net revenues in each fiscal year (i) 120 percent of the annual debt service requirement for such fiscal year on account of all bonds then

outstanding or (ii) 100 percent of the sum in such fiscal year of certain fund deposit requirements (see Chicago Skyway financial statements 2003-04).

4.2.2. The Statement of Net Assets

The statement of net assets (deficit) presents all the assets and liabilities using the accrual basis of accounting. The difference between assets and liabilities is reported as net assets. Up to the lease, the City's management used the increase or decrease in net assets as an indicator for judging the Skyway's financial position. The total net assets (deficit) had been increasing till 2004. The Skyway's current ratio (current assets/current liabilities) at December 21, 2004 was 0.80:1. Total net deficit of $134.54 million increased by $89.5million (198.8 percent) as a result of current loss before operating transfers out and capital grants of $1.26 million.

Table 21: Summary of the Skyway's Net Assets

Summary of the Skyway's Net assets			
In million dollars			
Years	**2002**	**2003**	**2004**
Total assets	419	422	410
Total Liabilities	470	467	544
Invested in capital assets-net of related debt	61	61	70
Restricted net assets	22	32	35
Unrestricted net deficit	-134	-137	-239
Total net assets (deficit)	-51	-45	-135

Source: The Chicago Skyway financial statements, 2002-2004

In the above table, the net assets (deficit) refers to difference between total assets and total liabilities.

Table 22: Change in Net Deficit

Change in Net Deficit			
In million dollars			
Years	**2002**	**2003**	**2004**
Toll revenue&concession revenues	43	40	41
Interest expense	16	18	21
Operating income	27	21	20
Nonoperating expenses	19	19	21
Operating transfers out	-23		-96
(Decrease)/Increase in net assets	-11	6	-89
Skyway's Operating Expenses			
In million dollars			
Years	**2002**	**2003**	**2004**
Administration	3	3	4
Operations	5	6	6
Maintenance	3	3	3
Depreciation and amortization	6	7	9
Total operating expenses	16	18	21
Chicago Skyway - Statement of Cash Flows			
In million dollars			
Years	**2002**	**2003**	**2004**
Cash flows from operating activities	34	28	29
Cash flows from (used in) noncapital and related financing activities	-15	-8	4
Cash flows used in capital and related financing	-60	-149	-121
Cash flows from investing activities	78	67	53
	37	-63	-35
Cash and cash equivalents - Beginning of the year	87	124	60
Cash and cash equivalents - End of year	124	60	25

Source: Chicago Skyway financial statements, 2002-2004

In 2004, the operating transfers out of $96 million were related to the Skyway lease transaction and were comprised of $34 million transferred to the Vehicle Tax Fund and $62 million to the Corporate Fund. The toll road's operating expenses did not experience much change from 2002 till 2004.

The administration expenses increased in 2004 by $ 0.71 million (23.9 percent) due to costs related to the long-term concession and lease of the Skyway. The increase in operations expenses of $0.23 million (4.1 percent) was due to increased insurance costs of $0.08 million, increased workers' compensation costs of $0.10 million and increased indirect expenses of $0.08 million. In 2004, the maintenance expenses decreased by 4.7percent due to decreased fleet maintenance and personnel costs. Depreciation and amortization expenses increased $1.62 million (23 percent) as a result of the capital activities of the Skyway's Capital Improvement Program.

4.2.3. Statement of Cash Flow

Such statement reflects the cash provided to the toll road project from its activities; operating activities, investing activities, and financing activities. The cash and cash equivalents category at the end of the year represents the ability of the toll road district to weather difficult economic times and to fund needed projects in future years. The above table shows that the City of Chicago made capital and related financing investing decisions worth $121 million in 2004 hence the net cash flow experienced major decline.

4.3. Was the City Management making the capital investments?

Up to the lease period 2005, the Skyway's capital activities were funded through Skyway revenue bonds, federal and state grants, and Skyway revenue. According to the notes to financial statements, during 2003, the Skyway expended $138.6 million on capital activities. Those capital activities were for construction projects, including the 75^{th} to 79^{th} street viaduct rehabilitation project and structural steel rehabilitation of Commercial avenue, Calumet River Bridge and 100^{th} Street viaducts and reconstruction of eastbound traffic lanes from Commercial avenue to the Indiana border; and realignment of the Indianapolis Boulevard entrance and exit ramps. During 2004, the

Skyway expended $83.2 million on capital activities. These capital activities included construction projects, principally the reconstruction of the westbound traffic lanes from Commercial Avenue to the Indiana border and construction of the 92nd Street entrance and exit ramps.

4.4. Ownership Structure upto 2005

According to the CAFR (2004), the City of Chicago was responsible for the management, maintenance, and operation of the Skyway since its opening. The Skyway had been accounted for as a separate enterprise fund of the City. According to the CAFR 2004, no major changes either in the population or the industrial base of the area were expected that would lead to a significant change in revenues.

4.5. Section II: The toll-road operation in the post-period lease

According to the financial accounts, the Skyway Concession Company (SCC) allocated the $1.83 billion paid to the City of Chicago and $17 million of other direct costs associated with entering into the Concession and Lease Agreement to the following assets based upon their relative fair values. The company used an outside independent appraiser to help determine the fair values of the various assets associated with the Concession and Lease Agreement. According to the 2004 financial accounts, a portion of this payment ($446 million) was used to advance refund all of the outstanding Skyways bonds.

The breakdown of the bid price

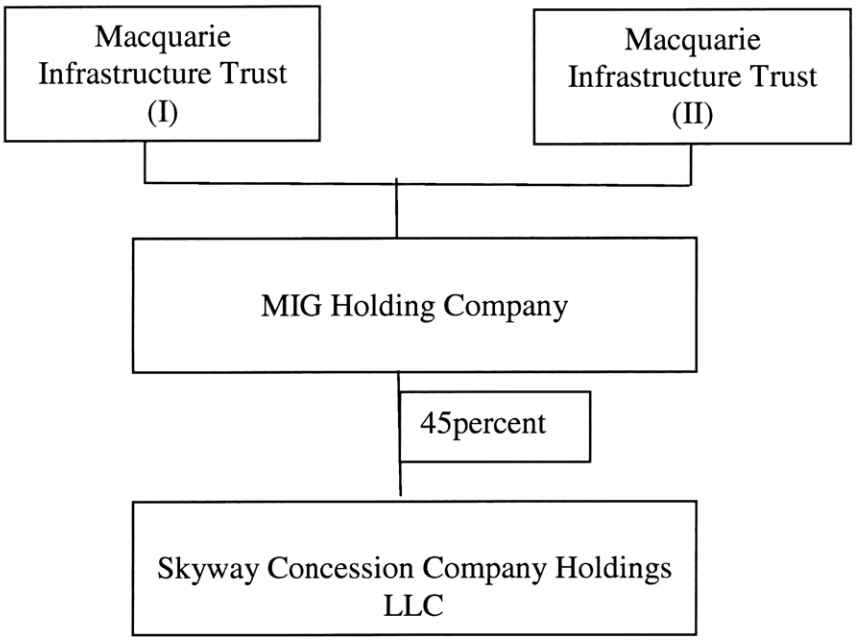
Assets	Fair Value ($) In '000'
Concession rights	1,513,272
Bridges and Roads	322,510
Buildings	1,003
Leasehold interest on land	8,618
Furniture, fixtures and office equipment	666
Computer, and office equipment	1,110
Total	1,847,179

Source: The Chicago Skyway financial statements, 2005-2006

4.5.1. Ownership Structure in the post-lease period

In January 2005, the City of Chicago completed a long-term concession and lease of the Skyway. The concession agreement granted the private company the ability to operate the Skyway and to collect toll revenue from the Skyway during the 99-year term of the agreement. According to the December 31, 2005 financial statements, the Skyway Concession Company Holdings, LLC (the "Company") is a limited liability company. It is a Pass through entity for the federal and state income tax purposes. The Company is indirectly owned 55 percent by Cintra and 45percent by MIG and Macquarie Infrastructure Partners (MIP).

Figure 27: SCC - Organization Table



Source: Skyway Concession Company Holdings, LLC and Subsidiary (A Delaware Limited Liability Company) Financial Accounts, 2005 and 2006.

4.5.2 Financing Structure and Capital Structure

According to the Macquarie Bank Limited, the total funding requirement for the Chicago Skyway is US $ 1.882 billion. The sources and uses are given below:

Sources for the Chicago Skyway's concession money

Sources	US$ million	Percentage
Bank Debt	1000	53
MIG Equity	397	21
Cintra Equity	485	26
Total	1882	100

Source: The MIG Chicago Skyway Presentation, 2005

Users of the Chicago Skyway's concession money

Users	US$ million	Percentage
Purchase Price	1830	97
Transactions and Debt Costs	52	3
Total	**1882**	**100**

Source: The MIG Chicago Skyway Presentation, 2005

Details about the Chicago Skyway's financing facility

Financing	US$ million
Acquisition Debt	1000
Capex Facility	110
Liquidity Facility	80
Total	**1190**

Source: The MIG Chicago Skyway, Presentation, 2005

The above three facilities constitute about $1.19 billion. The amount $1.00 billion was drawn on acquisition. The maturity of the debt is 9 years and the margin is 1.25percent from years 1 to 5.

4.5.2.1. The Chicago Skyway's toll-setting mechanism:

The logic behind the Chicago Skyway's toll-setting regulations was that tolls, prior to the concessions, had been kept artificially low. As explained before, the City of Chicago was unable to meet the required DSCR. According to the concession agreement, the tolls were adjusted by two factors:

c) Inflation (consumer price index (CPI))

d) Or the ability to pay (gross domestic product (GDP)).

The details of the toll adjustment schedule are explained below:

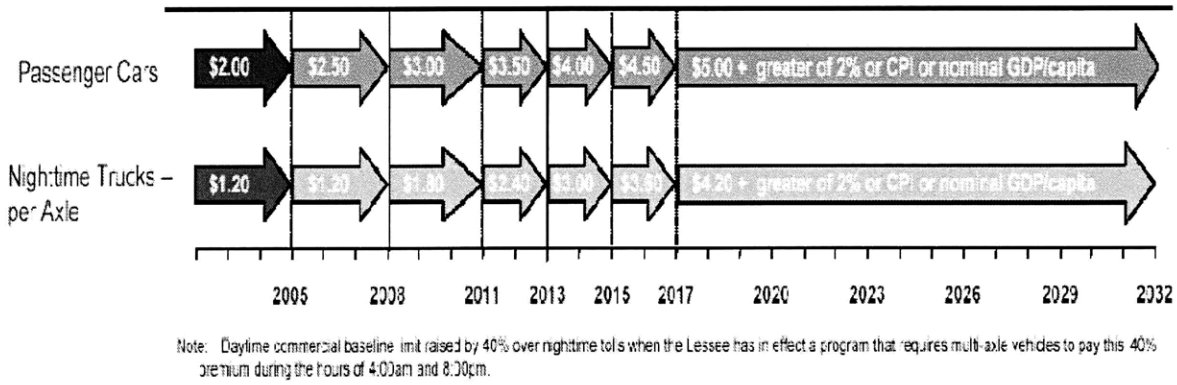
a) Before the lease, the toll was $2.00 for passenger vehicles. It was $1.20/axle for heavy vehicles. These tolls had not changed since 1993.

a) For passenger vehicles, the toll will be $2.50 after 2 Feb 2005.

b) Maximum tolls are raised on each of 1 Jan 2008, 2011, 2013, 2015 and 2017 by the greater of: $0.50; and CPI.

c) Greater of 2percent, CPI or nominal GDP/capita post-2017

Figure 28: Toll-setting mechanism (Chicago Skyway)



Source: Tolling Schedule, the Chicago Skyway Concession Agreement, 2005-2006

4.5.2.2. How the traffic has evolved in 2008?

Given that the Chicago Skyway concession agreement is ending in 2081, the MIG announces the traffic results every year. According to the MIG's presentation to investors, the Skyway traffic was negatively impacted during the June 2008 quarter by weakening surrounding national and regional economic conditions and fuel prices in Chicago.

Table 23: How the traffic has evolved in 2008?

Skyway Concession Company LLC - Skyway			
	Apr-June 2007	Apr-June 2008	Apr-June 2008 % change on pcp
Category			
Average daily revenue			
Revenues (US$)	151,862	165351	8.90%
Average daily traffic			
Workdays	51013	43702	-14.3%
Weekends/Public Holidays	53316	45372	-14.9%
All days	51747	44198	-14.6%
Non-cash transactions	39%	50%	10.0%

Source: The MIG's presentation to investors, 2008.

4.6. Accounting in the post-lease period

The Skyway Concession Company Holdings, LLC and Subsidiary publish three financial statements to evaluate the toll road performance. These statements include the balance sheet (BS), the profit and loss (P&L) statement, and the cash flow (CF) statements. A snapshot of the three financial statements is given below: because of the high interest expense, the P&L statement shows considerable decrease in net profit.

Table 24: Skyway Concession Company Holdings , LLC and Subsidiary

Skyway Concession Company Holdings, LLC and Subsidiary			
A Delaware Limited Liability Company - In million dollars			
Years	**2006**	**2007**	**2008**
Net property and equipment	361	378	375
Concession rights, net of amortization	1484	1469	1453
Others assets	44	19	25
Current and non-currents assets	1888	1866	1853
Deferred financing costs, prepaid expenses and others	47	41	37
Cash reserve accounts	82	58	55
Total assets	**2017**	**1964**	**1945**
Current and derivative liability	90	230	711
Long-term debt	1559	1550	1553
Total liabilities	1649	1780	2264
Members' equity	508	486	478
Accumulated other comprehensive income (loss)	0	-77	-428
Accumulated deficit at the end of the period	-141	-225	-368
Total liabilities and members' equity	**2017**	**1964**	**1945**

Source: Skyway Concession Company Holdings, LLC and Subsidiary 2006-2008

Table 25: Skyway Concession Company Holdings, LLC and Subsidiary Net Loss

Skyway Concession Company Holdings, LLC and Subsidiary				
A Delaware Limited Liability Company				
In million dollars				
Years	**2005**	**2006**	**2007**	**2008**
Toll, concession and other revenues	50	56	53	62
Operating expenses-toll collection operation	11	11	11	11
Depreciation and amortization	21	23	24	22
Operating expenses	32	34	35	32
Operating income	18	22	18	30
Derivative loss	-25	-26	-7	-76
Interest expense net	-89	-38	-95	-97
Net loss	-95	-42	-84	-143

Source: Skyway Concession Company Holdings, LLC and Subsidiary 2006-2008

As evident from above, it will take some time before the toll road operations start making profits because of high interest expenses.

Table 26: Skyway Concession Company Holdings, LLC and Subsidiary Cash flow Statement

Skyway Concession Company Holdings, LLC and Subsidiary			
A Delaware Limited Liability Company			
In million dollars			
Years	**2006**	**2007**	**2008**
Cash flow from operating activities			
Net loss	-42	-84	-143
Net cash flows used in operating activities	-26	-46	-44
Net cash flows from investing activities	-25	22	-7
Net cash flow from financing activities	52	24	51
Net change in cash	1	0	0
Cash			
Beginning of year	0	1	0
End of year	1	0	0

Because of high net loss, the cash flow position did not experience any significant change in cash.

4.7. Valuation of the Chicago Skyway

In the next chapter, I will discuss how MIG calculated the value of the Chicago Skyway. I also give details about the assumptions that MIG made about the cost of capital.

4.8. Summary

From above analysis, it appears that the Chicago Skyway toll road operations were experiencing some problem in meeting the debt service requirements. However, the City of Chicago was making capital improvements before the lease took place in 2005.

CHAPTER 5

AN ALTERNATIVE APPROACH TO VALUE THE CHICAGO SKYWAY

In Chapter 03, I discussed the methodology employed by the Macquarie Infrastructure Group (MIG), the concessionaire to calculate the Chicago Skyway's value. Like the ITR's analysis, there are two key drivers for the discounted cash flow (DCF) analysis.

c) The Chicago Skyway's toll elasticity of demand.
d) The cost of capital.

If we are employing the discounted cash flow (DCF) as the valuation technique to determine the Chicago Skyway's value, then an interesting question is how does the toll road's value changes under various scenarios? Such analysis offers a unique perspective of rethinking the way the City of Chicago could finance its infrastructure assets.

5.1. How can we calculate the cost of capital for the Chicago Skyway?

For my thesis, I define the value of the Chicago Skyway as the financial value of the toll road. To calculate the toll road's value, firstly I employ the net present value method (NPV). I use the same cash flow (CF) stream as in the Macquarie financial model. Like the ITR's valuation, I will also determine the Chicago Skyway's value under different approaches. The value of the cost of capital changes under each approach. I will discuss the approaches in the later section.

As Brealey, Myers, and Allen (2008) explain in chapter 07 "Introduction to Risk, Return, and the Opportunity Cost of Capital", the steps involved in calculating the

opportunity cost of capital; the rate of return the MIG would have gotten if it would have invested $1.88 billion in some other project of the same risk. It is the sum of the risk-free rate (r_f) and a premium of risk ($r_m - r_f$) so for the Chicago Skyway, the opportunity cost of capital would be r_m (2005) = r_f (2005) + beta * market risk premium ($r_m - r_f$).

According to the Brattle Group Incorporation, the beta of a toll road (an infrastructure asset) is 0.42. I calculate the opportunity cost of capital by using the capital asset pricing model (CAPM). The equation is given by

Cost of capital = risk free rate in 2005 (r_f) + beta * (market risk premium)

Cost of capital = 4.14 percent+0.42 * (7.6 percent) = 7.33 percent

Where the risk free rate is = 4.14 percent, β = 0.42 (the Brattle Group, Inc 2009) and the market risk premium is given by 7.6 percent. I assumed the values of such variables at the time of the transaction in 2005. While calculating the above formula, the critical assumption is that there is a normal, stable risk premium on the market portfolio hence the expected future risk premium can be measured by the average past risk premium.

Using the DCF analysis, I analyze the following scenarios:

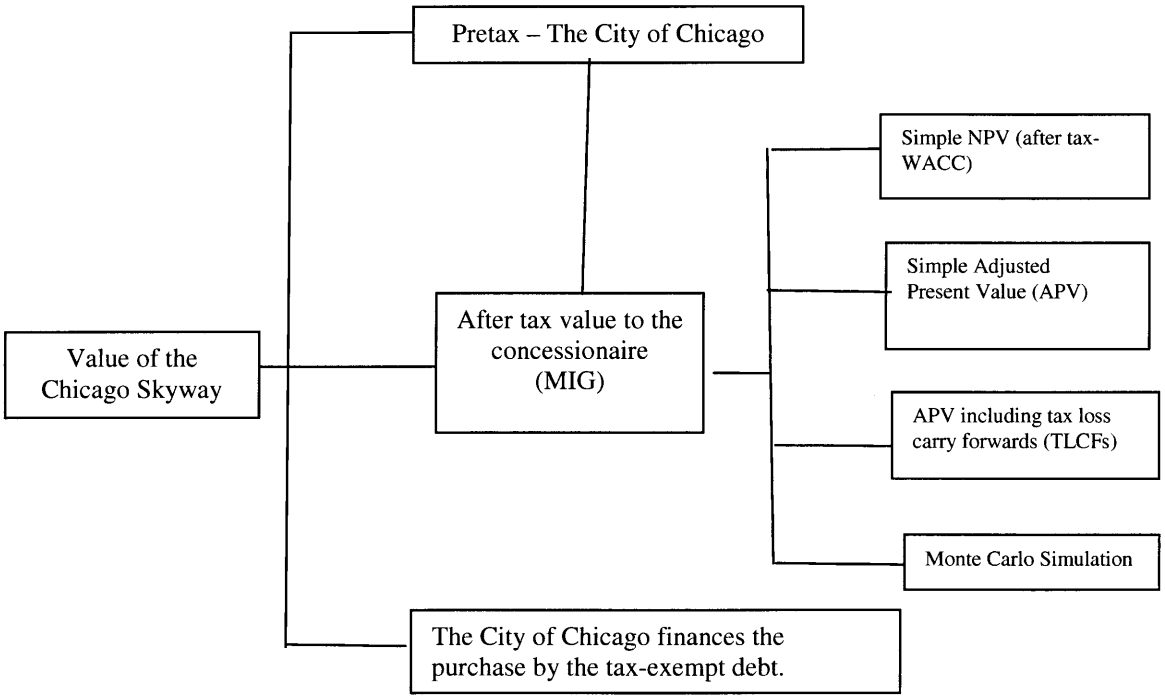
e) **Scenario 1**: The value of the Chicago Skyway if the City of Chicago continued to operate and maintain the toll road.
f) **Scenario 2**: How the value of the toll road changed when the City of Chicago leased the asset to Macquarie investment group. Note that federal and state taxes are triggered, but partly shielded by interest on the $ 1.0 billion of debt financing. I use Monte Carlo simulation to calculate the value of taxes paid after interest tax shields.
g) **Scenario 3**: How much value could the City of Chicago have achieved by retaining the Chicago Skyway and utilizing its debt capacity by issuing tax-exempt debt?

h) **Scenarios 4 and 5**: What toll increases or operating cost savings would be necessary to justify the privatization?

5.1.1 Assumptions: Macquarie Financial Model

The financial model relies on assumptions about revenues and car and heavy vehicle traffic. The assumptions are about the traffic growth (2 percent), traffic mix (cars/vehicles) and heavy vehicles day/night mix (70 percent to 30 percent). Within the total expenditures category, the administration expenses account for 16percent and the operations and maintenance expenses 46 percent. Before actually proceeding to calculating the value of the Chicago Skyway, I present my approach of calculating the toll road value in form of a conceptual diagram.

Figure 29: Various Approaches to value the Chicago Skyway



5.2. Discounted Cash Flow (DCF)

In a presentation to the investors, the MIG management 2005 claimed that under its operations, the toll road had started operating more efficiently i.e. at decreased operating expenses and higher toll revenues. As highlighted in Geltner and Moavenzadeh's (1987) paper, the private operator's efficiency can be defined as

a) The private operator can reduce the operating expenditures
b) And the private operator can raise the toll revenues.

The MIG's Management also defined efficiency in above two ways. However, in 2007, they reported that 2007 overhead was 11 percent below budget. However, the 2007 toll revenues for the Chicago Skyway were 5 percent below those of 2006 due to a decrease in heavy vehicles' traffic, despite a slight increase of light traffic.

The sections below show how the value of the toll road changes under various scenarios.

5.2.1. The value of the toll road to City of Chicago

Using 7.33 percent as the opportunity of cost of capital, the value of the toll road comes out to be $2.055 billion. This is the value of the toll road to City of Chicago.

Table 27: Chicago Skyway - NPV to the City of Chicago

In Million	2004-2013	2014-2023	2024-2033	2034-2043	2044-2050	Total Gross Cash Flows
Revenues	686	1696	3148	5732	6619	17,881
Operating Expenditures	274	678	1259	2293	2648	7,152
Operating Profit	516	1276	2367	4311	4978	13,446
Capex	0	0	0	0	0	1
Depreciation	104	258	478	871	1006	2,718
FCF	620	1533	2845	5182	5984	16,163
Revenues	686	1696	3148	5732	6619	17,881

NPV @ 7.3 percent = $ 2.055 billion.

5.2.2. Normal Net Present Value (NPV) – The after-tax WACC

Under such scenario, I calculate the after-tax weighted average cost of capital (WACC) which is defined as

$$\text{After-tax } WACC = r_d * (1 - T_c) * \frac{D}{V} + r_e * \frac{E}{V}$$

According to the MM's second proposition, the cost of equity comes out to be 6.90 percent.

$$r_e = r_a + (r_a - r_d) * \frac{D}{E}$$

$$r_e = 7.33 + (7.33 - 6.02) * \frac{1.00}{0.88} = 8.80\%$$

After-tax WACC=6.02*(1-0.40)*0.53+8.80*0.47 =6.09 percent

The after-tax cost of debt captures the interest tax shields. The cost of debt (r_d) is the market interest rate on its existing debt and on any new borrowing at the time of the sale. The cost of equity (r_e) is the expected rate of return demanded by investors for Chicago Skyway. The above formula assumes that the concessionaire, the MIG is constantly rebalancing its debt. Under such scenario, I will calculate the Chicago

Skyway's value using the after-tax WACC. The toll road value is $2494.9 million. This value is inclusive of interest tax shields.

Table 28: After-tax value of the ITR to the concessionaire

In Million	2004-2013	2014-2023	2024-2033	2034-2043	2044-2050	Total Gross Cash Flows
Revenues	686	1696	3148	5732	6619	17881
Operating Expenditures	274	678	1259	2293	2648	7152
Operating Profit	516	1276	2367	4311	4978	13446
Capex	0	0	0	0	0	1
Taxes	164	405	751	1367	1579	4265
Depreciation	104	258	478	871	1006	2718
FCF	456	1129	2094	3815	4405	11899

NPV @ 6 percent = $ 1.995 billion

For the after-tax value, I discount the above-cash flows at the after-tax WACC which appears to be a dangerous assumption as explained above. For such scenario, the after-tax WACC calculated above no longer is the correct approach to calculate the cost of capital of the toll road.

5.2.3. Adjusted Present value (APV)

It is because certain assumptions do not hold hence the after-tax WACC fails to give an accurate estimate for the Chicago Skyway, it does not have the same risk or capital structure as the MIG has. For such scenario, Brealey, Myers and Allen (2009) recommend that the adjusted present value (APV) is the correct approach of computing net present value (NPV), rather than after-tax WACC. Under the standard normal APV procedure, firstly we move towards simpler adjusted present value (APV). Unlike the WACC calculation, which assumed that the debt will be maintained at a constant ratio to value, we do not have to keep debt at a constant proportion of value. The value of the Chicago Skyway project is calculated as below:

Value of the Chicago Skyway project = After-tax value of all equity-financed project + the present value (PV) of tax shields.

I have assumed the cost of debt as $r_d = 6.02$ percent. It is the yield on the Baa corporate utility bond yield at the time the transaction took place (2005). I assume that the PV of all-equity financed project is represented by the PV (2). The PV (2) refers to the value of all equity-financed project. Then, the above equation becomes
APV = PV (2) + the present value of taxes saved by deducting $r_d D_t$ at r_d = 6.02 percent. The PV (2) = $1513 million, the value of an all-equity financed project being discounted at the opportunity cost of capital while the present value of tax shields is $359.3million. The value of the asset comes out to be $ 1872.3 million. As the taxes are triggered, despite the increases in the toll rates and the traffic volumes, the value of the toll road goes down by $0.18 billion.

5.2.4. Adjusted Present value (APV) with tax loss carry forwards (TLCFs)

Under above scenario, the Chicago Skyway value is $1911 million. The interest tax shields are worth $398.9 million. The calculations are explained later in

Appendix 5.2.

5.2.5. When the City of Chicago finances the purchase of toll road with the tax-exempt debt

Under such scenario, I want to calculate by how much value could the city of Chicago have achieved by retaining the Chicago Skyway and fully utilizing its debt capacity by issuing tax-exempt debt? I use 5.33 percent as the tax-exempt rate. The 5.33 percent is the interest rate for BBB tax-exempt bonds. The maturity of such bonds is 20 years. I am using this rate since the term of the concession is 99 years, hence I am using the bond rate with a long maturity. The below NPV calculation explains how much this

opportunity is worth. As explained in table below, the opportunity is worth $443.2 million. Borrowing at 5.33 percent is a good deal when the market debt rate is 6.02 percent. In case, I use 7.33 percent as the market risk premium then the worth of such opportunity comes out to be $ 718 million.

5.2.6. When the operator becomes more efficient by lowering operating expenditures or increasing the toll revenues

As explained in Appendix 1, in order to be efficient, the private operator needs to increase the tolls by 16 percent or reduce the operating expenditures by 39 percent.

5.2.7. Monte Carlo Simulation

One way to investigate the project financing of Chicago Skyway is by using the Monte Carlo Simulation. Due to the path–dependent nature of such particular investment, and the complication of some underlying variables, it is useful to use simulation in order to generate a probability distribution of possible outcomes. When I use the Monte Carlo Simulation (5000 trials), I find that in order to be efficient the private operator has to reduce the operating expenditures by 20.5 percent or has to increase the tolls by 10 percent.

APPENDICES

Appendix 5.1

($ Million)

Table 29: Comparison of various scenarios - Chicago Skyway

Scenarios		Value of the toll road	Weighted average cost of capital (WACC)
In the absence of Taxes	The value of the Chicago Skway to the IFA (the public entity)	2,055.4	7.33%
When the taxes are triggered.	Normal NPV - After-tax WACC	1,955.1	6.09%
	Normal APV	1,872.3	
	Normal APV with TLCFs	1,912.0	Cost of equity - 7.33%, the cost of debt=6.02%
If the City of Chicago finances the tollroad via tax-exempt debt.The value of the toll road is reduced to		2,262.0	The cost of debt is the tax-exempt debt worth 5.33 percent.
In the case, the private operator can be more efficient by reducing the operating expenditure	By APV (TLCFs)- (The operating expenditures are reduced by 26 percent)		Cost of equity - 7.33%, the cost of debt=6.02%
In the case, the private operator can charge higher tolls.	By APV (TLCFs)- (The private operator has to increase tolls by 11 percent)		Cost of equity - 7.33%, the cost of debt=6.02%

Appendix 5.2

The calculation of the interest tax shields by taking into account the tax loss carry forwards (TLCFs)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total Revenues	23148	49359	53949	53468	69833	71230	72655	89991	91791	110212
Total Operating Expenditures	9259	19744	21580	21387	27933	28492	29062	35996	36716	44085
Total Operating Expenditures(w/o Dep.)	5741	12241	13379	13260	17319	17665	18018	22318	22764	27333
Operating Profit	17407	37118	40569	40208	52515	53565	54636	67673	69027	82880
Tax (40%) - In case of an all-equity-financed firm	6911	14736	16106	15963	20848	21265	21691	26866	27404	32903
Interest	63308	63308	63308	63308	63308	63308	63308	63308	63308	63308
Net Income [Operating Income-Interest]	-45901	-26190	-22739	-23100	-10793	-9743	-8672	4365	5719	19572
Tax	0	0	0	0	0	0	0	0	0	0
Tax that is actually being paid										
Tax Loss Carry forward	-45901	-72091	-94829	-117929	-128723	-138465	-147137	-142772	-137053	-117482
Interest tax shield	6911	14736	16106	15963	20848	21265	21691	26866	27404	32903
Interest tax shield/Interest	11%	23%	25%	25%	33%	34%	34%	42%	43%	52%

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total Revenues	112416	131857	134494	**155137**	166555	176539	187019	197847	211217	223064
Total Operating Expenditures	44967	52743	53798	**62055**	66622	70616	74808	79139	84487	89225
Total Operating Expenditures(w/o Dep.)	27879	32701	33355	**38474**	41306	43782	46381	49066	52382	55320
Operating Profit	84537	99156	101140	**116663**	125249	132757	140638	148781	158836	167744
Tax (40%) - In case of an all-equity-financed firm	33561	39365	40152	**46315**	49724	52705	55833	59066	63058	66594
Interest	63308	63308	63308	**63308**	63308	63308	63308	63308	63308	63308
Net Income [Operating Income-Interest]	21229	35848	37832	**53355**	61941	69449	77330	85473	95528	104436
Tax				**21342**	24591	27571	30700	33933	37924	41461
Tax that is actually being paid				**12220**	24591	27571	30700	33933	37924	41461
Tax Loss Carry forward	-96253	-60404	-22573							
Interest tax shield	33561	39365	40152	**34095**	25133	25133	25133	25133	25133	25133
Interest tax shield/Interest	53%	62%	63%	**54%**	40%	40%	40%	40%	40%	40%

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Total Revenues	237823	250767	266497	283211	300487	318620	339916	359819	383045	407357
Total Operating Expenditures	95129	100307	106599	113284	120195	127448	135966	143928	153218	162943
Total Operating Expenditures(w/o Dep.)	58980	62190	66091	70236	74521	79018	84299	89235	94995	101025
Operating Profit	178843	188577	200406	212975	225966	239602	255617	270584	288050	306333
Tax (40%) -										
In case of an all-equity-financed firm	71001	74865	79561	84551	89709	95122	101480	107422	114356	121614
Interest	63308	63308	63308	63308	63308	63308	63308	63308	63308	63308
Net Income [Operating Income-Interest]	115535	125269	137098	149667	162658	176294	192309	207276	224742	243025
Tax	45867	49732	54428	59418	64575	69989	76346	82289	89222	96481
Tax that is actually being paid	45867	49732	54428	59418	64575	69989	76346	82289	89222	96481
Tax Loss Carry forward										
Interest tax shield	25133	25133	25133	25133	25133	25133	25133	25133	25133	25133
	25133	25133	25133	25133	25133	25133	25133	25133	25133	25133
Interest tax shield/Interest	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%

	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Total Revenues	430027	459091	486807	515449	548606	583222	615989	656796	695996	740290
Total Operating Expenditures	172011	183636	194723	206180	219442	233289	246395	262718	278399	296116
Total Operating Expenditures(w/o Dep.)	106647	113854	120728	127831	136054	144639	152765	162885	172607	183592
Operating Profit	323381	345236	366079	387618	412551	438583	463223	493910	523389	556698
Tax (40%) -										
In case of an all-equity-financed firm	128382	137059	145333	153884	163783	174117	183900	196082	207786	221009
Interest	63308	63308	63308	63308	63308	63308	63308	36122	57418	51462
Net Income [Operating Income-Interest]	260073	281928	302771	324310	349243	375275	399915	457789	465971	505236
Tax	103249	111925	120200	128751	138650	148984	158766	181742	184990	200579
Tax that is actually being paid	103249	111925	120200	128751	138650	148984	158766	181742	184990	200579
Tax Loss Carry forward										
Interest tax shield	25133	25133	25133	25133	25133	25133	25133	14340	22795	20430
	25133	25133	25133	25133	25133	25133	25133	14340	22795	20430
Interest tax shield/Interest	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%

	2044	2045	2046	2047	2048	2049	2050
Total Revenues	783226	834852	885109	937718	996260	1057347	1124831
Total Operating Expenditures	313290	333941	354044	375087	398504	422939	449932
Total Operating Expenditures(w/o Dep.)	194240	207043	219507	232554	247072	262222	278958
Operating Profit	588986	627809	665602	705164	749187	795125	845873
Tax (40%) -							
In case of an all-equity-financed firm	233827	249240	264244	279950	297427	315665	335811
Interest	45181	38557	31572	24206	16439	8249	914
Net Income [Operating Income-Interest]	543805	589252	634030	680958	732748	786877	844958
Tax	215891	233933	251710	270340	290901	312390	335449
Tax that is actually being paid	215891	233933	251710	270340	290901	312390	335449
Tax Loss Carry forward							
Interest tax shield	17937	15307	12534	9610	6526	3275	363
	17937	15307	12534	9610	6526	3275	363
Interest tax shield/Interest	40%	12%	9%	7%	4%	2%	1%
Present value of the interest tax shield @ 6.02%	**398986**						

Appendix 5.3

Under simple adjusted present value (APV), the calculation of interest tax shields

In Thousands	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Debt	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
Interest	60200	60200	60200	60200	60200	60200	60200	60200	60200	60200
Interest tax shield	23899	23899	23899	23899	23899	23899	23899	23899	23899	23899
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Debt	1000000	1000000	1000000	**1000000**	1000000	1000000	1000000	1000000	1000000	1000000
Interest	60200	60200	60200	**60200**	60200	60200	60200	60200	60200	60200
Interest tax shield	23899	23899	23899	**23899**	23899	23899	23899	23899	23899	23899
	2024	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**
Debt	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
Interest	60200	60200	60200	60200	60200	60200	60200	60200	60200	60200
Interest tax shield	23899	23899	23899	23899	23899	23899	23899	23899	23899	23899
	2034	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**
Debt	1000000	1000000	1000000	1000000	1000000	1000000	1000000	75197	79851	84793
Interest	60200	60200	60200	60200	60200	60200	60200	58148	53494	48552
Interest tax shield	23899	23899	23899	23899	23899	23085	21237	19275	17192	14979
	2044	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**			
Debt	90041	95614	101531	107815	114487	121573	129097			
Interest	43304	37731	31814	25530	18858	11772	4248			
Interest tax shield	12630	10136	7487	4674	1687	0	0			
Present value of the interest tax shield @ 6.02%	359,343									

The amortization schedule is calculated for the last ten years (2044-2050)

Year	Interest	Principal	Balance
1	$58,148	$75,197	$924,803
2	$53,494	$79,851	$844,951
3	$48,552	$84,793	$760,158
4	$43,304	$90,041	$670,117
5	$37,731	$95,614	$574,503
6	$31,814	$101,531	$472,972
7	$25,530	$107,815	$365,157
8	$18,858	$114,487	$250,670
9	$11,772	$121,573	$129,097
10	$4,248	$129,097	$0
	$333,452	$1,000,000	

In the above table, $ 1.0 billion is the debt amount.

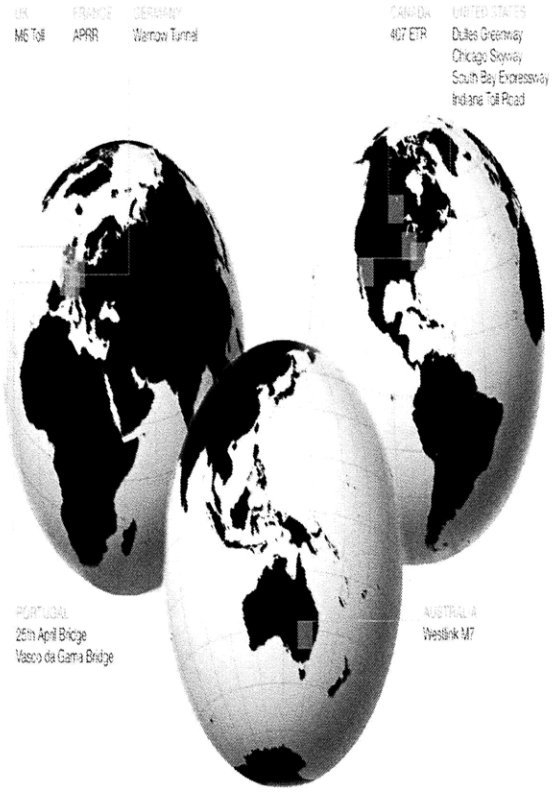
Appendix 6

Thesis Defense Presentation January 12, 2010

Valuation of the Indiana Tollroad (ITR) and the Chicago Skyway

Faiza Arshad
MIT DUSP

January12, 2010



Macquarie's Portfolio- Annual Report 2006-07

Introduction

- Was it "financially beneficial" for the states to sell the toll roads in absence of budget constraints?
- A zero-sum game? Present values (PVs and NPVs) add up. If NPV = 0 to buyer, NPV = 0 to seller.
- Taxes make it a negative-sum game;
  - Private buyer pays income taxes.
  - Private buyer can't issue tax-exempt debt.
- Can efficiency gains offset taxes?

2

Valuation Approach

- Value the asset (toll road) under various scenarios:
  - Zero-sum game (no taxes) = PV to Indiana or Chicago
  - After-tax to private investor
  - Lost value of tax-exempt debt
  - Can private operator operate more efficiently?
  - Can private operator avoid political constraints on toll increases?

3

The value of the ITR under various scenarios

- The theoretical value of toll road to the state of Indiana (No taxes)
- When taxes are triggered (the state transfers asset to the private operator)
- When the state of Indiana finances the purchase by tax-exempt debt
- The private operator can operate the asset (ITR) more efficiently-
  - Can levy more tolls
  - Or can reduce the operating expenditures

Both the numerator (the Cash flows) and the denominator (the cost of capital) will change in each scenario.

4

Market-value of the balance sheet – Indiana Toll Road

Assets	Liabilities + Equity
	Debt (D) = 3.278 (81%)
	Equity (E) = 0.770 (19%)
V =4.048	D +E = 4.048

$$r_a = r_f + \beta (r_m - r_f)$$

$$r_a = 4.52 + 0.42 * 7.6 = 7.7\%$$

Long-run average risk premium =7.6% at the time of transaction

Source: Macquarie financial model 2006- Analyst package

5

The theoretical value of toll road to the state of Indiana - (No taxes)

;h Flows (In millions)	2006-2015	2016-2025	2026-2035	2036-2045	2046-2055	2056-2065	2066-2075	2076-2081	Total Gross Cash Flows
Revenues	2,325	4,159	6,680	10,735	17,244	27,713	44,514	34,840	151,483
Operating ;penditures	877	1,437	2,354	3,857	6,321	10,357	16,972	12,197	56,929
;rating Profit	1,482	2,758	4,363	6,917	10,964	17,398	27,587	22,666	94,858
Capex	0	0	0	0	0	0	0	0	2.
epreciation	34	36	38	39	41	43	45	28	304
FCF	1,516	2,793	4,401	6,956	11,005	17,441	27,632	22,694	95,160

NPV @ 7.7%= $3.956 billion

6

When taxes are triggered (the state transfers asset to the private operator)

The term of concession: 75 years

ısh Flows millions)	2006-2015	2016-2025	2026-2035	2036-2045	2046-2055	2056-2065	2066-2075	2076-2081	Total Gross Cash Flows
ːnues	2,325	4,159	6,680	10,735	17,244	27,713	44,514	34,840	151,483
ˈating ːnditures	877	1,437	2,354	3,857	6,321	10,357	16,972	12,197	56,929
ˈating Profit	1,482	2,758	4,363	6,917	10,964	17,398	27,587	22,671	94,858
EX	0	0	0	0	0	0	0	0	2
ːs	579	1,089	1,730	2,751	4,369	6,942	11,017	9,057	36,221
ˈeciation	34	36	38	39	41	43	45	28	304
	936	1,705	2,670	4,205	6,636	10,499	16,615	13,641	57,338

After-tax WACC (6%)=$ 3.77 billion

APV= PV of all equity-financed+ PV of tax shields @ rd=6.78%

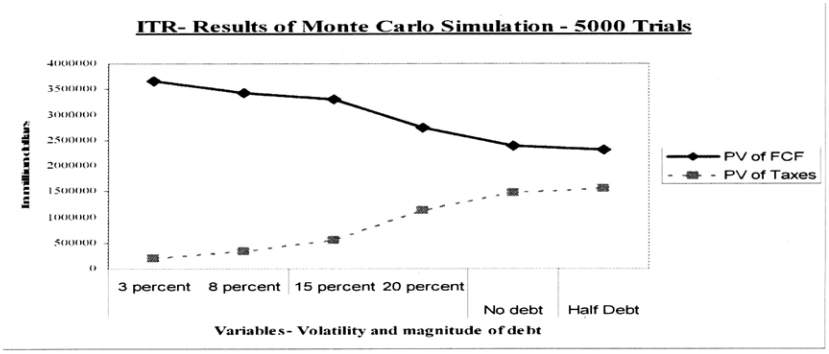
APV= 2.350 +1.322=$ 3.77 billion

7

Monte Carlo results–Interest tax shields

- $2.410
- $1.270
- $3.68

ITR- Results of Monte Carlo Simulation – 5000 trials						
	3 percent	8 percent	15 percent	20 percent	No debt	Half Debt
PV of FCF	3657814	3431460	3302927	2736663	2387094	2313759
PV of Taxes	207294	343639	562181	1128445	1478014	1551349



8

"Increased efficiency" - Can levy more tolls

ı Flows ıillions)	2006-2015	2016-2025	2026-2035	2036-2045	2046-2055	2056-2065	2066-2075	2076-2081	Total Gross Cash Flows
ues	2,578	4,611	7,406	11,903	19,119	30,726	49,355	38,629	164,327
ing ditures	877	1,437	2,354	3,857	6,321	10,357	16,972	12,197	54,371
ing	1,735	3,210	5,090	8,085	12,840	20,412	32,428	26,460	110,259
X	0	0	0	0	0	0	0	0	2
	680	1,270	2,021	3,218	5,119	8,148	12,953	10,573	**43,982**
ːiation	34	36	38	39	41	43	45	28	304
	1,088	1,976	3,106	4,906	7,761	12,307	19,520	15,915	66,579

Increase the revenues by 11 percent; the issue of demand elasticity of tolls???

9

Comparison of various scenarios- ITR

Scenarios		Value of the toll road (in billion dollars)	Weighted average cost of capital (WACC)	The variables (in the Free Cash Flow)			
				Total Revenues	Total Operating Expenditues	Total Operating Profit	Taxes
In the absence of Taxes	The value of the Indiana toll road to the IFA (the public entity)	3.956	7.7 percent	151,483,341	56,928,576	94,858,419	
When the taxes are triggered.	Normal NPV - After-tax WACC	3.771	6 percent	151,483,341	56,928,576	94,858,419	36,221,985
	Normal APV	3.732	Cost of equity - 7.7 percent, the cost of debt=6.78 percent	151,483,341	56,928,576	94,858,419	37,821,906
	Normal APV with TLCFs	3.541	Cost of equity - 7.7 percent, the cost of debt=6.78 percent	151,483,341	56,928,576	94,858,419	37,821,906
If the State of Indiana finances the tollroad via tax-exempt debt.The value of the toll road is reduced to		5.173	The cost of debt is the tax-exempt debt worth 4.45 percent.				
In the case, the private operator can be more efficient	By APV (TLCFs)- (The operating expenditures are reduced by 30 percent)	3.956	Cost of equity - 7.7 percent, the cost of debt=6.78 percent	151,483,341	40,073,459	111,713,536	44,563,953
	By MonteCarlo Simulation -(The operating expenditures are reduced by 11.2 percent)		risk-free rate 4.52 percent				
In the case, the private operator can charge higher tolls.	By APV (TLCFs)- (The private operator has to increase tolls by 11 percent)	3.956	Cost of equity - 7.7 percent, the cost of debt=6.78 percent	171,176,176	56,928,576	109,703,546	45,699,040
	By MonteCarlo Simulation -(The private operator has to increase tolls by 6.2 percent)		risk-free rate 4.52 percent				

In Billion Dollars

10

Market-value of the balance sheet – Chicago Skyway

The Market- Value Balance Sheet (June, 2004) (in $billion)	
Assets	Liabilities + Equity
	Debt (D) = 1.00(53.13%)
	Equity (E) = 0.88 (46.87%)
V =1.882	D +E = 1.882

$$r_a = r_f + \beta (r_m - r_f)$$

Ra = 4.14 percent+0.42 * 7.6 percent=7.33 percent

Long-run average risk premium =7.6 percent at the time of transaction

Source: Macquarie financial model- Analyst package

11

Comparison of scenarios- Chicago Skyway

Scenarios		Value of the toll road	Weighted average cost of capital (WACC)
In the absence of Taxes	The value of the Chicago Skway to the IFA (the public entity)	2,055.4	7.33%
When the taxes are triggered.	Normal NPV - After-tax WACC	1,955.1	6.09%
	Normal APV	1,872.3	
	Normal APV with TLCFs	1,912.0	Cost of equity - 7.33%, the cost of debt=6.02%
If the City of Chicago finances the tollroad via tax-exempt debt.The value of the toll road is reduced to		2,262.0	The cost of debt is the tax-exempt debt worth 5.33 percent.
In the case, the private operator can be more efficient by reducing the operating expenditure	By APV (TLCFs)- (The operating expenditures are reduced by 26 percent)		Cost of equity - 7.33%, the cost of debt=6.02%
In the case, the private operator can charge higher tolls.	By APV (TLCFs)- (The private operator has to increase tolls by 11 percent)		Cost of equity - 7.33%, the cost of debt=6.02%

$ million

12

Future Research

- Is it possible to reduce the operating expenditures (OEX) by such percentage, given the breakdown of the expenses?
- Can the same result achieved in the case of private ownership? Florida Turnpike case (in-house facility)
- Are there any limits to which the private operator can raise the tolls?
- Alternative explanation- The state of Indiana or the city of Chicago sold these assets for money.

13

BIBLIOGRAPHY

Indiana East-West Toll Road Project. Annual Reports. Indianapolis, Indiana. (2002, 2003, 2004, 2005, 2006).

P., Robert and P., Samuel (2008) For Whom the Road Tolls: Corporate Asset or Public Good. Pennsylvania (Report). Pennsylvania House of Representatives

Baxandall, P. (2008). Should we privatize toll roads? No: Loss of planning control, hidden fees would hurt state. Georgia PIRG.

Baxandall, P. (2009). Private Roads, Public Costs, U.S. PIRG Education Fund.

Brown, K. (2007). "Are Public-Private Transactions the Future of Infrastructure Finance?" Public Works Management & Policy 12(320).

Illinois, City of Chicago (2003,2004), Chicago Skyway Comprehensive Annual Financial Report. Illinois

Engel, E. M., F., Ronald, G., Alexander (2004). "Toll Competition Among Congested Roads." Topics in Economic Analysis & Policy 4(1).

Estache, A. (2001). "Privatization and Regulation of Transport Infrastructure in the 1990s." The World Bank Research Observer 16(1): 85-107.

FitchRatings (2007). Global Toll Road Rating Guidelines. New York.

FitchRatings (2007). Global Toll Road Rating Guidelines. Global Infrastructure and Project Finance. New York.

Gibbons, M. (2005). Valuing Project Financing Using Monte Carlo Simulation, With Application to the Expansion of a Chemical Company. Department of Mechanical Engineering. Cambridge, Massachusetts, Massachusetts Institute of Technology. Bachelor of Science.

Macquarie Infrastructure Group (2005). Financial Report Sydney, Macquarie Infrastructure Group.

Macquarie Infrastructure Group (2006). Financial Report 30 June 2006. Sydney, Macquarie Infrastructure Group.

Macquarie Infrastructure Group (2006). "Management Information Report."
Macquarie Infrastructure Group. (2006, 2007, 2008 & 2009). Analyst Package. Australia.

Group, T. B. (2005). The Effect of Debt On the Cost of Equity In a Regulatory Setting. Cambridge, Massachusetts.

Henisz, W. J., Zelner, Bennet A. (2001). The Political Economy of Private Electricity Provision in Southeast Asia. A Working Paper of the Reginald H. Jones Center. Philadelphia, The Wharton School of Pennsylvania.

Indiana (2005). "Indiana Toll Road- Request for Toll Road Concessionaire Proposals."

J., C. L., L. Martin J., Kurbanov, Shokhrukh I., Nelyubov, Vladimir A. (2006). The Buck Starts Where? Paying for Public Services Lexington, Kentucky. Symposium Paper. Kentucky, Martin School of Public Policy and Administration.
Johnson, C. L., Luby, Martin J., and Kurbanov, Shokhurukh I. (2007).

Toll Road Privatization Transactions: The Chicago Skyway and Indiana Toll Road, School of Public and Environmental Affairs, Indiana University.

Kelderman, E. (2007). Toll Roads hit speed bumps. Stateline. org.

Kolbe, A. L. (2004). Direct Testimony of A. Lawrence Kolbe, West Virginia-American Water Company, Case No. 04-0373-W-42T. Massachusetts, The Brattle Group.

Kolbe, A. L. (2004). West Virginia-American Water Company. Case No. 04-0373-W-42T. T. B. Group. Cambridge, Massachusetts, Public Service Commission of West Virginia: 34.

Matas, A. a. R., Jose-Luis (2003). The demand elasticity on tolled motorways. Department of Applied Economics at Universitat Autonoma of Barcelona ,wp0203.

McDonald, I. S., Bob (2009). A Makeover for Macquarie Model. The Wall Street Journal, Dow Jones & Company, Inc.
http://online.wsj.com/article/SB125072735420244729.html

Meckler, L. (2006). Making Public Highways Private: More state, local governments consider handing toll roads to companies to aid budgets. The Wall Street Journal, Eastern Edition.

Myers, S. C. M., Saman (1986). Tax Asymmetries and Corporate Income Tax Reform. Economic Papers. Canbridge, Massachusetts, The National Bureau of Economic Research (NBER)

NW Financial Group, L. (2006) "Then there were two. Indiana Toll Road vs. Chicago Skyway An Analytical Review of Two Public/Private Partnerships A story of Courage and Lost Opportunity." Volume, DOI:

Skurski, R. (2006). Testimony, University of Notre Dame.

Skyway Concession Company Holdings, L. a. S. (2005, 2006, 2007, 2008). Consolidated Financial Statements. Illinois

Small, K.A. (2009). "Private Provision of Highways: Economic Issues." EconPapers(80917).

State of Indiana, Indiana East-West Toll Road Financial Analysis (2006). http://www.in.gov/ifa/files/TollRoadFinancialAnalysis.pdf