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Guidebook on Financing of Highway Public-Private Partnership Projects

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UNITED STATES DEPARTMENT OF TRANSPORTATION

OFFICE OF INNOVATIVE PROGRAM DELIVERY

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Preface

On July 17, 2014, the Build America Investment Initiative was implemented as a government-wide effort to increase infrastructure investment and economic growth. As part of that effort, the U.S. Department of Transportation (USDOT) established the Build America Transportation Investment Center (BATIC). The BATIC helped public and private project sponsors better understand and utilize public-private partnerships (P3s) and provided assistance to sponsors seeking to navigate the regulatory and credit processes and programs within the Department. In December 2015, the Fixing America's Surface Transportation Act (FAST Act) was enacted, which directed USDOT to establish a National Surface Transportation Infrastructure Finance Bureau, which was renamed the Build America Bureau (the Bureau).

Building upon the work of the BATIC, the Bureau was established in July 2016 as USDOT's go-to organization to help project sponsors who are seeking to use Federal financing tools to develop, finance and deliver transportation infrastructure projects. The Bureau serves as the single point of contact to help navigate the often complex process of project development, identify and secure financing, and obtain technical assistance for project sponsors, including assistance in P3s. The Bureau replaces the BATIC and is now home to DOT's credit programs, including Transportation Infrastructure Finance and Innovation Act (TIFIA), the Railroad Rehabilitation and Improvement Financing (RRIF) and Private Activity Bonds (PAB). The Bureau also houses the newly-established FASTLANE grant program and offers technical expertise in areas such as P3s, transit oriented development and environmental review and permitting. The Bureau is also tasked with streamlining the credit and grant funding processes and providing enhanced technical assistance and encouraging innovative best practices in project planning, financing, P3s, project delivery, and monitoring.

Working through the Bureau, USDOT has made significant progress in its work to assist project sponsors in evaluating the feasibility of P3s, and helping simplify their implementation. In response to requirements under the Moving Ahead for Progress in the 21st Century Act (MAP-21) and the FAST Act to develop best practices and tools for P3s, the Bureau, jointly with FHWA, is publishing this report on U.S. highway P3 concessions.

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Acronyms & Abbreviations

ADR	Alternative Dispute Resolution
ADSCR	Annual Debt Service Coverage Ratios
CADS	Cash Available for Debt Service
CAPM	Capital Asset Pricing Model
CBE	Capital Beltway Express
CPI	Consumer Price Index
DBF	Design Build Finance
DBFM	Design Build Finance Maintain
DBFOM	Design Build Finance Operate Maintain
DBM	Design Build Maintain
DBOM	Design Build Operate Maintain
DS	Debt Service
DSCR	Debt Service Coverage Ratio
EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortization
EMMA	Electronic Municipal Market Access
EPC	Engineering, Procurement, Construction
FHWA	Federal Highway Administration
HOT	High Occupancy Toll
IRR	Internal Rate of Return
IRS	Internal Revenue Service
LIBOR	London Interbank Offered Rate
LLCR	Loan Life Coverage Ratio
MAP	Maximum Availability Payment
MPO	Metropolitan Planning Organization
MRG	Minimum Revenue Guarantee
MSRB	Municipal Securities Rulemaking Board
NPV	Net Present Value
O&M	Operations and Maintenance
OIPD	Office of Innovative Program Delivery
OS	Official Statement
P3	Public-Private Partnership
PAB	Private Activity Bonds
PPA	Pocahontas Parkway Association
PPTA	Public-Private Transportation Act
PV	Present Value
QPA	Quantified Probability Analysis
RFI	Request for Information
RFP	Request for Proposals
RFQ	Request for Qualifications
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SB	Shadow Bid
SIB	State Infrastructure Bank
SPV	Special Purpose Vehicles
T&R	Traffic and Revenue
TIAA-CREF	Teachers Insurance and Annuity Association College Retirement Equities Fund
TIFIA	Transportation Infrastructure Finance and Innovation Act
TxDOT	Texas Department of Transportation
VDOT	Virginia Department of Transportation
WACC	Weighted Average Cost of Capital

1 Introduction

1.1 Background and Purpose

This Guidebook has been developed cooperatively by the U.S. Department of Transportation's Build America Bureau and the Federal Highway Administration's (FHWA) for transportation professionals who may be involved in a Public-Private Partnership (P3) project. The Guidebook is part of a P3 Toolkit consisting of tools and guidance documents to assist in educating transportation professionals as well as public sector policymakers, and legislative and executive staff. The P3 Toolkit forms the basis of a broader P3 capacity-building program that includes a curriculum of P3 courses and webinars. The P3 Toolkit addresses Federal requirements related to P3s and four key phases in P3 implementation: (1) legislation and policy, (2) planning and evaluation, (3) procurement, and (4) monitoring and oversight. This guidebook fits into the planning and evaluation phase and is concerned with the financial assessment of P3s prior to procurement and implementation.

Table 1 shows the core components of the FHWA P3 Toolkit. This guidebook, the third to be produced for the planning and evaluation phase as part of the Toolkit, is a companion to the Financial Structuring Fact Sheet, the Financial Structuring and Assessment Primer, and the P3-VALUE 2.0 Analytical Tool. The guidebook may be used as a stand-alone reference or in conjunction with other publications and analytical tools in the FHWA P3 Toolkit. It may also be cross-referenced with FHWA's Model Public-Private Partnerships Core Toll Concessions Contract Guide.[1]

Table 1. FHWA P3 Toolkit Core Components

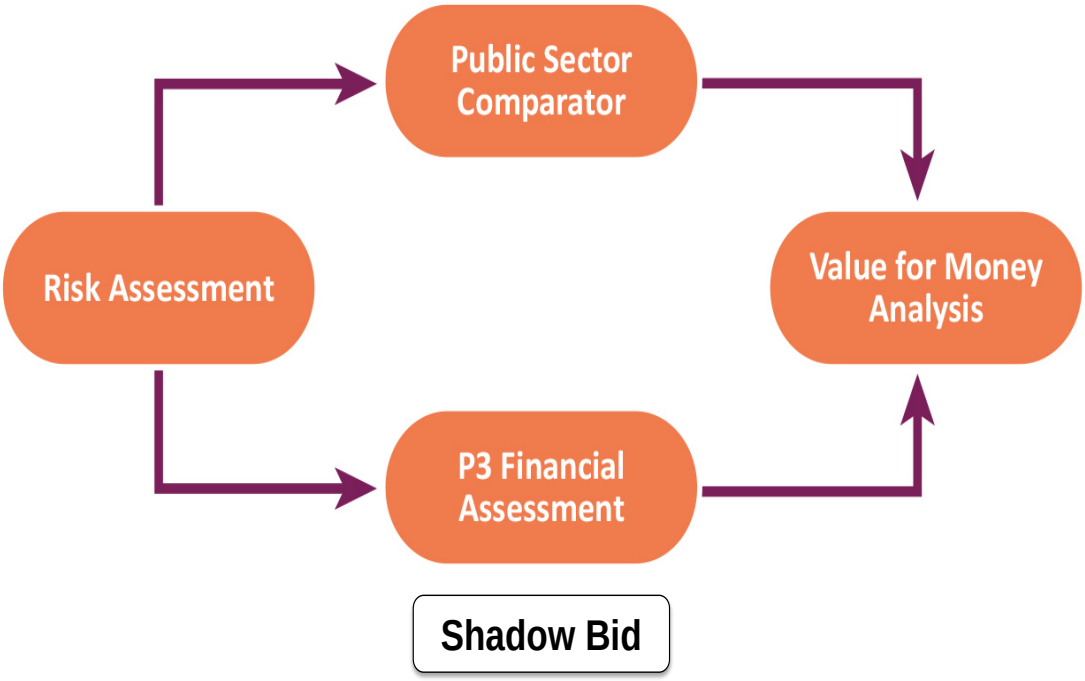
Core Components of the FHWA P3 Toolkit	Description
Fact Sheets	• FHWA P3 Toolkit • Risk Valuation & Allocation • Value for Money Analysis • Financial Structuring • Analytical Studies • Conducting Procurements • Monitoring & Oversight
Primers	• Establishing a P3 Program • Financial Structuring & Assessment • Risk Assessment • Value for Money Assessment
Guidebooks	• Risk Assessment • Value for Money Assessment • **P3 Project Financing (this document)** • Toll Concession Contract Guide • Benefit-Cost Analysis Framework to Compare P3 and Conventional Delivery
Analytical Tools	• **P3-SCREEN** • **P3-VALUE 2.0** ▪ Excel Spreadsheet Tool ▪ User & Concept Guide ▪ Quick Start Guide ▪ FAQs

[1] Available for download at: http://www.fhwa.dot.gov/ipd/pdfs/p3/model_p3_core_toll_concessions.pdf.

The Risk Assessment Guidebook focuses on identifying, managing, and allocating risks, which are important topics for financial assessment since the allocation of risks has important implications for financial feasibility. Risk allocation is discussed in section 2.3 from a financial perspective. This section can be cross-referenced with the Risk Assessment Guidebook.

The Value for Money Analysis Guidebook focuses on comparing the public sector delivery option to the P3 delivery option. The outputs of P3 financial assessment may be used to develop a P3 option for use in value for money analysis to determine the preferred delivery option. The P3 Project Financing Guidebook may be considered a prerequisite to the Value for Money Analysis Guidebook in terms of chronological sequencing, as shown in Figure 1.

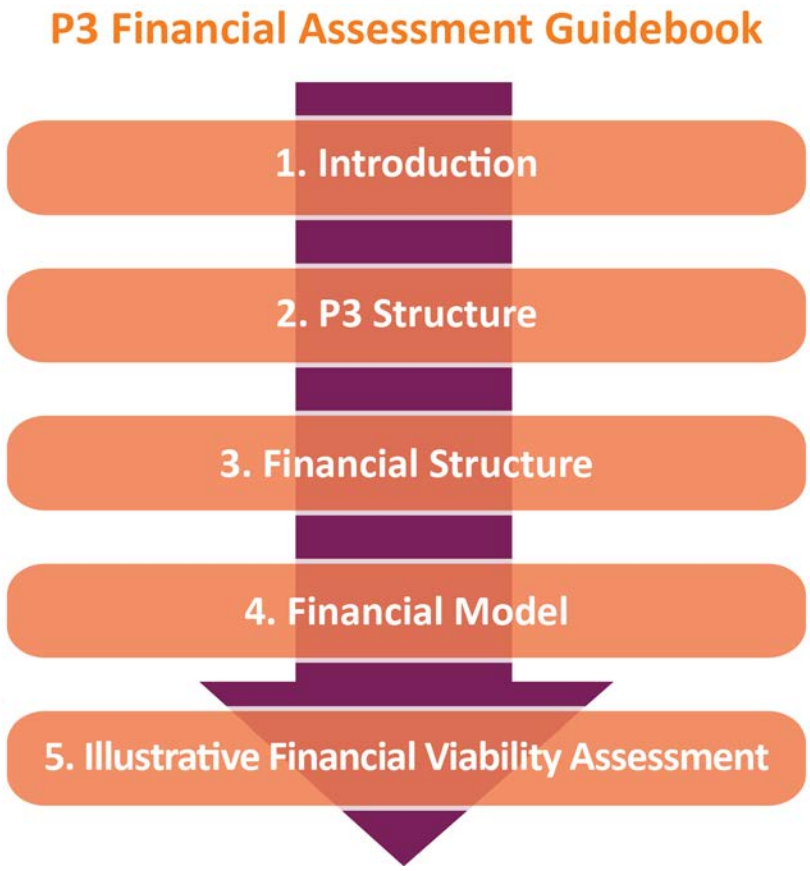
Figure 1. Value for Money Analysis Process



The P3-VALUE 2.0 analytical tool analyzes the P3 option for a project. The accompanying P3-VALUE 2.0 guide can help the user navigate the features of the P3-VALUE 2.0 Tool and assist in understanding the concepts underlying the tool.

The objective of this guidebook is to increase the readers' knowledge of the concepts and skills needed to procure transportation projects using a P3 approach. The guidebook also aims to demonstrate, through practical applications, some of the techniques used to conduct a P3 financial assessment. The guidebook includes examples of real projects so the reader can understand how concepts have been applied in practice. These examples include projects that have encountered financial difficulties. Such projects provide lessons learned that have informed the approach to the financial assessment of P3s. The layout of the guidebook is shown in Figure 2.

Figure 2. Overview of Structure of the P3 Project Financing Guidebook



Many of the rationales for using P3s to implement projects have financial implications. Design-build contracts can help to control construction costs. Design-build-operate-maintain (DBOM) contracts can help to take advantage of the efficiencies of lifecycle costing. The introduction of equity financing to projects can provide financial incentives for private partners to manage projects efficiently. For these reasons, understanding the structure of P3s is essential to the financial assessment of P3s. This is the subject of Chapter 2.

Different types of P3s are suitable for different types of financing. While certain types of financing are available in many parts of the world, the US market offers financial products and strategies that may not be commonly available in other countries. Financing typically constitutes a major cost of P3s and affects the financial feasibility of P3 projects. For this reason, it is essential to understand financing strategies and structures for P3s in order to complete a robust P3 financial assessment. Financial structure is the subject of Chapter 3.

Financial models, discussed in Chapter 4, are used as tools to determine the financial feasibility of P3s. These models incorporate a range of assumptions and inputs that are then used to calculate outputs that provide indicators of financial feasibility. Knowledge and skill in financial modeling as well as the underlying financial concepts represented is essential for any practitioner engaged in the financial assessment of P3s. Chapter 5 provides a simplified example of how a P3 project undergoes financial assessment and structuring.

1.2 Overview of P3s

1.2.1 History and Recent Examples

There are many examples of private development of transportation infrastructure throughout history. Ports, canal systems, turnpikes, and railroads have all been developed privately in the US and internationally. Currently in the US, most ports and airports feature a high level of private investment or involvement in the financing and management of facilities. Private involvement in roads, tunnels, and bridges is less common. While there are some historical examples, such as the original Pennsylvania Turnpike and the Brooklyn Bridge, this type of infrastructure historically has been provided by the public sector in the U.S.

The current P3 trend can be traced to the 1980s as an outgrowth of government reform and privatization efforts. When the Dulles Greenway opened in 1995, it was the first private toll road in Virginia since 1816. California's 1989 P3 law enabled the SR-125 and SR-91 projects. As of February 2014, 33 states and Puerto Rico have P3 legislation, according to the National Conference of State Legislatures. There are a variety of reasons for engaging in P3 projects. The private sector may offer cost savings for projects. Innovations in design, construction, operations and maintenance (O&M), and financing may offer such savings. Another rationale for P3 projects is technological and management innovation. High-occupancy toll (HOT) lanes are one example of an innovative solution being applied by the private sector on several P3 projects. The private sector may offer other innovations in the use of technology or the management of project resources.

Risk transfer is one of the most important rationales for engaging in P3 projects. While risk transfer may involve highly complex contractual and financial arrangements, the following text provides a simplified discussion. Risk is transferred from the public to the private sector mainly through contracts. Even simple construction and operations contracts feature risk transfer, as they require the private partner to perform tasks in place of the public authority, thereby releasing the public authority from many risks associated with the work. When more tasks are performed by the private partner, the level of risk transfer typically is greater. Under a full-scale P3 project, the private sector is responsible for complete project delivery and management throughout the entire project lifecycle. This is a high level of risk transfer and one that typically limits risks to the public authority.

Public authorities may conclude that the private sector is better able to manage certain project risks, or they may wish to transfer risk as a matter of policy. Public authorities may be most interested in using P3 delivery methods where they perceive project risks to be highest. Private firms that specialize in particular types of projects have the experience of implementing similar projects, perhaps not only around the country but around the world. Public authorities may have to deliver certain types of projects only once or a few times, and may be interested in P3 delivery to take advantage of the experience of firms that have delivered similar projects more often.

Despite transferring a greater amount of risk to the private sector, P3 projects never achieve 100 percent risk transfer. The public authority is always exposed to some project risks. Also, in the US, nearly all highway P3 projects feature some form of public funding support.

Public authorities may engage in P3s mainly as a way of to access financing. The US public finance market is unique in the world in that nearly every state and local government in the US has direct or indirect access to the capital market. At the state and local level, public debt is typically tax-exempt, which is another unique feature that provides a low cost of financing for many projects. These features are discussed in detail in section 3.0.

It is important to note that this guidebook focuses on new-build P3 projects. In some cases, these projects involve the upgrading and expansion of existing infrastructure and not the construction of completely new

infrastructure. This guidebook does not address asset monetizations, whereby the public authority receives an upfront payment for the long-term lease of an asset and rights to related toll revenues. However, many of the concepts and issues in terms of the operations of these projects may be similar.

1.3 Overview of Financial Assessment of P3 Projects

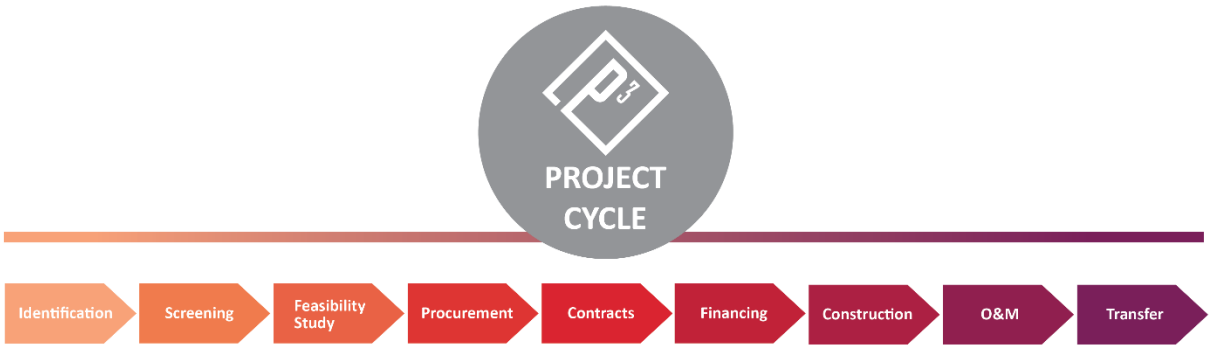
Financial assessment of P3 projects is typically required by several parties. The public authority wants to know how much the project will cost so it can compare its own estimates to those of private sector bidders. The private sector wants to know where it can offer efficiencies and cost advantages. Financial institutions want to know to what extent they can offer financing to the project.

As stated in section 1.1, this guidebook is intended to be used for the planning and evaluation of P3s. Financial feasibility needs to be assessed and confirmed at several stages prior to implementation. Beginning with the identification and selection phase, projects need to be screened for financial viability. Very few projects will be financially viable on their own, and the norm is for state grants and other revenues to cover a portion of capital costs for a project. To justify such grants, the economic benefits of the project may be assessed. This may be done through cost/benefit analysis and through estimation of an economic internal rate of return that can be compared to the financial internal rate of return (IRR).

Once a project passes initial screening, it may be subjected to a P3 feasibility study that lays the foundation for the project, determining the preferred delivery option using Value for Money or other types of analysis. Financial feasibility may be affected during the procurement and negotiation stages of the project cycle (see Figure 3). For example, bidders may not want to accept certain risks; therefore, financial assessment of P3s may have to continue throughout the procurement and negotiation process.

Financial market conditions may also affect financial feasibility. If interest rates differ significantly at financial close relative to when the P3 feasibility study was prepared or when bids were submitted, it may cause a project to become financially infeasible.

Figure 3. Project Cycle



1.3.1 Economic Development Impacts

Some P3 projects have encountered financial difficulties not because of project-specific issues but because of broader economic and demographic issues. Some projects were built in undeveloped regions on the outskirts of metropolitan areas. In each case, the region that the road serviced was projected to grow, with planned residential and commercial developments. When that development did not occur, at least not during the period expected, actual toll revenues fell short of projected toll revenues.

Roads whose revenues rely on planned economic development feature a high level of revenue risk. In these cases, the public authority may need to identify other revenues to fund road construction and operations in initial years.

Investors and rating agencies are more wary of greenfield projects and more interested in projects that have established levels of traffic.[2] Some may be interested in greenfield projects but only where the public authority guarantees project revenues through minimum revenue guarantees or availability payments.

1.3.2 Sources of Financing

As already mentioned, financing costs are a major component of overall project costs. Different sources of financing feature different costs so these must be considered in the financial assessment of projects. Identifying potential sources of financing for projects is part of the financial assessment process. There are many types of financing available for P3 projects. Some are unique to the US market, such as tax-exempt Private Activity Bonds (PAB).

Financing costs will be affected by P3 structure and design. For example, financing for availability payment projects[3] procured by a creditworthy public authority typically carries a lower cost than financing for a toll concession project. Debt providers (whether lenders or bondholders) will typically charge a higher interest rate to finance a project backed by uncertain toll revenues compared to a project backed by availability payments from a creditworthy public authority. In addition, debt providers will typically be comfortable financing a larger share of an availability payment project than a toll concession project. So, toll-financed P3s typically feature a higher proportion of equity financing. Since equity financing typically is more expensive than debt financing, this drives up overall project costs.

The returns expected by both debt providers and equity investors depend on a number of factors. This includes overall economic conditions as indicated by base rates such as US Treasury bond rates and expectations for inflation. They also include project-specific factors such as the estimated level of revenue risk. Both debt providers and equity investors will demand higher rates of return for riskier projects than for less risky projects, *ceteris paribus*. For example, a road that has a long history of established traffic volumes and toll revenues will be viewed as less risky than a greenfield road with no traffic or revenue history. The types of investors and the returns they seek are discussed in detail in Chapter 3.

1.3.3 The P3 Feasibility Study

The feasibility study phase is the most important stage of the P3 project cycle in terms of financial assessment. A P3 feasibility study, also referred to as a business case or delivery options study, determines the financial viability and optimal delivery method for a project. It compares not only the extreme options of public delivery and design-build-finance-operate-maintain (DBFOM) contracts, but also intermediate options such as design-build-maintain (DBM), design-build-finance-maintain (DBFM), and design-build-operate-maintain (DBOM) in determining the scope of the project[4]. The P3 feasibility study develops a risk allocation scheme for the project, defines key project performance requirements, and determines the evaluation factors to be used in

[2] "Greenfield" refers to new or "new-build" projects whereas "brownfield" refers to the upgrading or expansion of existing projects. The "brownfield" terminology is unrelated to environmental issues such as pollution or contamination.
[3] For a basic introduction to P3s of various types, the reader is directed to FHWA's Primer on P3 Concessions for Highway Projects
[4] See Value for Money Analysis Guidebook for more information.

the procurement. The P3 financial model (also known as the Shadow Bid) is developed as part of the feasibility study phase, and this is compared to the Public Sector Comparator using Value for Money Analysis. Spending the time required to develop a proper P3 feasibility study helps to ensure a smooth procurement and negotiation process.

The P3 feasibility study determines whether a project can or should be implemented as a P3 project and, if so, the type of P3 to use and the related contractual and risk arrangements for project implementation. The P3 feasibility study is not used to determine whether or not a project should be implemented. This is a separate exercise that is done using benefit-cost analysis to assess whether the societal economic benefits from project implementation exceed its societal economic costs. However, in some cases, a P3 delivery option may prove financially feasible where a public option is not financially feasible, if it offers significant cost savings or other innovations.

The P3 feasibility study is crucial to financial assessment and to ensuring value for money for the public authority.[5] As part of the P3 feasibility study, a detailed financial model is developed much like those that form FHWA's P3-VALUE tool. This enables the public authority to understand the key drivers of project financial viability and value for money and helps it maintain its bargaining position during the procurement and negotiation phases, particularly in terms of risk allocation.

The financial model and other project documentation that is developed as part of the P3 feasibility study phase are typically referenced and updated not only during procurement and negotiation but also throughout the implementation phase. This helps ensure that the project delivers the expected value for money. It also helps inform the public authority of issues to address in the design and procurement of other projects.

1.4 Introduction to Project Scenarios

Table 2 summarizes the funding and financing for 10 examples of DBFOM transactions that occurred between 2007 and 2013. Many of these projects will be used as examples to illustrate the concepts presented. Descriptions of these projects can be found on the FHWA Office of Innovative Program Delivery website. The projects are very complicated and feature many sources of funding and financing. The amounts of those sources can change with time. For example, public authority contributions may change depending on actual bond proceeds or construction costs. Bond proceeds may be equal to the par amount of issuance or they may be more or less than the par amount of issuance. Contingencies may or may not be drawn during construction. For these reasons and others, the amounts presenting in this Guidebook may or may not conform to amounts provided by other sources of project information.

Where projects were financed with Private Activity Bonds (PAB), this Guidebook typically relies on the information in the Official Statements released as part of bond issuance, not only on amounts of project costs and sources of funding and financing but also for project arrangements and other qualitative and quantitative information. As such, this information reflects project details at financial close. Many project features may change after financial close, such as during the construction and implementation period. The Guidebook also relies on FHWA websites for some project information. Readers may wish to access other sources of project information.

[5] For detailed information on Value for Money analysis, see the FHWA P3 Toolkit Primer and Guidebook on the topic.

Table 2. Sample US DBFOM Transportation Project Funding and Financing through March 2013

Project	P3 Concession Type	Financial Close	Subsidy	Debt			Private Equity	Tolls During Construction	Total
			State Capital Subsidy	PABs	TIFIA	Bank Senior Debt			
East End Crossing	AP	3/28/13		$677.0			$78.0		$755.0
I-95 HOT Lanes	Toll	8/1/12	$71.0	$252.0	$300.0		$292.0		$915.6
Presidio Parkway	AP	6/14/12			$150.0	$166.6	$43.0		$359.6
Midtown Tunnel	Toll	4/16/12	$309.0	$675.0	$422.0		$221.0	$368.0	$1,995.0
LBJ-635 Corridor (HOT)	Toll	6/22/10	$496.0	$615.0	$850.0		$664.0		$2,625.0
North Tarrant Express (HOT)	Toll	12/17/09	$573.0	$398.0	$650.0	$0.0	$426.0		$2,047.0
Port of Miami Tunnel	AP	10/15/09	$309.8		$341.0	$341.0	$80.3		$1,072.6
I-595	AP	3/3/09	$232.0		$603.0	$781.0	$207.7		$1,823.8
SH-130 Segment V-VI	Toll	3/7/08			$430.0	$685.8	$209.8		$1,325.6
I-495 HOT Lanes	Toll	12/20/07	$409.0	$589.0	$589.0	$0.0	$350.0		$1,937.0

Sources: Information on these projects was gathered from a variety of sources. For projects that were financed with Private Activity Bonds (PAB), the Official Statements (OS) provided much of the information. OS's are available for download online from the MSRB EMMA database: http://www.emma.msrb.org/.

These projects have some features in common. Most of them accessed Federal Transportation Infrastructure Finance and Innovation Act (TIFIA) program loans. They all feature some level of private equity financing. Most of the projects cost more than $1 billion, and several of them cost close to or more than $2 billion. The exception is the Presidio Parkway project at $360 million because it is essentially half of a project (only the northbound segments are included in Phase II that is being delivered as a P3). This project did not get an upfront subsidy, but did get a milestone payment which is not included in the table. The SH-130 project in Texas is the only project that was launched without upfront public subsidies. Four of the projects feature HOT lanes. Two projects (Presidio Parkway and Port of Miami Tunnel) are not tolled. Two are tunnels. Midtown Tunnel is the only project that relies on toll revenue during the construction period. This was possible because there is already an existing tunnel on which tolls were levied as the new tunnel is being constructed. Presidio Parkway, Port of Miami Tunnel, I-595, and East End Crossing are availability payment deals. For the other projects, the private partners accepted traffic and revenue risk, at least to some extent.

Most of the projects used long-term private activity bonds (PAB) as the source of senior debt. The I-95 HOT lanes project features PABs with principal payments spread out from year 18 to year 27. Repayment of the PABs for Midtown Tunnel is staggered from year 10 to year 30, with large payments due in Year 25 and Year 30. The LBJ-635 and North Tarrant Express PAB principal payments are spread out from year 20 to year 30. The Capital Beltway HOT Lanes PAB principal repayments are spread out year 30 to year 40.

The bank debt for Presidio Parkway and Port of Miami Tunnel was essentially in the form of construction loans. For Presidio, the loan was for 3.5 years and expected to be repaid with a milestone payment. The Port of Miami Tunnel bank debt included a $322 million, 5-year loan to be repaid with $450 million of milestone and final acceptance payments and a $22 million loan to be repaid from the first availability payment. For I-595, the bank debt was intended to serve as long-term financing. It had an original term of 10 years with the expectation of refinancing for another 12.5 years. The bank debt for SH-130 carried a 30-year term. That project came to financial close before the financial crisis. Other features of these projects will be discussed in relevant sections throughout the guidebook.

2 P3 Organizational and Contractual Structure

The objective of this chapter is to provide an understanding of the financial rationale and implications of:

- The range of P3 contract types and structures
- The main types of revenue sources for P3s
- Risk transfer
- The special purpose vehicle (SPV)
- Common P3 contract terms and conditions.

On legal issues related to toll road projects, readers may also reference FHWA's Model Public-Private Partnerships Core Toll Concessions Contract Guide.[6]

2.1 Structure of P3s

While the term P3 may be used to indicate a range of policies and project types across sectors, within the transportation infrastructure market it has a very specific meaning and typically indicates a DBFOM contract or some minor variation thereof. These projects can be seen as the middle ground between fully public and fully private delivery options. As noted in Chapter 1, this guidebook particularly focuses on new-build projects.

One way to understand the DBFOM contract is to analyze its component parts and to understand the rationale for grouping these different functions together under one contract (see Figure 4). The following text does this from the specific perspective of financial benefits. It is a simplified discussion to illustrate the potential benefits of P3. The issues are discussed in greater detail throughout this Chapter. Readers may also wish to reference other sources on these topics, notably Yescombe (2007)[7], Grimsey and Lewis (2007)[8], Delmon (2011)[9] and Engel and Fischer (2014)[10]. While the potential benefits of P3 are discussed below, actual benefits offered by a P3 delivery option for any specific project may vary and must be analyzed and considered independently. That process is the subject of FHWA's Guidebook on Value for Money Analysis, as well as FHWA's ongoing research on P3 benefit-cost analysis.

[6] Available for download at: http://www.fhwa.dot.gov/ipd/pdfs/p3/model_p3_core_toll_concessions.pdf.
[7] Yescombe, E. R. 2007. *Public Private Partnerships: Principles of Policy and Finance*. Oxford: Butterworth-Heinemann.
[8] Grimsey, Darrin and Mervyn Lewis. 2007. *Public Private Partnerships: The Worldwide Revolution in Infrastructure Provision and Project Finance*. Cheltenham: Edward Elgar Publishing.
[9] Delmon, Jeffrey. 2011. *Public-Private Partnership Projects in Infrastructure: An Essential Guide for Policy Makers*. Cambridge: Cambridge University Press.
[10] Engel, Eduardo and Ronald Fischer. 2014. *The Economics of Public-Private Partnerships: A Basic Guide*. Cambridge: Cambridge University Press.

Figure 4. The Building Blocks of P3

2.1.1 Design-Bid-Build

Under design-bid-build arrangements, the design and build (construction) functions are conducted by distinct entities. The separation of these functions may even be required by law (which is why new legislation is often needed before implementing P3 projects). The public authority will generally either prepare the designs itself or will contract a firm to prepare the designs for a new asset. With the designs prepared, the public authority will bid out the project. Firms bid on the project as it appears in the designs that are included as part of the bid documents.

While this type of procurement may be suitable and successful for certain types of projects and certain public authorities, it may present challenges. It is possible for a form of moral hazard to arise when the firm building an asset did not prepare the designs for the asset. The construction firm may blame any problems encountered by the project on the design. Disagreements can cost the public authority millions of dollars in project delays and change orders. One approach to resolve this issue is to combine the design and build functions into one contract.

2.1.2 Design-Build

By combining the design and build functions, the public authority can transfer design risk to the private sector. The design-builder is typically held responsible for its own design work and the implications they have for construction, such as schedule and budget. When the design-builder accepts responsibility for the design work, it must price and time the project's construction in line with the designs it has prepared itself. Any overruns in time or costs resulting from errors or omissions in the design work are then borne by the private sector. If it is expected to produce its own designs, the private sector requires access to the project right of way and background information. It also requires more time during the procurement process to assess the project to ensure its designs conform to the physical and natural limitations of the right of way.

The public sector has a new role in managing design-build projects. It is no longer preparing detailed designs or ensuring adherence to designs procured from a third party. The public sector distances itself from detailed design and constructability review and focuses its role on output requirements, oversight and monitoring rather than prescription and control.

Where design work was not already procured separately, introducing design-build also creates competition and fosters innovation. New technologies and techniques integrated with construction methods can be more easily accessed when design is combined with construction in the same contract.

2.1.3 Design-Build-Maintain

Combining the design-build approach with maintenance contracts may allow the public sector to realize significant efficiencies in contracting. When the same contractor or group of contractors is responsible for design, construction, and maintenance of an asset, it is expected that it will make different decisions about the upfront investment in the asset. Namely, the private sector will engage in lifecycle costing, weighing the costs and benefits of investment and maintenance activities over the entire life of the asset rather than focusing on achieving the lowest upfront capital cost. Under a conventionally procured construction contract, the public

sector may be tempted—or even required by law—to accept the lowest bid. But the lowest bid may not offer the best quality. When the construction of an asset and its maintenance are combined in one contract, the private sector may be incentivized to build a better asset since it also will be responsible for maintaining the asset. Another consideration for lifecycle projects is the condition of the asset at the end of the project term. Long-term contracts usually include detailed provisions and requirements for the condition of the asset if it is to be returned to the public authority, which is the case with most transportation P3s. The transfer of this "handback risk" is another potential benefit of long-term P3 projects since the maintenance contract allows the public entity to avoid the risk of deferred maintenance.

2.1.4 Design-Build-Operate-Maintain

By contracting out the O&M of infrastructure assets, the public sector may realize significant savings and efficiency gains.[11] The private sector offers its managerial skills and its technical innovations to improve service delivery and reduce costs. Under these arrangements, the public sector can transfer certain O&M risks to the private sector and can lock in price caps and cost increases in multi-year contracts. Depending on the project, the public sector may also transfer market or demand risk for the services provided.

Just as maintenance costs may be a function of the quality of construction, operational costs may be a function of maintenance practices. A well maintained asset can be less costly to operate and offer a higher level of performance. This is another justification for adding operations to a DBM contract. This type of contracting also favors certain green technologies, which may have higher up-front costs but result in lower operational costs in the long run. However, it may be the case that the private sector, while offering efficiencies in design, construction, and maintenance, does not offer efficiencies in operations. State DOTs already operate large networks of toll-free roads either directly or under separate contracts, and the operations of toll-free roads are usually less complex than the operations of other infrastructure assets that have been delivered through P3, such as transit systems or power plants.

2.1.5 Design-Build-Finance-Operate-Maintain

The final building block of a P3 is the financing. As is discussed in Chapter 3, transportation P3s can take advantage of the tax-exempt bond market through the issuance of PABs. One feature of P3 financing that differentiates it from conventional public project financing in the US is equity investment. Equity investors are effectively owners of a project and, as such, typically have incentives to manage projects efficiently and effectively. This can be seen in the cash flow waterfall diagram, where equity investors hold the most subordinate position. This is also considered the "first-loss" position since equity investors will be the first to suffer from any decrease in project revenues or increase in project costs.

All of these elements, when combined into a DBFOM contract, create a full-fledged P3 project. To summarize, this arrangement offers the following potential benefits to the public sector:

- Technological innovation and competition in design
- Transfer of design and construction risk
- Lifecycle costing
- Transfer of O&M risk, possibly including market or demand risk
- Private financing
- Investor management and supervision of the project.

[11] While this has not been proven empirically, there is substantial anecdotal evidence. See Engel and Fischer (2014), p. 44, for US examples.

2.2 Payment Structures

There are two main types of revenue for a concessionaire in highway P3 projects: tolls and availability payments. In the case of availability payments, the public authority is the source of the revenue. Regardless of the source of revenue, the services to be provided by the private sector partner typically are regulated by a comprehensive contract or project agreement that includes performance requirements detailing the type, level, and quality of service to be provided.

2.2.1 Availability Payments

Under an availability payment arrangement, the public authority makes regular, predetermined payments to the private sector partner as long as an asset or service is *available* for use. The payments usually are tied to the performance of the private sector partner, so failure to comply with the performance requirements usually results in reductions to the availability payment. However, the potential reductions for failure to perform are not so deep as to affect the project sponsor's ability to pay debt service. There also may be incentives for the private sector partner to exceed the performance requirements, and the project agreement may provide for increased availability payments in such cases. The I-595, Port of Miami Tunnel, Presidio Parkway, and East End Crossing projects all feature availability payments. The public authority typically retains the market or demand risk on availability payment deals, although usage or revenue can be included as a performance indicator to incentivize the private sector and/or to compensate the private sector for additional wear and tear. Availability payments are typically calculated to cover:

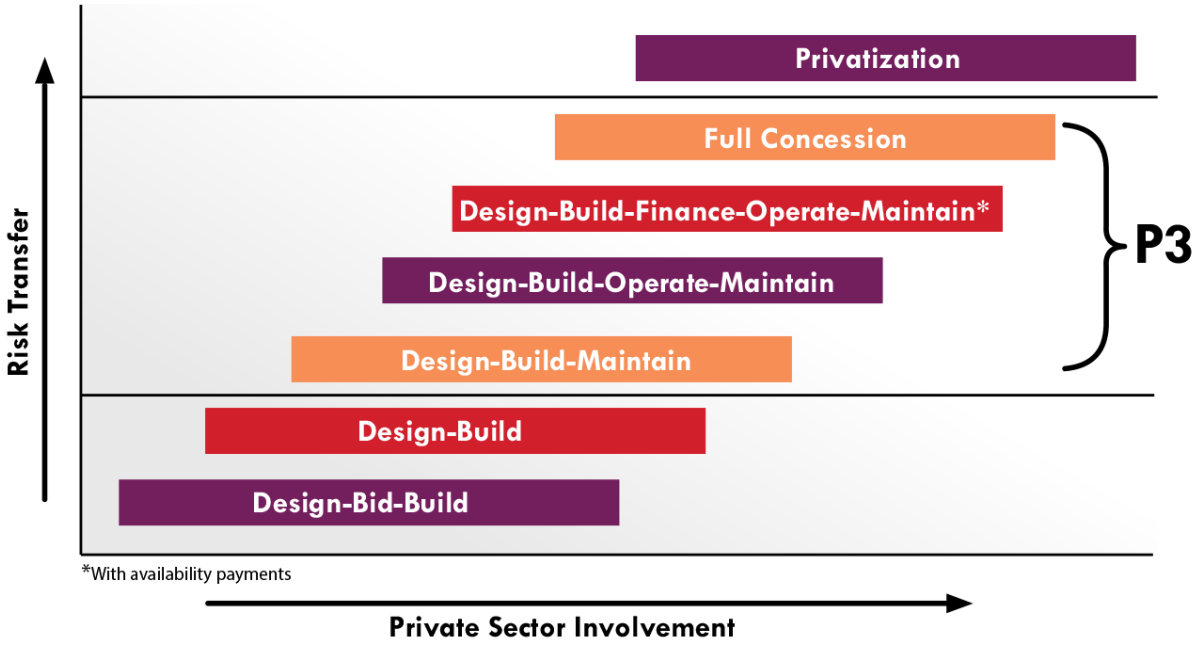
- Operations and maintenance.
- Debt service.
- Taxes.
- Equity returns.

In the US, availability payments have been used in conjunction with upfront contributions including capital subsidies and/or milestone payments, which buy down the amount of project cost that must be financed and thus reduce the amount of the availability payment.

2.2.2 Tolls

The other main source of revenue for highway P3 projects is toll revenue. Tolling involves many different activities, including setting the toll rates, collecting the tolls and enforcing payment of tolls. In practice, the public authority may be involved in any or all of these activities even on a P3 project that relies on toll revenues as its only source of revenue. Toll concessions often transfer demand and revenue risk to the private partner (see Figure 5). However, there are instances where the private partner also receives upfront capital subsidies, milestone payments and O&M payments in conjunction with toll revenues. Internationally, some public authorities have offered minimum revenue guarantees on some toll road concessions.

Figure 5. Private Sector Involvement vs. Risk Transfer



When tolls are the only or main source of revenue on a project, the private partner is usually very interested in the projected level of traffic and revenue. They will engage traffic and revenue forecasters to estimate likely revenues from a project. Private sector assumptions about toll revenues may be more aggressive than the public authority's. Toll revenue projects typically feature a higher percentage of equity financing when compared to availability payment projects. This issue is discussed in detail in Section 3.2.5.

The private sector partner may be averse to accepting demand and revenue risk, especially since the 2009 recession which resulted in reduced traffic volumes and toll revenues even on roads with well-established growth rates and no history of traffic decreases. If demand and revenue risk are not completely transferred to the private partner, the public authority may share demand and revenue risk with the private sector.

There are cases when toll revenue is supplemented with other funding sources. Most recent toll concession P3s in the US have received an upfront capital grant. An operational subsidy paid alongside toll revenues may achieve a similar effect in terms of increasing the project's financial viability. The combination of availability payments and user fees is common in some other P3 sectors internationally. Recently, this approach was used on the innovative Nottingham Express Transit Phase II project in the UK for which availability payments constitute 60 percent of revenues at project start and gradually decrease to 40 percent as other project revenues (mainly from ridership) increase. This project transfers demand risk to the private sector partner by incorporating ridership levels into the project's performance requirements. The I-77 HOT Lanes Project in North Carolina that was awarded to Cintra in April 2014 features an annual payment for O&M of the general purpose lanes in addition to toll revenues from the HOT lanes.

2.3 Risk Transfer

2.3.1 Allocation of Risk

As noted above, a key function of P3s is to transfer certain project risks to the private partner and its service providers. These are risks that would be retained by the public authority in a conventional public procurement

process. Risks are typically transferred according to the general principle that risk is transferred to the party considered best able or most willing to manage it. For example, some of the risk of cost overruns during construction in a design-build or P3 structure may be transferred to the private partner because the private partner may be considered better able to manage that risk. The risk is transferred through a construction contract that assigns responsibility for construction-related cost, quality, and schedule performance to the construction contractor.

Environmental risk provides another example. Environmental damage that is caused by contractors working on a project, or by the operator of the project after construction, typically will be borne by those parties. Responsibility for environmental damage to the project site which has occurred prior to the commencement of the project agreement typically rests with the public authority. An exception may occur if the damage is identified ahead of time and its remediation is accepted as part of the project scope by the private partner. In any case, the assignment of responsibility for the risk is included in the project contracts.

The network of back-to-back contracts and sub-contracts within the P3 structure work together to allocate risk. In preparing for a P3 project, public authorities generally use a risk management framework. This includes the identification and valuation of project risks, the development of targeted risk allocation arrangements, and monitoring to track if those targeted arrangements are achieved during procurement and negotiation. This process is addressed in detail in the FHWA P3 Toolkit Guidebook for Risk Assessment in Public-Private Partnerships.

One reason public authorities prepare risk valuations are so they can compare the cost of retaining a risk to the cost of transferring it. While it may be tempting to aim to transfer all risks to the private sector, in practice this is generally not feasible. There are some risks that the public authority will always retain at least to some extent, such as political risk. There are other risks that the public authority may determine are priced excessively by the private sector partner if they are transferred.

The private sector's appetite for risk is not static but dynamic. As mentioned above, an economic downturn and resulting decreases in traffic volumes may decrease the private sector's appetite or inclination to accept demand or revenue risks. The performance of other projects may also affect private sector risk appetite.

Table 3 indicates a typical risk allocation arrangement for a transportation P3 project. It shows which party – the public authority, concessionaire or subcontractor – is likely to take on various risks. This is an indicative and illustrative arrangement and specific risks may be allocated differently depending on the project, the public authority, and the private partners involved. For more information on P3 project risk management, readers may consult FHWA's Guidebook for Risk Assessment in Public-Private Partnerships on the P3 Toolkit website.

2.4 Special Purpose Vehicle

2.4.1 SPVs & Project Finance

A Special Purpose Vehicle (SPV) is typically established by the private partners to manage a P3 project. As the term implies, SPVs have only one function: the project itself. Most SPVs are Limited Liability Corporations (LLC) that are owned by their equity investors. Table 3 below displays the typical arrangements and structure surrounding an SPV. The owners of the SPV are usually parties to the project, such as the design-build subcontractor and the O&M subcontractor. In fact, some P3 legislation requires a certain level of ownership in the SPV among these subcontractors for a certain period of time. Third party investors such as equity funds and pension funds may also be equity holders in a P3 SPV. Investors are discussed in detail in Section 3.2.2.

Table 3. Indicative Risk Allocation Arrangement for a Transportation P3 Project

Typical Risk Allocation Arrangements			
Phases	**Public Authority**	**Concessionaire**	**Subcontractor**
Development Phase			
Planning & environmental process	✓		
Political will	✓		
Regulatory	✓		
Site Acquisition	✓		
Permitting	✓	✓	✓
Procurement	✓	✓	
Financing		✓	
Construction Phase			
Engineering & construction			✓
Changes in market conditions		✓	
Operation Phase			
Traffic		✓	
Competing facilities	✓		
Operations and maintenance			✓
Appropriation	✓	✓	
Financial default risk to public agency	✓		
Refinancing		✓	
Political	✓		
Regulatory	✓		
Handback		✓	

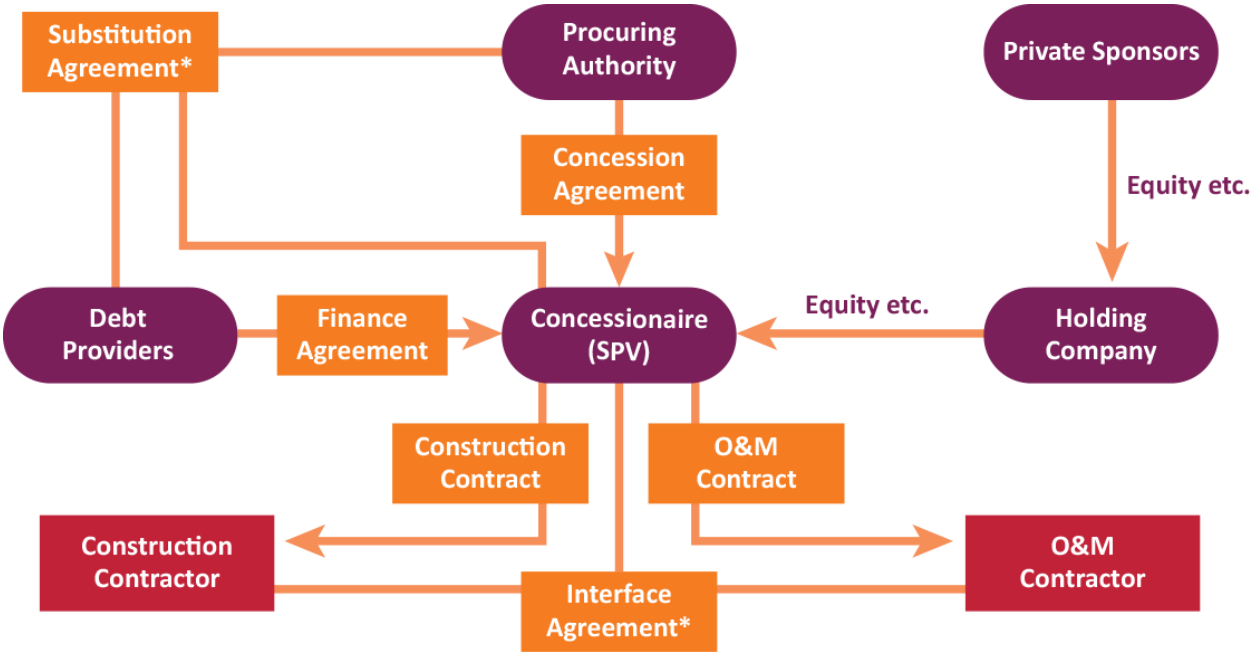
Whereas corporations may have several lines of business with many projects undertaken by each business, an SPV has only one business, the project itself. This provides both a managerial focus and a financial focus. SPV management is focused exclusively on issues related to the project. SPV revenues and financing are similarly exclusive to the project. In other words, the revenues and financing are "ring-fenced". This arrangement facilitates a clear assessment of project financial feasibility as well as monitoring of project financial indicators during the implementation phase. Financing for ring-fenced project revenues is said to be "non-recourse" or "limited recourse". This means that the source of repayment for project financing is limited to project revenues. Debt providers may not pursue the owners (parent companies) of the SPV for repayment of project debt. However, in some cases, parent companies do provide guarantees, particularly in the case of the construction price and timetable. Since there is some recourse to parent companies in these circumstances, the financing is said to be "limited recourse". Various forms of guarantees and credit enhancement are discussed in sections 3.3 and 3.5 of this guidebook.

Some elements of SPV arrangements and financing resemble revenue bond financing in the US public finance market. Whereas holders of General Obligation bonds may seek repayment of debt from any and all government revenues, the holders of revenue bonds expect repayment of debt from only designated revenue streams, such as toll revenues. In this sense, revenue bonds are non-recourse.

The SPV structure and non-recourse or limited recourse financing that usually accompanies it help to allocate project risks (see Figure 6). The public authority is insulated from financial risk because it does not have to borrow to fund the project (although in the case of availability payment deals, it is the source of project revenues). The equity investors or owners of the SPV are insulated from financial risk because they pledge only the project revenues and not their balance sheets to support project financing. The project is also insulated

from financial risk because if one of the equity investors experiences bankruptcy, the project will continue intact based on the agreements signed with the SPV.

Figure 6. P3 Financing Structure



* The *substitution agreement* between the public authority and the lenders permits "step-in rights" that allow the lender to force a change in management under certain stressed conditions. The *interface agreement* is concluded between the design-build subcontractor and the O&M subcontractor to reinforce project risk transfer arrangements and limit the potential for damaging claims disputes.

2.5 Contracts

The project company engages only in the business of financing, developing, constructing, and operating a specific P3 project and owns or has rights to only the assets necessary for that purpose. One of the critical assets held by the project company is the network of back-to-back contracts. Through this system of contracts, the parties not only allocate key project risks as between the public authority and the private sector, but also push certain of those risks down to specialized entities that are designated specifically to perform the various functions necessary to implement the construction and the operational phases of the project, and to manage the associated risks. These additional entities may be third-party service providers, or they may be members or associated companies of the private consortium retained by the public authority to develop and operate the project. The typical contracts required in a P3 structure consist of the project agreement, lending agreements, shareholder agreements, construction contracts, and O&M agreements. Any one of these may be further divided into multiple agreements, depending on the particular project, as well as the participants and their needs.

An often-overlooked source of services for the project may be the public authority itself. For example, if the P3 is small relative to other highway projects in a state, the project may benefit from using the public authority for maintenance. Similarly, the public authority may already be operating services providing tolling, information technology, or landscaping, and it may be most economical for the private operator of the P3 to piggyback off these services. This has been the case in several US P3 projects that have featured very small segments of road.

Armed with the fully negotiated and signed project agreement, the developer will first set up the project company, most often referred to as the "concessionaire," to stand at the center of (and serve as the party to) the network of contracts that will be required to finance, develop, construct, and operate the project. Next, the developer, on behalf of the concessionaire, will finalize the project financing package, bringing construction lenders, long-term lenders, mezzanine lenders, and equity participants into the deal. Lenders may take the form of commercial banks, bondholders or governmental lending programs like TIFIA or state infrastructure banks. Equity participants generally include the developer, who already has risk exposure to the project in any event, and may also include long-term financial players such as insurance companies, pension funds, and specialized infrastructure funds managed by investment banks and others. Negotiations among all these parties results in a final capital structure for the project, consisting of equity and one or more kinds of debt.

The developer, on behalf of the concessionaire, will also use this opportunity to identify and negotiate contracts with various service providers needed during development, construction, and operation of the project. Such service providers may be members of the consortium team. A critical participant during the operational phase of the project will of course be the O&M operator—the company that undertakes day-to day management of the facilities. Before the project can be operated, however, it must typically be built and/or refurbished (in the case of existing facilities), so the so-called EPC (engineering, procurement, and construction) contractor is also an important player.

Because the public authority is concerned about the creditworthiness, technical resources, and reputation of all of the foregoing entities, the project agreement will generally prohibit, at least for the early term of the contract, any of these participants from withdrawing from the financing structure or assigning their performance obligations under the project contracts to anyone else. At financial close, this network of project contracts among the participants will be executed and delivered by the project participants, including the project company, with the project company representing the interests of the private developer and the other private sponsors.

2.6 Key Financial Terms in a P3 Contract

P3 contracts are addressed in detail in FHWA's Model Public-Private Partnerships Contract Guides.[12] Key financial provisions are discussed here.

2.6.1 Role of Land in P3 Projects

The ownership and transfer of land in P3 projects is often a sensitive topic. Land may be the most important contribution to a P3 made by the public authority. For transportation projects, ownership of the land typically is not transferred to the private partner. Instead, the public authority grants the rights to use the land and other assets for the contract term. The project may also use a lease arrangement for this purpose. Most P3 legislation exempts land used in P3s from property taxes.

2.6.2 Contract Term

Contract terms typically are derived from the economic useful life of the subject assets or major maintenance lifecycles. This is especially true in the case of new-build projects, since one of the objectives in engaging in a P3 is to take advantage of lifecycle costing. Tax regulations may also affect the choice of contract term, as it is

[12] Available for download at: http://www.fhwa.dot.gov/ipd/pdfs/p3/model_p3_core_toll_concessions.pdf.

generally the case that assets may only be depreciated if they are considered to be owned for tax purposes. Tax ownership is discussed in more detail in section 4.2.1.

2.6.3 Rates & Charges; Pricing Flexibility

The setting of tolls and other fees has a profound effect on the financial feasibility of a project. At the same time, tolls and fees can be highly sensitive political issues. Unlike rates billed by investor-owned utilities, tolls and charges for transportation infrastructure generally are not regulated by state public utility commissions. And, in contrast to governmentally-owned and managed projects where rate setting is typically determined by the minimum level needed to achieve debt service coverage and other covenants defined in the financing documents, P3 projects are being operated by private investors seeking to maximize their investment returns. For these reasons, the public authority will typically want to impose some form of limitation on the ability of the concessionaire to increase tolls and fees during the contract term. The authority may suggest an absolute cap, indexing (perhaps to inflation), or a requirement for consents.

The private operator will want as much flexibility as possible to adjust rates and charges after commencement of the concession. Accordingly, the parties must work together to address this issue.

2.6.4 Revenues & Payment Streams

As might be expected, payment structures associated with a project can pose difficult financial structuring issues. There are two different types of issues that may arise. First is whether the project is to support itself strictly from the toll revenue generated from users. As an alternative, there may be some contribution required by the government. As noted above, this could take the form of upfront capital subsidies or ongoing operational subsidies. (See the discussion in section 2.2 relating to availability payments.)

A second and related issue is how the public and private sector are to share excess revenues that the project may generate. If the public authority provides a floor to project revenues or equity returns through a subsidy or guarantee, it may also provide a ceiling or limit to revenues or returns. Table 4 summarizes the revenue sharing mechanism on the Capital Beltway HOT Lanes Project. Public authorities contemplating revenue or profit sharing on projects should consult a professional tax advisor.

Table 4. Summary of the Revenue Sharing Mechanism for the I-495 HOT Lanes Project

Base Case Level	Concessionaire's Internal Rate of Return (IRR), percent	Virginia DOT's Revenue Sharing Percentage
First Tier	7.940 to 8.496	5
Second Tier	8.497 to 8.965	15
Third Tier	8.966 to 12.980	30

Source: Amended and Restated Comprehensive Agreement Relating to the Route 495 HOT Lanes in Virginia Project, Dated December 19, 2007 by and among the Virginia Department of Transportation and Capital Beltway Express LLC.

2.6.5 Performance Requirements

Performance requirements are included in the project agreement. Without clear standards, this can be a source of continuing and disruptive disputes between the public authority and the private operator. For this reason, the agreement will typically contain standards for construction as well as ongoing maintenance of the facilities. Depending on the sector, there may be existing industry standards that can be incorporated by reference in the project agreement to serve these purposes. For example, Federal-aid projects must comply with a range of laws and regulations that may impinge on performance requirements.

One of the benefits of making the private developer responsible for both construction and operation is that this creates a certain alignment of interests between the public owner and the private operator. If the private operator knows that it will be responsible for the operational phase of the project, then during construction, that party will make every effort to ensure that the facility is built initially to the optimum standards, balancing the cost of construction with the cost of future maintenance during the contract term, thereby helping control later operational costs. This will directly affect the public authority's assessment of full lifecycle costs for the project.

A related issue pertains to the standards set in the agreement for the condition of the facilities at the time they are turned back to the public authority, at the end of the concession term.[13] This issue is easy to ignore at the time the concession is negotiated. Nonetheless, it is an issue that must be addressed. The private operator will have an incentive to cut corners on maintenance and repair in the final years of the concession, to increase the private return on the facility operation. This problem can be handled by including clear maintenance standards in the project agreement; however, that alone may not be adequate. Parties may agree to a third-party valuation of the facilities, to be conducted several months prior to the turn-over date, with payments to flow to one party or the other, depending on the indicated condition of the facilities at that time. Alternatively, the parties may agree on the condition in which the infrastructure will be handed back at expiry of the contract term and will build into the project agreement provisions requiring a condition survey prior to expiry of the term with payments being held back from the private partner in an escrow account pending satisfaction of the handback condition.

2.6.6 *Timely Completion*

Failure to achieve timely completion of construction of a P3 project can impact its financial position in several ways. First, the delay has a direct effect on the project budget and the related financing. A second impact on the project finances comes from the fact that a delay often implies that there will be change orders associated with completion of the project construction. These change orders in themselves will add to the project cost; moreover, the later the date at which those change orders are negotiated between the owner and the contractors, the more expensive they will become, just from inflationary effects. Again, the resulting cost over-runs could at some point exceed the financed contingency amount, potentially causing the project to default on its loans. Third, and perhaps most devastating, is that delays in construction completion can set back the ramp-up to long-term profitability for the entire project, as everything assumed in the feasibility study becomes erroneous. This can have a permanent impact on the project, lasting through the entire term of the concession and reducing the parties' total returns on the project. This effect is more pronounced for toll concessions.

In addition to setting out dates for completion of project construction, and liquidated damages to be payable by the concessionaire and the contractors to the public authority if these dates are not achieved, the project agreement will specify procedures for acceptance testing for substantial completion. Acceptance testing is critical to the public authority, since it is that testing that will tell the authority that the project construction is completed and will be able to operate at least initially in accordance with the performance requirements set out in the project agreement.

2.6.7 *Termination as a Remedy*

Termination is generally viewed as the "big club" that the public authority can use to ensure performance by the private parties in the concession. The truth is more complicated. The main problem with termination as a

[13] See also FHWA's Model Public-Private Partnerships Core Toll Concessions Contract Guide available for download at: http://www.fhwa.dot.gov/ipd/pdfs/p3/model_p3_core_toll_concessions.pdf.

remedy is that it has a "scorched earth" quality to it. For this reason, public authorities are often reluctant to exercise this remedy. The provisions for compensation on termination contained in project agreements also are likely to lead to reluctance on the part of the public authority to terminate as, even where the private partner is in default, they may still be required to find the funding to compensate the private partner for the loss of the contract. It is more common for lenders to exercise their step-in rights to take control of a project that has encountered financial difficulties.

2.6.8 Renegotiation as a Remedy

Renegotiation is generally to be avoided to the extent possible. Whatever the reason for the renegotiation, public authorities typically face certain disadvantages—mainly asymmetries in information and bargaining power.

Consider that the private operator is already in place and is running the business day-to-day. This invariably means that the operator knows more about the project than the public authority does. Moreover, there is no external competition in place to put pressure on the operator during the negotiation, as there was during the initial bidding process. This is the disparity in bargaining power. The public authority can only eliminate this leverage if the private partner truly believes that the partnership might be terminated. But consider the discussion above relating to termination as a remedy. The bottom line is that renegotiation is likely to result in the public authority suffering a loss of financial advantage relative to the private operator in the process of reaching a "mutually agreeable" result.

However, given the long-term nature of P3 projects, some changes are inevitable, and so it is important that provisions are contained in the project agreement apportioning the risk of such changes and regulating how they are made and priced.

2.6.9 Changes in Law

The cost of changes in law are of particular relevance. Who bears the risk of such changes will depend on whether they are discriminatory changes (i.e., they only affect toll road operators) or non-discriminatory changes (i.e., those affecting business generally). Discriminatory changes generally are treated as a compensation event for the concessionaire, meaning that the original "economic equilibrium" of the project will be maintained.

2.6.10 Alternative Dispute Resolution (ADR)

Considering how inadequate the remedies discussed above can be, the alternative dispute resolution mechanisms contained in the project agreement can quickly assume critical importance during the operational phase of the project. ADR mechanisms typically include three types: determination by an expert, mediation, and formal arbitration. A well-designed ADR process can ensure the smooth operation of the P3 project over many decades, resulting in a good relationship between the public and private parties, and a project that delivers to both parties the anticipated financial benefits.

2.6.11 Insurance & Guarantees

To safeguard the project and itself, the public authority typically will require that the project company and its equity investors provide a range of insurance and guarantee products to support the project. These are discussed in more detail in section 3.5.

2.6.12 Substitution & Interface Agreements

Substitution and interface agreements help to safeguard the project from performance and default issues. The substitution agreement between the public authority and the lenders permits "step-in rights" that allow the lender to force a change in management under certain stressed conditions. The interface agreement is concluded between the design-build subcontractor and the O&M subcontractor to reinforce project risk transfer arrangements and limit the potential for damaging claims disputes.

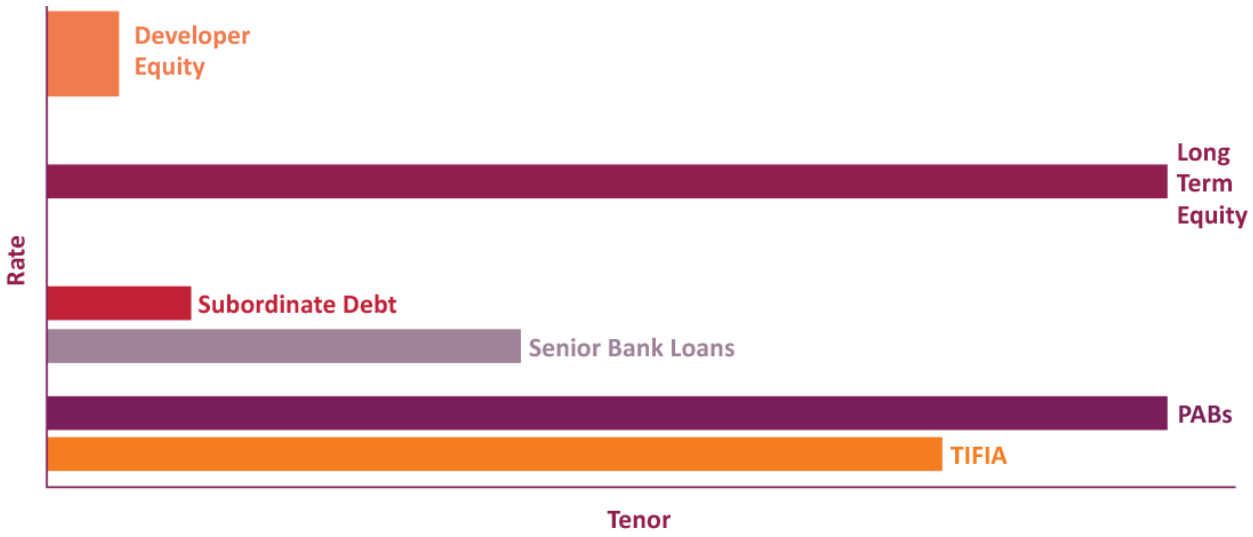
3 P3 Financial Structure

The objective of this chapter is to provide an understanding of:

- Types and characteristics of different sources of financing.
- Different types of investors.
- The use of grants and subsidies.
- Rating agency considerations.
- The types and characteristics of credit enhancement.
- Financial optimization strategies.

As mentioned in Chapter 2, P3s are generally financed by a combination of debt and equity. These are broad categories, and there may be several variations on each type of financing, such as short-term debt, long-term debt, subordinate debt, preferred equity, common equity, and mezzanine financing. The risk appetite and associated pricing for different types of financing are displayed in Figure 7. This figure is only indicative. The financing term or repayment period (tenor) and pricing may differ depending on timing and other project characteristics. In addition, P3s also frequently receive upfront subsidies or grants and milestone payments from public authorities. Although both upfront grants and milestone payments may be funded by the public authority from the same revenue source, the latter are conditioned upon the P3 developer achieving certain pre-defined project completion indicators. Subsidies may reduce the amount of financing required for a project, close a financing gap or help to lower required tolls or availability payments. Financing costs can be reduced through the use of credit enhancements. These include internal credit enhancements such as cash reserves, and various types of external credit enhancements such as bond insurance. Finally, all of these elements need to be combined in a strategic fashion to optimize project delivery.

Figure 7. Types of Financing with Notional Rate and Tenor



3.1 Debt Sources

Debt plays a critical role in P3 projects. The project finance model is designed to be highly leveraged, meaning that debt—as opposed to equity—typically provides more than half of the financing required for the project. The level of debt in a project is a direct function of the project's level of risk. This attribute of the project is sometimes referred to as "gearing" and is measured by the project's debt/equity ratio. Projects with a low level of risk may be very highly leveraged, reaching as much as 90 percent debt and 10 percent equity, or 90/10. Riskier projects will require more equity financing and may feature debt/equity ratios in the range of 70/30 or 60/40. The level of debt in a particular project finance structure is dictated by the debt providers.

As a general rule, it can be said that debt providers are more conservative and risk-averse than equity investors. Debt providers accept lower returns, but only on the condition that loan repayment is predictable and involves less risk. Indeed, repayment of debt, at least senior debt, is a contractual requirement codified in the bond indenture or loan agreement. Equity returns, on the other hand, may have target rates but typically are not contractually obligated. There are two main financial products used for debt financing: bonds and loans. These may come as both senior and subordinate sources of financing. These different types of debt are described below.

3.1.1 Senior Debt

There are two main types of debt often used to finance P3 projects: senior and subordinate. These designations generally describe the priority of the creditor relative to other creditors with regard to two things—payments from the project (when the project is not in default) and security (after a project has defaulted). So, for example, we have talked about the cash flow waterfall that is typical in P3 financing. The waterfall describes the priority order in which payments are applied to different project needs—paying operating expenses, establishing reserves, repaying creditors, rewarding equity investors, etc. Senior debt providers receive their payments from the project cash flow before any other capital provider, helping to ensure that they are paid in full and on time even if there may not be sufficient cash to pay a creditor lower in the order, or subordinate. For this relatively secure position, the creditor will be paid a lower return than a subordinate creditor.

Similarly, there is a priority of access to project collateral among the creditors if a default occurs. In a typical P3 project financing, a variety of assets will be used to provide security to creditors—real property (physical facilities and fixtures, and possibly land) as well as personal property (equipment, vehicles, intellectual property, and the project license itself). With first priority access, the senior debt providers are assured to be first in line to step into the shoes of the project operator, or under liquidation to receive the first proceeds of sale of any property, helping to minimize losses in that event.

Debt Service Coverage Ratio (DSCR)

One feature that defines senior debt is its coverage ratio. Annual debt service coverage ratios (ADSCR) are a critical indicator for all project financings. From one perspective, they are an indicator of the financial condition of the project. From another perspective, minimum ADSCRs are a requirement of debt providers, who will require higher ADSCRs for projects with higher levels of perceived risk. The ratio requires the net cash flow available for debt service (CFADS) from operations in any year to exceed the debt service due in that year. Cash balances at the beginning of the fiscal period are not taken into account as "cash" for the purposes of this test. All cash flows completely through the waterfall each year. As a practical matter there will be minimal cash on hand that has not been trapped by reserves or distributed to equity accounts. As the cash flow waterfall indicates, only operating expenses are higher than debt service in order of priority, so once

those are deducted from revenue, the difference is CFADS.[14] The DSCR is calculated by dividing CFADS by debt service (DS), as shown in figure 8:

Figure 8. Equation. Calculation of DSCR

$$DSCR = \frac{CFADS}{DS}$$

Where

DSCR = Debt Service Coverage Ratio
CFADS = Cash Flow Available for Debt Service
DS = Debt Service (Principal + Interest)

Availability payments provide a high certainty of cash flows so that the need for cash flows to exceed debt service is kept to a minimum. Availability payment deals with a AAA-rated government may be eligible for a minimum ADSCR of 1.2 or lower, whereas projects with significant toll revenue risk may require an ADSCR of 2.0 or higher for senior debt. This requires CFADS to be double the debt service for the specified year, which allows for a substantial shortfall in estimated traffic perhaps resulting from toll price elasticity well outside the expected range. Cash balances in reserve accounts and any other cash on hand are not treated as available in this measure of the project company's ability to repay debt.

The ADSCR determines the maximum amount of debt a project can use for financing (debt capacity). If cash flows only support a 2.0 ADSCR with 70 percent debt financing, then more senior debt cannot be issued to finance the project. If initial modeling determines high projected DSCRs, there may be room either for additional senior debt or for subordinate debt. Subordinate debt requires lower coverage ratios than senior debt and is lower in the priority of payments than senior debt. In exchange for this riskier position, subordinate debt typically requires higher rates. Subordinate debt is discussed in more detail in section 3.1.2.

Once a project is built, the ADSCR is also used to determine if the project can incur additional debt for capital expansion. This calculation is known as the "Additional Bonds Test" (ABT) and typically requires that an expert consultant for the project sponsor calculate ADSCR both on "historic" terms (comparing prior year's results to pro-forma existing and new debt service) and projected results (forecast indicating that ADSCR with the existing and additional debt service can be met in every future year).

Project lenders also monitor the loan life coverage ratio (LLCR). LLCR considers the ratio of the present value of total cash flow available over the life of the loan (discounted at the loan interest rate) to the face amount borrowed. Unlike the ADSCR, the LLCR does not consider each year's coverage factor; rather, it considers the extent to which the NPV of cash flows anticipated by the loan's stated maturity date are sufficient to retire the remaining principal outstanding. The minimum initial LLCR requirement for a P3 project typically requires discounted future cash flows to meet a test about 10 percent higher than required by the ADSCR. Cash balances in reserve accounts that are not earmarked for maintenance purposes can be included in this measure of the project company's ability to repay debt. Finally there is a project life coverage ratio (PLCR), which takes into account the NPV of project cash flows over the life of the project -- effectively, the

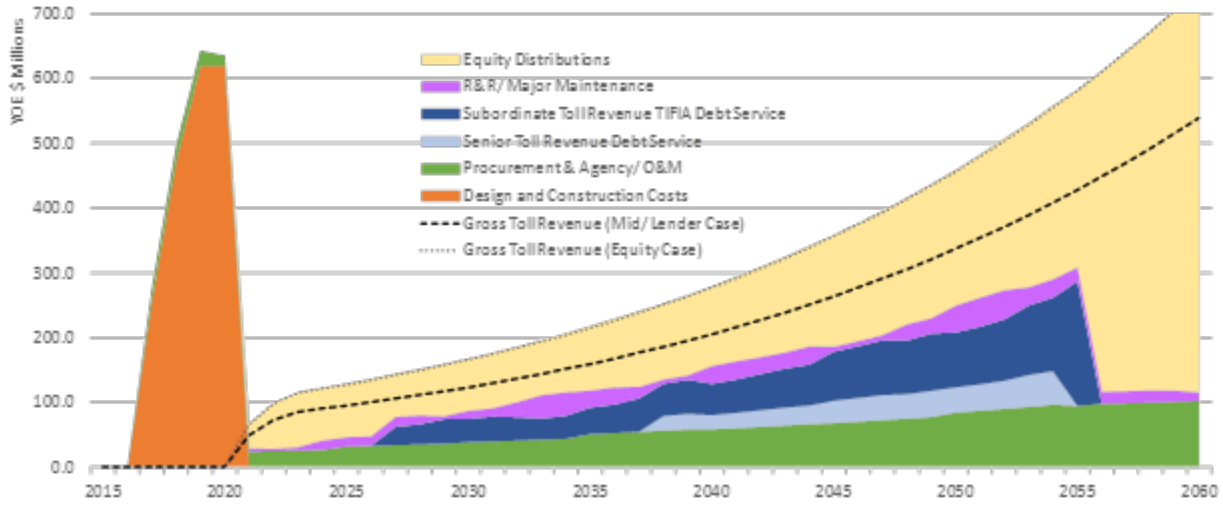
[14] There are numerous approaches to how to calculate and what to include in DSCR, depending on the project. Here we provide the simplest and most straightforward method.

term of the P3 operating concession, which may extend well beyond the loan's final maturity date. See "Debt Tail Requirements" discussion below.

Debt Tail Requirements

To hedge against the risk of negative project performance, debt providers usually require a schedule of repayment that is shorter than the concession term, thus creating a debt repayment tail (see Figure 9). Tails will be longer for riskier projects, particularly those for which the private partner accepts demand risk, such as toll roads. By this feature, the public authority provides an additional period for the debt providers to recover their principal in cases when the debt or the project is restructured. Under availability payment deals, the tail typically is very short. In Canada, for example, tails on availability projects are typically set at 6 months because availability payments are typically calculated to include debt service payments.

Figure 9. Illustrative Project Costs, Forecast Revenues, Expenses, and Debt Service



Some countries have experimented with flexible-term concessions to hedge against revenue risk. The term of these projects varies with pre-determined indicators, such as principal repayment, revenue generation and traffic volume targets or cumulative and discounted revenue targets[15]. Under a "Present Value of Revenues (PVR)" criterion, Developers propose the minimum gross revenue (discounted at a common rate) they are willing to accept. The P3 contract ends when the gross revenue PV is reached. The concession term may vary, but the contract provides for a base case and minimum/maximum terms. The mechanism transfers most revenue risk to the Agency, without immediate fiscal impacts. This makes it attractive from financeability and fiscal impact perspectives.

Tax-exempt Bonds

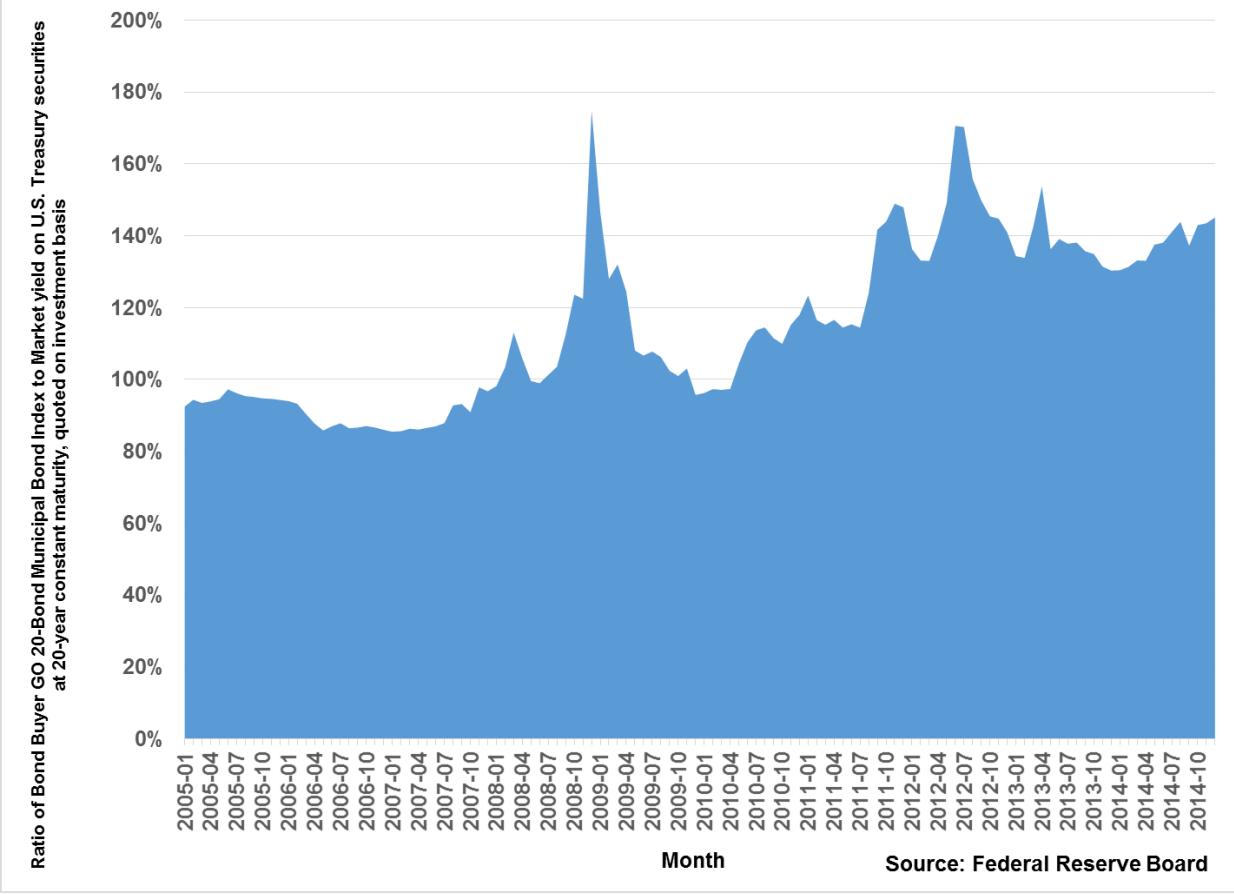
Tax-exempt bonds are instruments that are issued to investors in the capital markets. Although these instruments are often referred to as "municipal bonds" in US market jargon, they include debt instruments issued by both state and local governments. These bonds are issued to finance the vast majority of infrastructure in the US, including transportation infrastructure, and this has been the norm for more than 150 years. In fact,

[15] Oxera and RB Consult. 2012. *Disincentivising Overbidding for Toll Road Concessions.* Prepared for Department of Infrastructure and Transport. Oxford: Oxera.

the US municipal bond market is unique globally in the access to capital markets that it provides state and local governments and their agencies.

State and local government bonds are tax-exempt in that taxpayers holding such bonds are allowed to exclude their interest earnings on such instruments from gross income for purposes of determining their Federal income tax liability. Since investors do not have to pay tax on their interest income from these instruments, they do not require as high a return as they might with so-called taxable debt instruments, such as corporate bonds. Tax-exempt state and local government bonds usually offer a lower interest rate than even US Treasury bonds, since US Treasury bonds are not tax-exempt. If the creditworthiness of the US Treasury and a state/local government bond issuer were equal, the rate offered by the tax-exempt bond theoretically should be equal to one minus the tax rate multiplied by the Treasury rate. Tax rates differ among individuals, but assuming the maximum marginal tax rate of 35%, the comparable tax-exempt rate would be 65 percent of the rate offered by Treasury bonds: (1-t)r with t=0.35. As a practical matter, other factors such as liquidity differences and call features require tax-exempt bonds to pay higher yields to investors than this equation would suggest. There may be additional tax exemptions available at the state and local level. However, during the financial crisis beginning in 2008, rates on state and local government bonds increased to levels much higher than those of US Treasury bonds, due to concerns about the fiscal stability of municipal issuers. Figure 10 shows the ratio of the benchmark state and local government bond rate to the benchmark US Treasury bond rate during this period.

Figure 10. Ratio of Tax-exempt Bond Yield to Treasury Yield



The tax-exemption provided by the Federal government for state and local government bonds is generally applicable only where the state or local government unit is the main party benefitting from the project and its financing. Generally, within the transportation P3 market, no more than 10 percent of an issuance of tax-exempt bonds can benefit any private business. If that threshold is exceeded, the bonds will lose their tax-exempt status. (PABs are an exception, and they are discussed in greater detail later in this chapter.) State and local governments may also use tax-exempt bonds to raise funds that are in turn committed to P3s in the form of an upfront grant. For example, Virginia DOT used Federal Grant Anticipation Revenue Vehicle (GARVEE) bonds to raise its upfront grant for the Midtown Tunnel project. With GARVEE bonds, future Federal funds are used to repay the debt and related financing costs under the provisions of Section 122 of Title 23, U.S. Code. GARVEEs can be issued by a state, a political subdivision of a state, or a public authority.

Revenue Bonds; General Obligation Bonds

Approximately two-thirds of all tax-exempt bonds are issued as "revenue bonds," meaning their repayment comes from a designated revenue source. In some cases, the revenue source is an operating enterprise such as a toll road or water and sewer system, where debt service is paid from *net* revenues derived from users, after paying operations and maintenance costs. In other cases (often termed "special revenue bonds"), the revenue source is a dedicated tax or fee unrelated to the performance of the enterprise. For example, many state transportation departments issue special revenue bonds secured by statewide fuel taxes, and public transportation agencies issue bonds secured by county or regional sales taxes. Such bonds typically have a "gross" rather than "net" pledge of the dedicated revenues and these revenues are generally not subject to project-related risks, making them more secure than project-based financings.

Revenue bonds are distinguished from "general obligation" bonds that are backed by the "full faith and credit" of their issuers—that is, by the issuer's taxing power. Enterprise-backed revenue bonds can in fact be viewed as a form of project finance since specific revenue streams are designated as the source of repayment, including toll roads and other infrastructure user fees. Revenue bonds may offer public authorities a type of non-recourse financing, as bondholders cannot typically pursue repayment of revenue bonds from general government revenues unless the public authority has offered a guarantee or backstop for a specific financing. Project revenue bonds typically bear higher interest rates than their general obligation equivalents, since their revenue sources are more limited and thus represent a higher risk to the bondholder.

Where tax-exempt revenue bonds differ from the debt used in most P3 financings is in the prioritization of payments. Bonds may be issued on the basis of gross revenue pledges or net revenue pledges. General Obligation bonds are gross revenue pledges; so bondholders have the most senior claim on the revenues of the bond issuers and are in the top position in terms of the cash flow waterfall or flow of funds. Most tax-backed revenue bonds, such as those backed by gasoline tax revenues, also are gross revenue pledges. Operating revenue bonds, such as toll revenue bonds, are often net revenue pledges so debt service payment on the bonds is second to operating expenses and major maintenance costs. However, this is not always the case. Recent examples of gross revenue pledges for toll financings include Triangle Expressway in North Carolina, Grand Parkway in Texas and the Louisville-Southern Indiana Ohio River Bridges Project. Where tax-exempt revenue bond financings are based on net revenues, the public authority may offer a guarantee of O&M expenses, so the project is not truly "ring-fenced." (See Triangle Expressway case study in Appendix B.)

Private Activity Bonds

The particular sectors that may be financed tax-exempt with PABs under applicable tax law tend to be situations where private capital has traditionally been active, or where private parties have been heavily engaged in operation and management of the facilities. Even then, the physical facilities are typically required to be owned by the governmental unit, and if leased to a private entity for operations, then subject to certain terms ensuring that the indicia of tax ownership remain with the public authority. In transportation, these

facilities include what are referred to in the Tax Code as "exempt facilities"—airports, ports, local mass transit, high-speed intercity rail, and qualified highway or surface freight transfer facilities.

For surface transportation projects, PAB allocations are available from a $15 billion pool established by the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). As of December 2015, approximately $12 billion of this pool had been allocated and $4.8 billion issued. Table 5 indicates which projects have received allocations and issued bonds through 2015. More information on the PAB allocation process is available on the FWHA website at: http://www.fhwa.dot.gov/ipd/finance/tools_programs/federal_debt_financing/private_activity_bonds/.

Table 5. PAB Allocation and Issuance through December 2015

Project	PAB Allocation ($ in thousands)
Bonds Issued	
Capital Beltway HOT Lanes, Northern Virginia	$589,000
North Tarrant Express, Fort Worth, Texas	$400,000
IH 635 Managed Lanes (LBJ Freeway), Dallas, Texas	$615,000
RTD Eagle Project (East Corridor & Gold Line), Denver, Colorado	$397,835
CenterPoint Intermodal Center, Joliet, Illinois	$150,000
CenterPoint Intermodal Center, Joliet, Illinois	$75,000
Downtown Tunnel/Midtown Tunnel/MLK Extension, Norfolk, Virginia	$675,004
I-95 HOV/HOT Lanes, Northern Virginia	$252,648
Ohio River Bridges East End Crossing, Louisville, Kentucky	$676,805
North Tarrant Express Segments 3A & 3B, Fort Worth, Texas	$274,030
Goethals Bridge, Staten Island, New York	$460,915
U.S.36 Managed Lanes/BRT Phase 2, Denver Metro Area, Colorado	$20,360
I-69 Section 5, Bloomington to Martinsville, Indiana	$243,845
Rapid Bridge Replacement Program, Pennsylvania	$721,485
Portsmouth Bypass, Ohio	$227,355
I-77 Managed Lanes, North Carolina	$100,000
Subtotal	**$5,879,282**
Allocations	
Knik Arm Crossing, Anchorage, Alaska	$600,000
CenterPoint Intermodal Center, Joliet, Illinois	$700,000
SH-288, Houston Metro Area, Texas	$600,000
Purple Line, Maryland	$1,300,000
Rapid Bridge Replacement Program, Pennsylvania	$1,200,000
Purple Line, Maryland	$1,300,000
All Aboard Florida	$1,750,000
I-70 East Reconstruction, Colorado	$725,000
Subtotal	**$5,675,000**
GRAND TOTAL	**$11,554,282**

Bank Loans

P3 bank loans are made directly by commercial banks and held on bank balance sheets. Large loans may be syndicated to spread the risk over several banks. Projects may therefore be financed by a group, or club, of banks. For large-scale projects, "club deals" may involve 10 or more banks. The original financing for the I-595 project in Florida featured a 10-year, $800 million bank club loan. The consortium of banks included BBVA, Caja Madrid, Calyon, Fortis, Societe Generale and Santander. One reason cited for the use of bank financing for the I-595 and Port of Miami Tunnel projects was the turmoil in the bond market in the first half of 2009 when both of these projects reached financial close.

Bank loans offer some major advantages compared to bonds. Banks are willing to advance funds, often in small amounts, during a flexible drawdown period. In contrast, bond issues sold in the capital markets generally are issued in the full amount of the debt capital required for the project, both for reasons of efficiency and to avoid market risk of not being able to complete the capital raise. As a consequence, part of the funding will likely be placed on deposit at a lower interest rate than that the project has to pay to bondholders. This interest rate differential is known as negative carry and is an additional cost that partly offsets the lower coupon on bond financing.

Compared to bonds, bank loan tenors on P3s since the financial crisis have been much shorter. Recent examples are provided in section 3.5. This partly results from the weakened financial health of the banks, which all suffered from the financial crisis. Another factor is increased bank regulation that requires banks to hold additional capital against long-term loans. This is a requirement of both the US Dodd-Frank financial legislation and the Basel III international bank regulatory regime. The net stable funding ratio requirement of Basel III requires banks to obtain additional long-term deposits, which are more expensive, when making long-term loans. P3 project loans are also not considered liquid under Basel III solvency tests, again driving up the cost of bank finance. A study by the UK National Audit Office after the banking crisis found that the cost of bank loans for P3 projects had risen by around one-third.

Interest Rate Hedges

An interest rate swap is a contractual agreement whereby two parties agree to exchange payments on a predetermined notional amount(s) over a predetermined set of time at agreed upon interest rate(s). Typically, one party will receive the floating rate payments in exchange for paying a fixed rate. Typically, there is a "netting" of the two payments, with one party receiving the net payments in each period. There is no exchange of principal, only an exchange in interest rate payments usually settled in net dollar amounts.

Interest rate swaps are common in bank-financed deals since banks usually lend at variable rates, which borrowers then swap for a set of payments based on a fixed rate. Prior to the 2008 financial crisis, some municipal issuers issued variable rate bonds and entered into an interest rate swap with a financial institution to obtain a "synthetic" fixed rate slightly below their direct fixed rate borrowing cost. In the current regulatory and interest rate environment, swaps are not common in bond-financed US P3 projects, and most bonds used to finance these projects carry a fixed interest rate or coupon.

3.1.2 Subordinate Debt

Subordinate debt requires lower DSCRs than senior debt but higher interest rates to compensate for its lower position in the cash flow waterfall. Subordinate debt may be provided by specialized funds or by project shareholders. TIFIA, the USDOT financing program, also is authorized to provide functionally subordinate debt.

Shareholder Loans/Mezzanine Financing

Shareholder loans and mezzanine financing are sometimes provided by investors to satisfy project financing needs and enhance their own returns. These lending instruments offer the benefits of loans in that they pay a predetermined rate on a contractual basis. The interest on these loans is also deducted from the project company's taxable income. These loans typically carry a higher interest rate than senior debt but a lower rate than targeted equity returns.

The East End Crossing Project provides an example of shareholder loans during the construction phase on a US P3 project. The loans are referred to as equity bridge loans, and the principal of the loan is converted to equity at substantial completion.

TIFIA

The TIFIA program provides credit for qualified projects of regional and national significance. Many surface transportation projects—highway, transit, railroad, intermodal freight, and port access—are eligible to apply for assistance. At the time of writing, since its launch in 1998, the TIFIA program has helped 56 projects leverage nearly $23 billion in DOT credit assistance into more than $82.5 billion in infrastructure investment across the U.S.

The program nominally offers three distinct types of financial assistance—direct loans, loan guarantees, and standby lines of credits. These instruments are designed to address the varying requirements of projects throughout their lifecycles.

- Secured (direct) loan—Maximum term of 35 years from substantial completion, with repayments starting no later than 5 years after substantial completion. This allows for ramp-up, particularly in toll road projects.
- Loan guarantee—Guarantees a project sponsor's repayments to a non-Federal lender. Loan repayments to the lender must commence no later than 5 years after substantial completion of the project.
- Standby line of credit—Contingent loan available for draws as needed up to 10 years after substantial completion of project.

As a practical matter, however, virtually all of the TIFIA activity has taken the form of direct loans, because they offer the most cost-effective form of credit assistance. To be eligible for assistance, project costs generally must total at least $50 million ($15 million for Intelligent Transportation System projects and $10 million for transit-oriented development projects, rural projects and local infrastructure projects). TIFIA generally finances up to 33 percent of eligible costs but cannot lend more than 49 percent of eligible project costs.

The TIFIA Program is designed to fill market gaps and leverage substantial private co-investment by providing supplemental and subordinate capital to projects. TIFIA credit assistance provides improved access to capital markets, flexible repayment terms, and potentially more favorable interest rates than can be found in private capital markets for similar instruments. Additionally, TIFIA can help advance qualified, large-scale projects that otherwise might be delayed or deferred because of size, complexity, or uncertainty over the timing of revenues.

The TIFIA program has been vital to the development of the US P3 industry. TIFIA has been involved in almost all major US greenfield projects advanced as P3, and approximately one-third of the projects in the TIFIA portfolio are P3 projects. Some of TIFIA's P3 projects include Capital Beltway HOT Lanes, Port of Miami Tunnel, North Tarrant Express, Presidio Parkway, and Goethals Bridge (see Table 6).

Table 6. TIFIA Loans to P3 Projects

Project	Amount	Rate (%)	Term (years)*
I-95 HOT Lanes	$300.0	2.76	35.0
Presidio Parkway Tranche A	$90.0	0.46	3.5
Presidio Parkway Tranche B	$60.0	2.71	28.0
Midtown Tunnel	$422.0	3.17	44.0
LBJ-635 Corridor	$850.0	4.22	40.5
North Tarrant Express	$650.0	4.51	35.0
Port of Miami Tunnel	$341.5	4.31	35.0
I-595	$603.4	3.63	35.0
SH-130 Segment V-VI	$430.0	4.45	35.0
I-495 HOT Lanes	$588.9	4.4	40.0

Source: State and Local Government Series (SLGS) Daily Rate

*Term is estimated from data at financial close. All loans mature no later than 35 years after Substantial Completion. TIFIA rate is set according to comparable-term Treasury yields. Source: http://www.dot.gov/tifia/projects-financed

The TIFIA program has developed a tailored approach for credit evaluations of P3 projects to facilitate these procurements. To align the TIFIA evaluation process with the overall P3 procurement timeframe, the program gets involved early in the application process. This is intended to give both the public sponsor and private bidders greater cost certainty and to streamline the TIFIA review process once the selected private bidder submits the plan of finance.

3.2 Equity

This section explores the contribution that equity investors make to a P3 project, and how to evaluate the investment returns set out in the project's financial plan.

Equity investors seek to maximize their risk-adjusted returns within their investment parameters and risk profile. They do this by minimizing costs and risks. This makes them efficient managers and owners of projects. In this sense, equity investor goals are generally aligned with government clients on P3 projects. However, in some cases goals may diverge. Most equity investors who invest at the initiation of the project have a short-term horizon of 10 years or less. To ensure "skin in the game," design-build subcontractors generally are required to hold equity in P3 projects at least until construction is complete and the project is operational. Public authorities and other equity investors may require O&M subcontractors to keep equity invested in projects during the entire contract term. Different types of equity investors are discussed in more detail below.

Another strategy for equity investors to amplify their returns is to maximize leverage, or the debt/equity ratio. Increasing the level of debt financing on a project creates a higher return on a lower amount of equity invested, although it may also increase financial risks. The debt/equity ratio usually is determined by requirements of the debt providers, mainly the debt service coverage ratio (DSCR), discussed above in Section 3.1.1.

On projects with terms much longer than the debt used to finance them, equity investors look forward to the last phase of the project when all debt has been paid down, since more cash flows are then available to be paid out as dividends. In other cases, equity investors prefer to increase leverage to have more equity available for other investments. This is often the case in asset monetization, where the initial acquisition may be done using all equity, only to be leveraged after acquisition.

3.2.1 Role of Equity in P3s

Equity investors are considered to be in a first-loss position and to accept the highest level of risk among sources of financing. They appear at the bottom of the cash flow waterfall. While equity investors may have target rates of return, the amount and timing of their returns are uncertain. This is the main difference between debt and equity financing. Debt providers enter into contracts to provide upfront financing and be repaid at predetermined rates and times over the course of a designated term. Equity investors take the risk and reward of being business owners. Just like investors in the stock market, equity investors may lose their entire investment without recourse. Because of this high level of risk to equity investments, equity investors require a higher return on their investments.

While equity investors are in a first-loss position, they also seek to insulate themselves from losses and to transfer risks, just like debt providers and public authorities. Major risks can be passed on to sub-contractors, up to negotiated financial limits.

Public authorities can benefit from the incentive framework in which equity investors operate. For example, equity investors will seek to minimize costs. However, public authorities need to ensure that their interests are aligned with equity investors in terms of project outcomes. That is the rationale behind the performance requirements and other contract issues discussed in chapter 2.

3.2.2 Types of Equity Investors

Equity investors in transportation P3 projects fall into three main categories, as described below:

- *Strategic Equity:* Subcontractors responsible for construction and/or operation and maintenance of the project may contribute equity. This may take the form of a direct investment by the contracting company or be made on an arm's-length basis by a parent company. Alternatively, another company in the same group may only act as an investor. For example, on the Midtown Tunnel project, Skanska is both a 50 percent equity investor in the SPV and a member of the design-build contractor.
- *Financial "Short-term" Equity:* This category includes investors who are not involved in the delivery or management of the project, but seek a competitive risk-adjusted return. This category could be broken down to include direct investors and indirect investors through intermediary funds, as well as shorter-term and longer-term horizon investors. Financial institutions, such as investment banks and limited partnerships, invest following a private equity model. They include "direct" equity investors that get involved in the project versus "indirect" equity investors that go through funds. This is usually a short-term investment, and these investors are willing to take higher risk, but seek a relatively early "exit strategy." The exit will typically take place once a project has started to deliver stable earnings. Such investors may target returns of 25 percent or more from successful exits, as further discussed below. For example, Macquarie sold its stake in the Denver Fastracks Eagle P3 project after the project reached financial close.
- *Financial "Long-term" Equity:* Other financial institutions prefer to invest in operating projects which offer them a long-term, stable return. Pension funds and life insurance investment funds are typical investors in this category. Often, these long-term investors are interested in the scale and duration of the overall investment opportunity, rather than in a shorter-term highly leveraged return on a small amount of equity. For example, TIAA-CREF, a pension fund, acquired a 50 percent stake in the Florida I-595 project when the project neared substantial completion.

Table 7 shows the equity investors and the amount invested for recent P3 transportation projects in the US.

Table 7. Equity Investors in US P3 Transportation Projects

Project/Investor	Amount (millions)
East End Crossing	
Walsh Investors	$26.00
VINCI Concessions SAS	$26.00
Bilfinger Berger	$26.00
I-95 HOT Lanes	
Fluor	$24.20
DRIVe USA	$217.80
Presidio Parkway	
Hochtief	$23.00
Meridiam	$23.00
Midtown Tunnel	
Skanska	$99.45
Macquarie	$121.55
LBJ-635 Corridor	
Cintra	$364.00
Meridiam	$266.00
Dallas Police / Fire Pension Fund	$70.00
North Tarrant Express	
Cintra	$241.50
Meridiam	$141.90
Dallas Police / Fire Pension Fund	$42.60
Port of Miami Tunnel	
Bouygues	$8.00
Meridiam	$72.30
I-595	
ACS Iridium	$207.70
SH-130 Segment V-VI	
Cintra	$136.40
Zachry	$73.40
I-495 HOT Lanes	
Flour	$35.00
Transurban	$315.00

Source: 2013 Guide to US P3 Transportation Projects published by Claret Consulting and available at http://www.claretconsult.com/ustrp3guide.html.

3.2.3 *Equity IRR/Hurdle Rate*

The minimum rate of return required by investors is also known as a hurdle rate. The hurdle rates used by investors to determine their bid price do not necessarily reveal their expected returns. The bid rate is likely to be an IRR on equity calculated using the equation presented in Figure 11.[16]

[16] Readers may also wish to consult Yescombe (2007), Grimsey and Lewis (2007), Delmon (2011) and Engel and Fischer (2014).

Figure 11. Calculation of Bid Rate

$$\sum \frac{(D_i - I_i)}{(1+r)_i} = 0$$

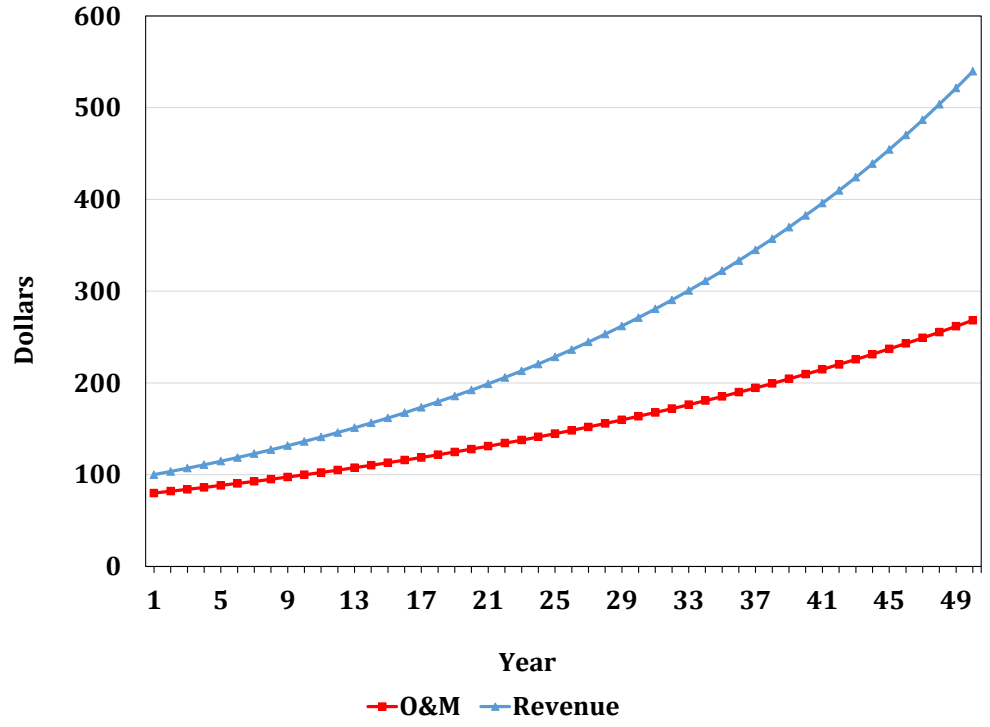
Where

r	=	Internal Rate of Return (Bid Rate).
D_i	=	Dividend at Year i.
I_i	=	Amount Invested by the Shareholders at Year i.

For an investment to be justified, and if held to the targeted investment horizon, the equity IRR must be above the hurdle rate. The approach used by bidders for pricing P3 projects is to determine the leverage and cost of debt, and then to apply their required equity return to the balance of funding needed. The required equity IRR (i.e., the hurdle rate) may then be used by bidders, under a number of different scenarios, to calculate the required annual availability payment or to set the target level of revenues from tolls.

Actual returns may turn out higher than expected because of operating efficiency, or because of changes from the assumptions made in the original project model. For example, if the rate of increase in operating costs is overestimated, and the rate of increase in revenues is underestimated, the resulting trends will increasingly diverge, and profitability will be boosted. Figure 12 shows the case of O&M costs increasing at 2.5 percent and revenues increasing at 3.5 percent. The result is an increase in the net revenue from 20 percent in Year 1 to 50 percent in Year 50.

Figure 12. Revenues Trending Higher than Costs



This example shows the importance of the initial choice of cost indices in forecasting growth in revenues and expenses. For example, the national CPI is a composite and may be easier to hold the growth in expenses below CPI in some regions of the country than in others.

3.2.4 Equity Returns Expected for Different P3s

Required equity returns decrease as the risks affecting returns reduce over time. Table 8 illustrates such a reduction, as a project moves through key phases. These differentials in required returns exist even though the investors pass most project delivery risks to their contractors (mainly on fixed priced contract terms).

Table 8. Project Phases and Required Equity Return

Phase	Risk-free Rate, percent	Project Risk, percent	Phase Risk, percent	Equity Return, percent
Construction	6	2 to 4	4	12 to 14
Ramp up	6	2 to 4	2	10 to 12
Long-term operation	6	2 to 4	—	8 to 10

Source: Adapted from Yescombe, E.R. (2007) Public-Private Partnerships: Principles of Policy and Finance. Oxford UK: Elsevier Ltd.

The risks also vary depending on differences in construction risk, such as if difficult tunneling is involved, and if applicable, the level of revenue risk on traffic volume and toll pricing. As further discussed in section 3.2.5, the investors may bear substantial revenue risk, which could be mitigated by dynamic concession terms and/or revenue bands. Table 9 indicates the targeted post-tax equity IRRs for 10 recent transportation P3 projects in the U.S.

Table 9. Equity IRRs

Project	P3 Type	Targeted Nominal Equity IRR
East End Crossing	AP	7.00[1]
I-95 HOT Lanes	Toll	12.50[2]
Presidio Parkway	AP	16.00[3]
Midtown Tunnel	Toll	12.00[4]
LBJ-635 Corridor (HOT)	Toll	17.60[5]
North Tarrant Express (HOT)	Toll	12.58[6]
Port of Miami Tunnel	AP	11.33[7]
I-595	AP	11.50[8]
SH-130 Segment V-VI	Toll	12.00[9]
I-495 HOT Lanes (HOT)	Toll	13.00[10]

Sources:
1. http://www.pwfinance.net/document/Sample_Sept_2014.pdf
2. http://www.raisingkaine.com/10369.htm
3. http://media.metro.net/board/Items/2013/01_january/20130124RBMItem36.pdf
4. https://driveert.com/wp-content/uploads/2012/12/MTCP-Toll-Feasibility-Study-_Final_-Dec2007.pdf
5. http://ftp.dot.state.tx.us/pub/txdot-info/dal/lbj_635/lbj_development_partners/financial_plan.pdf
6. ftp://ftp.dot.state.tx.us/pub/txdot-info/ftw/nte/cda/segments_3a_3b/volume_3.pdf
7. http://www.presidioparkway.org/project_docs/files/presidio_prkwy_prjct_bsnss_case.pdf
8. http://www.pwfinance.net/document/research_reprints/595_case.pdf
9. http://ftp.dot.state.tx.us/pub/txdot-info/tta/sh130_cda/exhibit_5.pdf
10. http://www.pwfinance.net/document/research_reprints/13%20495%20beltway.pdf

The project IRR represents the financial return or yield of the project regardless of the financing structure. It may be used to assess the general financial viability of a project without taking account of its financial structure (i.e., ratio of debt to equity). The equity IRR generally will be higher than the project IRR. One way to understand this is to realize that the project IRR must be distributed to several parties, mainly tax authorities, debt providers, and equity investors. Project IRR can be presented in both pre-tax and post-tax forms. As

discussed above, debt is typically cheaper than equity and, since P3s are typically highly leveraged, debt typically accounts for more than half of project financing. So, equity is both more expensive (equity investors expect a higher return) and less abundant in project financing. In other words, more of the project return will accrue to a smaller amount of the financing.

3.2.5 *Factors Determining Actual Return on Equity*

An inherent factor, potentially generating higher returns than declared in the bid, is the initial investors' expected exit rate of return (i.e., the return from selling the project to a new investor prior to the end of the concession). At the time of bidding, primary investors can estimate a future value of their equity, based on pro-forma projections of financial performance or recent secondary market prices. When based on availability payments, revenue streams are relatively stable and can confidently be estimated within a narrow range. Transportation projects with traffic risk will naturally produce revenue estimates across a broader range. In either case, investors also have to consider economic factors that may alter the required rate of return by the time their project is ready for sale.

In the UK, for example, secondary market investors have acquired revenue streams from many projects that have reached the operating stage. These have been availability payment based projects, and the required returns have recently been around 7 to 8.5 percent. The impact on UK projects initially bid at around 14 to 15 percent has been to generate exit rates of return above 30 percent. Potential returns on this scale have attracted investors during the uncertain bidding stages of transportation projects, leading to increased competition.

The secondary market for equity stakes in P3 projects in the US is nascent. There have been a few transactions, most involving the outright sale of the project to another developer/owner. The exception is ACS's sale of half of its stake in the I-595 project to the Teachers Insurance and Annuity Association College Retirement Equities Fund (TIAA-CREF) in October 2011. The project was still under construction at the time, and the sale was seen mainly as a move by ACS to shore up its balance sheet given financial difficulties in its home market of Spain and in other regions. Other examples of P3 project sales include the following:

- In 2005, Macquarie Infrastructure Group purchased Toll Road Investors Partnership II, the owner of the Dulles Greenway concession in Virginia, and in 2006 Macquarie Infrastructure Group sold 50 percent of its economic interest in Dulles Greenway to Macquarie's Infrastructure Partners.
- Macquarie acquired the SR-125 South Bay Expressway in California from Parsons Brinkerhoff in 2003, opened the road in 2007 and subsequently filed for bankruptcy.

Perceived Risk

Many transportation projects have, in some respects, been "repeat" projects where the format and risks of the type of project have become well understood. Although the P3 contract structure pushes risk down to the subcontractors best able to manage them, there are still long-term performance, coordination and "systematic" risks (sometimes referred to as "systemic" risks) related to the overall economy that help to justify equity rates of return. Risks that may require a higher return, but which reduce over time include the following:

- There is uncertainty about whether bids will be successful and whether bid costs will be recovered. Transportation project procurements can take many months, and sometimes years, with losing bidders often involved until a late stage. This bidding risk affects only the Strategic Equity investor (Developer), not the Financial Equity investor, who does not commit capital until the franchise is awarded.
- Construction completion delays and overruns (including force majeure that cannot be shifted).

- The selected P3 subcontractors may fail, especially during construction, and in the early operating or ramp-up phase.
- Higher-than-estimated lifecycle costs over the extended project life.
- Additional insurance and hard-to-predict cost changes or uninsured events.
- Unintended mismatch between concession terms and those in sub-contracts.
- Sustained revenue deductions for performance failures.

The FHWA's Risk Assessment Guidebook suggests that some systematic risk may be valued through a derived discount rate, and some risk may be valued in the cash flows.

FHWA Risk Assessment Guidebook, Appendix 2, Determination of the Discount Rate

In a P3 approach, a substantial portion of the risk profile is reflected in the Weighted Average Cost of Capital (WACC). The pricing follows the organizational structure of a P3 special purpose vehicle (SPV). Most of the risks are typically subcontracted and therefore shown in the cash flows in the bid. Some of the risks are explicitly or implicitly (for example through caps on liabilities in subcontracts) retained by the SPV. These are not only typical systematic risk categories (for example inflation, interest rate, and toll risk) but also risk categories that are associated with the long-term and integrated characteristics of the contract (long-term performance risk and project coordination risks).

Availability Payment vs. Toll Concession

Projects are structured so that debt service payments can be met by project income under various risk-based scenarios. On availability payment based projects, debt providers have low default risk as a result of the credit being a relatively safe public authority. This reduces the project risk and lowers the cost of finance. The amount of equity required will likely fall in the range of 5 to 15 percent. There is a more variable risk of public authority interference—for example, managing a P3 project more aggressively after a change of political leadership. In early credit rating exercises, availability payment projects were ranked two notches below the public authority payment counterparty.

Investors in a toll-based project may bear substantial revenue risk, which may be mitigated by dynamic concession terms and/or revenue bands. The amount of equity required may be higher, reaching 20 to 40 percent of the total funding needed. As table 10 indicates, US P3 projects reflect these realities. The toll concession projects have featured equity investments that represent 16 to 35 percent of the financing, while equity in availability payment projects has ranged from 10 to 13 percent.

3.3 Public Subsidies and Guarantees with Toll Concessions

3.3.1 Capital Subsidies

A key feature of US P3 toll concession projects has been relatively large state grants to help cover capital costs (see Table 10). In addition to grants, projects may also receive milestone payments, which are conditioned upon the developer achieving certain project completion thresholds. The choice of whether to provide funding through upfront public subsidies or through milestone payments may be determined by a state's own cash flow issues or strategically through consideration of financial incentives. These issues are addressed in more detail in section 3.6. State grants help to reduce required revenues to repay financing on P3 projects, which typically translates into lower toll rates on the projects.

Table 10. Equity in US P3 Transportation Projects

Project	P3 Type	Equity as a Percentage of Financing, percent	Equity as a Percentage of Cost, percent	Subsidy as a Percentage of Cost, percent
I-95 HOT Lanes	Toll	35	32	8
LBJ-635 Corridor (HOT)	Toll	31	25	19
North Tarrant Expressway (HOT)	Toll	29	21	28
I-495 HOT Lanes	Toll	23	18	21
Midtown Tunnel	Toll	17	11	15
SH-130 Segment V-VI	Toll	16	16	0

Source: Official Statements, FHWA website

3.3.2 Operational Subsidies

Operational subsidies typically have not been a feature of US P3 projects. (A recent example is I-77 in North Carolina awarded to Cintra in April 2014.) Instead, certain functions or tasks remain outside of the scope of the project, such as maintenance or policing. The project company will sometimes sub-contract the public authority for some of these services. The US market has not featured projects that are financed through a mix availability payment and user fee (toll) revenue streams, although this is a possibility and one way to provide operational subsidies even to a user-fee-based project. The UK Nottingham Express Transit Phase II project is an example of innovative structuring that does just that. The availability payment constitutes 60 percent of project revenues to start and then gradually decreases to 40 percent as other project revenues increase. The project also features performance requirements for ridership levels to encourage the private partner to attract ridership on the transit system.[17]

3.3.3 Revenue Guarantees

While revenue guarantees have not been a feature of US transportation P3 projects, they have been used extensively in other countries. Some public authorities find guarantees more attractive than direct subsidies because they do not require cash commitments and are only triggered in cases when revenues do not meet projected targets. In many cases, minimum revenue guarantees (MRG) are designed in conjunction with revenue or profit sharing mechanisms. In such cases, a revenue band may be established whereby if revenues fall below a certain threshold, the public authority will pay a subsidy to the concessionaire and if revenues rise above a certain level, the concessionaire is required to share revenue with the public authority.[18]

3.4 Maturity and Amortization

This section provides examples of loan repayment terms from both the bond market and the bank market. The public authority generally is interested in the longest available tenor for affordability reasons, to minimize

[17] For more information, see http://www.thetram.net/construction-about-phase-two/.

[18] For more information on revenue guarantees, see:
Irwin, Timothy. 2003. *Public Money for Private Infrastructure: Deciding When to Offer Guarantees, Output-Based Subsidies, and Other Fiscal Support*. World Bank Working Paper No. 10. Washington, DC: World Bank.
European Public Private Partnership Expertise Center (EPEC). 2011. *State Guarantees in PPPs: A Guide to Better Evaluation, Design, Implementation and Management*. Luxembourg: Brussels.
Hemming, Richard. 2006. *Public-Private Partnerships, Government Guarantees, and Fiscal Risk*. Washington, DC: International Monetary Fund.

the annual payment requirement even if the nominal financing rate is higher. The most desirable maturity will correspond to the useful life of a well-maintained highway. A commercial constraint on extending this period indefinitely will be the difficulty in accurately estimating future major resurfacing expenditure.

In terms of projects that have relied on bond financing, the I-95 HOT lanes project features PABs with principal payments spread out from year 18 to year 27. Repayment of the PABs for Midtown Tunnel is generally ascending, reflecting the projected increases over time in available net revenues. The LBJ-635 and North Tarrant Express PAB principal payments are spread out from year 20 to year 30. The Capital Beltway HOT Lanes PAB principal repayments are spread out from year 30 to year 40. Tenors may go even longer.

In terms of the bank market, since the onset of the financial crisis, the ability of commercial banks to extend long-term financing has been severely eroded. The SH-130 project in Texas that reached financial close early in 2008 featured a 30-year loan in the amount of $685 million. Many banks can now extend loans to a maximum of only 7 years, which is in stark contrast to long-term lending prior to the crisis. However, for I-595, the bank debt was intended to serve as long-term financing. It had an original term of 10 years with the expectation of refinancing for another 12.5 years. The allocation of refinancing risk is discussed in section 3.5.2.

For Presidio Parkway, the loan was for 3.5 years and expected to be repaid with a milestone payment. The Port of Miami Tunnel bank debt included a $322 million, 5-year loan to be repaid with $450 million of milestone and final acceptance payments and a $22 million loan to be repaid from the first availability payment.

One factor affecting bank loan tenors is the financial health of the banks, which all suffered from the financial crisis. Another factor is increased bank regulation that requires banks to hold additional capital against long-term loans. This is a requirement of both the US Dodd-Frank financial legislation and the Basel III international bank regulatory regime.

Amortization Profile

Both bank and bond financing allow for "repayment sculpting" to match debt service to project revenues. Bond financing usually features the issuance of a series of bonds that carry different maturities and rates. Midtown Tunnel relies on $663,750,000 of PABs as part of its financing. This amount is divided into 14 separate bond maturities or tranches (11 serial bonds and 3 term bonds) that are scheduled to come due within a range of 10 to 30 years. The principal amounts, maturities, coupon, and yields for these bonds are displayed in Table 11. The difference between the coupon and the yield is a function of the actual price paid for the bond. If the bond sells at face value, then the coupon is the same as the yield. If the price paid for the bond is higher than the face value, then the yield will be lower and vice versa. The semiannual maturity shown in the table is unusual. Also, the table includes a mix of callable and non-callable bonds, which account for the differences in yield.

Banks also rely on repayment sculpting to support project ramp-up phases and revenue projections. They may offer a period of interest-only payments during construction and after (referred to as "grace period") to provide some relief to the project. They may also offer different repayment scenarios, such as fixed principal payment or fixed total payment based on the project cash flows.

While P3s sourcing debt from the public capital markets typically issue long-term bonds at the outset, P3s alternatively may rely on construction loans and subordinate loans to satisfy financing needs during construction and other periods in the contract term. Construction loans usually are replaced with long-term financing once the project is operational, or they may be paid off with milestone payments from the public authority. Some public authorities see value in construction lenders and the discipline they may bring to construction monitoring and cash flow management. This is one rationale for providing milestone payments at different stages of construction. Another motivation is reducing long-term interest expense by insulating permanent lenders from construction completion risk. Cash flow management on the public side is another

rationale. This is the motivation behind Florida's extensive design-build-finance (DBF) program, where short-term financing is used to accelerate projects in advance of future years' internally available resources, federal aid, and bond proceeds. Projects may also rely on bond anticipation notes (BAN) and construction loans to be paid off with TIFIA loan proceeds as long as all of the short-term loan proceeds are used for TIFIA-eligible project costs.

Table 11. Midtown Tunnel Bond Financing

CUSIP	Maturity	Principal, US$	Coupon, percent	Yield*, percent
928104KW7	1/1/2022	670,000	4.25	4.45
928104KX5	1/1/2023	685,000	4.50	4.60
928104KY3	7/1/2023	1,775,000	5.00	4.60
928104KZ0	1/1/2024	1,760,000	5.00	4.75
928104LA4	7/1/2024	2,900,000	5.00	4.75
928104LB2K	1/1/2025	3,080,000	4.75	4.90
928104LC0	7/1/2025	4,875,000	5.00	4.90
928104LD8	1/1/2026	5,290,000	5.00	4.95
928104LE6	7/1/2026	6,700,000	5.00	4.95
928104LF3	1/1/2027	6,150,000	5.00	5.00
928104LG1	7/1/2027	8,480,000	5.00	5.00
928104LH9	1/1/2032	91,795,000	5.25	5.25
928104LJ5	1/1/2037	209,185,000	6.00	5.32
928104LK2	1/1/2042	320,405,000	5.50	5.50

Source: Midtown Tunnel Official Statement available from MSRB EMMA database, CUSIP 928104LK2.

*The rate is the rate offered to bond buyers. When bonds are sold, they often do not sell at face value but at either a premium or a discount. The yield indicates the actual return offered to bondholders based on the actual price paid.

Other public authorities have adopted a different approach by providing upfront public subsidies instead of milestone payments. Under this scenario, private partners are still obliged to adhere to the construction schedule, but they invoice against committed state funds as well as bond proceeds and, if needed, their own equity during construction.

Amortization vs. Bullet Payment (for Bonds)

While individual bonds do feature balloon payments, in that they feature interest-only payments until their maturity when full principal is due, bond financing of large-scale transportation projects in the US, including P3s, involves the issuance of a whole series of bonds for individual projects. As discussed previously, the maturity of these bonds is typically spread out over a range of years. In the case of Midtown Tunnel, bonds mature over a period of 10 to 30 years. On the other hand, East End Crossing's Series B PABs in the amount of $195 million are essentially construction financing coming due in 2019 and priced to yield 2.28 percent.

Bank financing will include amortization beginning at least in the second year of the loan. Prior to the financial crisis, it was possible to obtain interest-only loans with balloon payments, and these may return to the market at some point. Principal payments may be constant or increasing to match decreasing interest payment on a total fixed payment arrangement. On availability payment deals, banks may be able to offer loans of up to 20 years, but on revenue risk deals, they are unlikely to offer loans longer than 7 years. If project cash flows are not sufficient to repay a loan in 7 years, then the project may face refinancing risk. Even before the crisis, many P3s internationally relied on 10-year bank loans with the government accepting refinancing risk. This is typically not an issue in the US, where bank loans have been used almost exclusively for short-term construction financing with bond financing offering terms up to 40 years, thereby eliminating refinancing risk.

Cash Sweep

A cash sweep, or debt sweep, is the mandatory use of excess free cash flows to pay down outstanding debt rather than distribute it to shareholders. Debt providers consider how far the ability to slow down distributions to shareholders mitigates their risk. They model the impact in a number of stress tests or downside scenarios. Alternatively, part of the sweep proceeds can be placed in a debt service reserve account. A cash sweep may be used where a balloon payment structure exists, to encourage refinancing of the debt well before the final balloon repayment date. It may also be used where there is uncertainty about the growth of future revenues, where lenders are concerned about the tail risk, or where substantial costs are to be incurred a long time into the future, such as for renewal, replacement, or expansion of the highway facility.

3.5 Credit Enhancements

Credit enhancement involves the use of both internal structural provisions and external financial guarantees from higher-rated entities to provide greater security to creditors, thereby lowering default risk and reducing financing costs. Some of these techniques can result in a higher credit rating on the debt obligations than would be attainable otherwise. Various forms of credit enhancement and their purpose are listed in Table 12. They are described further in the sub-sections that follow.

Table 12. Listing of Internal and External Credit Enhancement Tools

Type of Enhancement	Purpose
Internal Credit Enhancement	
Cash Reserves	Cover debt service or other expenses if net revenues are insufficient
Debt Tranching	Obtain higher rating on most of debt by making a portion of it junior lien
Cash Flow Optimization	Enhance debt through applying excess cash to prepaying portions of it ahead of scheduled amortization.
External Credit Enhancement	
Letters of Credit	Guarantee debt service to investors
Lines of Credit	Working capital for project sponsor
Bond Insurance	Guarantee debt service to investors
Governmental Guarantees	Guarantee debt service to investors or subsidize operations
Construction Risk Guarantees	Protect against contractor default

3.5.1 Internal Credit Enhancement

Cash Reserves

The establishment of cash reserves provides resources to meet obligations in the event that pledged project revenues prove insufficient to meet semiannual principal and interest payments or other project spending requirements. Reserves usually are managed by a trustee acting on behalf of bondholders who has specific instructions that indicate under what conditions reserves are to be paid out, either to bondholders or to the borrower, depending upon the nature of the reserve. Under traditional P3 models, reserves are built up after project completion from the project's initial earned revenues. When bond financing is used, it is typical to establish certain reserves (such as the debt service reserve fund) upfront with bond proceeds. Reserves may drive up project costs and financing requirements but also provide additional security for investors.

Typical reserve accounts used in connection with project financing are:

- *Debt Service Reserve Fund*: capitalized either with bond proceeds or available revenues accumulated over several years, and required to be maintained in an amount equal to average (and sometimes maximum annual) principal and interest payments;

- *Operating Reserve Fund*: usually built up over time from excess project revenues to provide liquidity to pay operating expenses, and required to be maintained at a certain level (such as 90 days of budgeted operating costs);
- *Maintenance Reserve Fund*: usually built up over time from excess project revenues to fund unanticipated extraordinary maintenance costs necessary to maintain the facility's operability, and typically required to be maintained at a level specified by an independent expert engineering consultant each year.

Debt Tranching

A project can also structurally enhance the creditworthiness of a portion its debt financing by segmenting it into a senior tranche ("slice" of indebtedness) and a junior or subordinate tranche. Giving certain bondholders or creditors a first claim on revenues before other bondholders provides a higher level of debt service coverage for the senior holders, and often can result in a higher rating for that portion compared to all the debt being uniformly secured. Because there is lower risk on the higher rated debt, the more attractive interest cost achieved on the senior portion can more than offset the interest cost of selling the smaller tranche of lower-rated subordinate debt.

Other Structuring Techniques

Project sponsors may enhance the creditworthiness of debt obligations through other structuring techniques as well. For example, structuring the annual "flow of funds" so that all or a set percentage of residual cash flow are captured through a "cash sweep," and using it to accelerate (prepay) portions of the outstanding debt, reduces bondholder exposure in the out years. Equity lockups and similar mechanisms provide additional security for lenders by limiting conditions under which cash flow may be released to equity holders, decreasing the risk of default on the debt. In addition, setting the term of a P3 agreement so that it extends well beyond the final maturity date of the debt obligations issued to finance a project provides latitude for restructuring and extending the debt to be repaid over a longer time period. All of these mechanisms add security to bondholders and lenders.

3.5.2 External Forms of Credit Enhancement

Letters of Credit

A Letter of credit (LOC) is a form of guarantee typically provided by a commercial bank that assures the recipient of full and timely payments. In the context of project finance, an LOC would take the form of a bank guaranteeing to a creditor (lender or bondholder) that debt service payments would be received as they became due. If the LOC is from a highly-rated bank and covers the full amount of principal outstanding plus accrued interest due on the payment date, the bond rating will reflect the bank's rating rather than the (lower) underlying rating of the project. Although LOC's are used to secure long-term (25 to 30 year) bond issues, the bank commitment typically extends only 5-10 years. If the bank elects not to renew its LOC at the end of the commitment term, either a substitute bank must be brought in with at least as high a credit rating, or the bonds must be redeemed with a final draw on the LOC and the issuer is forced to refinance the issue.

LOCs often are used in connection with variable rate demand obligations (VRDOs), which are floating rate securities that allow the bondholder to put or tender the bond back on a weekly or monthly basis. VRDOs were quite prevalent 10-15 years ago, but as a result of sustained low long-term interest rates and the decline in the credit ratings of many of the major banks, LOCs are much less common today. For example, the *Bond Buyer Annual Review*, an industry trade publication, reports that the volume of new municipal bond issues backed by letters of credit declined from $71.5 billion in 2008 to just $3.3 billion in 2014—a 95% reduction. The obligor pays annual commitment fees to the bank providing the letter of credit, and to the extent the LOC is drawn upon, such advances must be repaid to the bank with interest over a defined "reimbursement

period" (e.g., five years). The borrower will determine the cost-effectiveness of the bank's credit enhancement by comparing the rate on the LOC-backed issue plus annual bank fees to its own cost of borrowing without enhancement.

Lines of Credit

A Line of credit differs from a letter of credit, in that it is a standby lending commitment from a bank generally issued *in favor of the obligor*, not the creditor, within specified limits. Lines of credit offer liquidity on demand for project companies. They can be used for general working capital needs of the project, typically arranged at project start-up or once project revenues have begun. They offer coverage in the case of a cash flow shortfall and may be used by the borrower for debt service or for operational expenses. But they do not directly provide the bondholder with a guarantee protecting them from default risk. Lines of credit also may be used to repurchase bonds with a "put" feature that have been tendered back to the project company issuer but have not yet been remarketed to new investors.

The obligor pays annual commitment fees to the bank providing the line of credit, and any draws on the bank facility must be repaid typically within five years at interest set at some margin over the prevailing short-term London Interbank Overnight Rate (LIBOR), an international benchmark lending rate.

Bond Insurance

Monoline bond insurers use their capital base and high ratings (AAA in the best scenario) to support project financings by guaranteeing repayment, thus sharing some of the risk and reducing the price (interest rate) charged by debt providers for financing. The borrower typically pays the insurer a guarantee fee (the bond insurance premium) upfront out of bond proceeds. If the borrower defaults, the insurer steps in and pays principal and interest as originally scheduled. As with the bank LOC's, issuers take into account the cost of the credit enhancement (the bond insurance premium) in determining whether the guarantee is cost-effective.

Prior to the 2008 financial crisis, seven monoline insurers carried AAA ratings, and bond insurance was widespread—over 57% of all new municipal bond issues were insured in 2005. However, many of these insurers guaranteed subprime mortgage financings and were downgraded as a result of their exposure to those assets and/or because of indirect effects of the subprime crisis. In 2014, only 5.5% of new issues were insured. However, several new monoline insurers are back in the market with AA ratings (Assured Guaranty and Build America Mutual), and there have been some recent P3 financings with monoline support internationally. They may once again become a widespread source of financial guarantees in the US P3 market.

Governmental Guarantees and Subsidies

A governmental project sponsor can provide credit enhancement to local projects through various mechanisms, ranging from contingent funding commitments to outright guarantees. For example, the City and County of Denver provided a long-term "moral obligation" commitment to support up to 50% of the debt service payable on a Federal Railroad Administration loan secured by projected tax revenues in a tax increment district surrounding the newly expanded Denver Union Station. For the Number 7 subway line extension in Manhattan and related pubic improvements, the City of New York agreed to pay interest on $3 billion of tax increment bonds issued by the Hudson Yards Infrastructure Corporation, reducing the level of project revenues needed to cover debt service and thereby helping it obtain an A2 bond rating.

Governmental project sponsors may also provide credit enhancement indirectly, by assuming certain project operating costs, thereby allowing all project revenues to first be applied to debt service. For example, for the $1.0 billion Triangle Expressway, a 20-mile toll road near Raleigh, NC, debt service payments rank higher in priority claim on annual toll revenues than do annual operations and maintenance expenses. This is possible because NCDOT has agreed to pay O&M costs from the State Highway Trust Fund should toll revenues be insufficient after meeting annual debt service requirements. By inverting the typical flow of funds sequencing,

where the first revenues received normally would pay for operations, NCDOT has enhanced the credit profile of this project, enabling it to obtain an investment grade rating of Baa3.

State/local sponsors can also "over collateralize" a new project financing by making available additional revenue streams to augment project-generated revenues. For Virginia Department of Transportation's Downtown/Midtown Tunnel project (described elsewhere in this Guidebook), new toll revenues on an existing tunnel are supplementing tolls to be collected on the new harbor crossing to help finance this $2.1 billion project.

At the federal level, the loan guarantees that are technically available (but virtually unutilized) under the TIFIA and RRIF credit programs represent a potential source of credit enhancement. Such guarantees would command a AAA rating, based on the irrevocable promise of the United States to pay principal and interest on the guaranteed obligations. However, project sponsors have instead preferred to obtain federal credit assistance in the form of direct loans, because of the lower interest rates and more flexible structuring and repayment terms.

Construction Risk Guarantees

Various external credit enhancement mechanisms are used to reduce the risk of project construction not being completed because of contractor performance issues.

Parent Company Guarantees.

Private sector companies usually participate in P3 projects through subsidiaries or special purpose vehicles (SPVs). The objective is not solely to limit the parent company's financial exposure. Indeed, a separate governance structure around a project is necessary to provide delegated authority and the autonomy needed to motivate project executives. The rationale for the SPV structure is discussed in detail in chapter 2.

The public authority project sponsor, however, reasonably requires parent company financial engagement over and above the reputational risk for the private companies undertaking construction of the project. As described below under "Contractor Surety Bonds," construction contracts typically require various surety policies, and may additionally require bank letters of credit covering a limited percentage of the value of the contract. Debt providers consider the amount of such financial guarantees in stress testing the project for downside scenarios. If the amount of parent equity investment in the SPV and/or the surety policy backstopping of the SPV's contractual obligations proves insufficient in some scenarios, debt providers may ask for the parent companies to guarantee the provision of greater amounts.

In the US, parent companies typically guarantee compliance with all financial and technical requirements of the design-build agreements that form part of the overall P3 agreement. They also guarantee equity contributions to project financing by the project company, which commitment may be further backed by a bank letter of credit. Parent companies have also pledged contingent capital to supplement any shortfalls in toll revenues during construction (in the case of Midtown Tunnel) and to replenish reserve accounts (in the case of LBJ-635).

Contractor Surety Bonds.

A contractor surety bond is a guarantee, in which the surety guarantees that the contractor, called the "principal" in the bond, will perform its obligation to construct the project, as stated in the bond. It normally remains in full force and effect until the contractor fully performs the stated obligation. For example:

- The obligation stated in a *bid bond* is that the principal will honor its bid and enter into a binding construction contract if it is selected as the winning bidder.
- The obligation in a *performance bond* is that the principal will complete the project.

- The obligation in a *payment bond* is that the principal will properly pay subcontractors and suppliers.

If the principal fails to perform the obligation stated in the bond, both the principal and the surety are liable on the bond, and their liability is "joint and several." That is, the principal, the surety, or both may be sued on the bond, and the entire liability may be collected from either the principal or the surety. The upward limit on the amount that may be collected is the amount in which a bond is issued (known as the "penal sum," or the "penalty amount," of the bond).

The beneficiaries (or obligees) of the bond depend on the applicable State and Federal statutes that require surety bonds on public projects. On bid bonds, performance bonds, and payment bonds, the obligee is usually the owner. In the case of a P3 project, this may be the project company. Where a subcontractor furnishes a bond, however, the obligee may be the project company, the general contractor, or both. In such cases, an owner must require a "dual oblige" rider.

The Miller Act of 1935 requires performance bonds for Federal construction projects, and subsequent "Little Miller Acts" at the State level require bonding for State projects.[19] While states may require performance bonds for 100 percent of the contract value for smaller projects, large mega-projects typically have only a limited portion of the total contract value covered by a performance bond, due to market capacity limitations. Performance bonds typically add 1.5 percent to project costs.[20] For comparison, Canada requires bonding at 50 percent, and the UK requires bonding at 10 percent. The rationale for different levels of bonding differs from country to country. Where the bonding requirement is low, the aim is for the public authority to have sufficient funds to re-tender the project to select another contractor. In the US, the rationale is for the public authority to have sufficient funds for the project to be completed.

Surety requirements have not been adjusted in light of P3 project structures, under which equity investors also cover some risks. There are some efforts underway to reduce the bonding requirements.[21]

Surety providers may not pay immediately. They may try to negotiate a settlement or litigate. This is why debt providers prefer letters of credit. However, surety providers can and do pay out and even take control of the project to ensure completion. In fact, sureties were responsible for managing the completion of the Big Dig project in Boston after the default of Modern Continental.[22]

Surety providers have responded to market concern over probability of payouts with a product referred to as a demand-pay surety, or surety with a liquidity layer. This product features a portion of the available payout that is made immediately to support continued progress on the project while the surety investigates the cause of the cash flow short fall and who is to blame.

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[19] Federal projects are those for which the federal government is the procurement agency, such as water infrastructure projects carried out by the Army Corps of Engineers or highway projects on federal lands carried out by the FHWA. The vast majority of infrastructure projects – especially in the transportation sector – are procured by state or local government agencies and are subject to the contracting requirements of the "Little Miller Acts."
[20] Gransberg, Douglas, Elizabeth Kraft and Heedae Park. August 1, 2013. "Performance Bond: Cost, Benefit and Paradox for the Public Highway Agencies". Transportation Research Board 2014 Annual Meeting.
[21] See for example http://c.ymcdn.com/sites/www.surety.org/resource/collection/73672F79-BC99-45A3-BCD0-FB3EFF8080BA/P3-NH-2014-03-12.pdf.
[22] See http://c.ymcdn.com/sites/www.surety.org/resource/collection/73672F79-BC99-45A3-BCD0-FB3EFF8080BA/P3-FAQs.pdf.

3.6 Financial Optimization Strategies

P3 financing is a complex process with a number of moving parts. Public authorities generally seek expert advice, not only from financial advisors but also from other public authorities and Federal, state, and local agencies that have undertaken similar projects. While rating agencies do not directly advise issuers on how to structure their transactions, they do publish reports describing the criteria they use in determining bond ratings, and their credit reports on specific offerings are important sources of information for bond issuers, underwriters and advisors as well as investors,

One goal of a public authority is to minimize costs. However, this is not the only goal. Even within the public finance market in the US, the use of revenue bonds as the predominant financing tool recognizes the benefits of project finance approaches that may be more expensive than general obligation financing but offer other benefits, including off-balance sheet borrowing and project finance ring-fencing.

Public authorities may seek to maximize the level of equity in a project to ensure that the private developer has "skin in the game." However, equity is more expensive than debt, so raising the level of equity also raises project costs, whether those are paid by users in the form of tolls or by the public authority in the form of availability payments.

Credit enhancements—including cash reserves, lines of credit, surety, and insurance—help to ensure project financial sustainability, but they also carry a cost. The cost of each of these instruments needs to be weighed against the benefits and viewed in light of project-specific features.

The US P3 market is experiencing a renaissance. Many P3 models have been imported from international markets. For example, it is common in other countries for the public authority to accept demand risk (and in this way provide a type of project subsidy) by structuring availability payment projects. The public authority then requires the private partners to raise their own financing from private sources. In the US, across many sectors, it is more common to require the private partner to take on demand risk but to then subsidize its financing in the form of tax-exempt debt and government loan programs.

3.6.1 Simple Debt Sizing Example

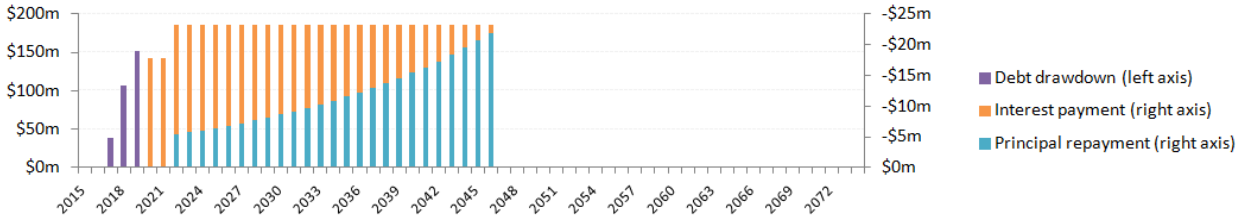
Since debt is typically less expensive than equity, the high leverage that is typical in project finance is one way to minimize costs. For example, if a project is expected to yield $100 million in net toll revenue in its first year with an increase in revenue of $1 million per year over 33 years, then CFADS is $100 million in the first year, increasing to $133 million in year 33. Given a 2.0 required coverage ratio, the maximum debt service for the project is $50 million in year 1 and $67 million in year 33. Over a 33-year term, total maximum debt service is equal to $1.739 billion (see Table 13).

The amount of financing that can be raised from this revenue stream depends on the structure of repayment. P3 projects typically have complex financing structures, potentially involving a large number of debt and equity instruments. The financing/funding structure would typically include equity, debt and public Agency subsidy payments. Debt service can be structured in two ways:

- Annuity-type (mortgage-style) debt service
- Sculpted debt service

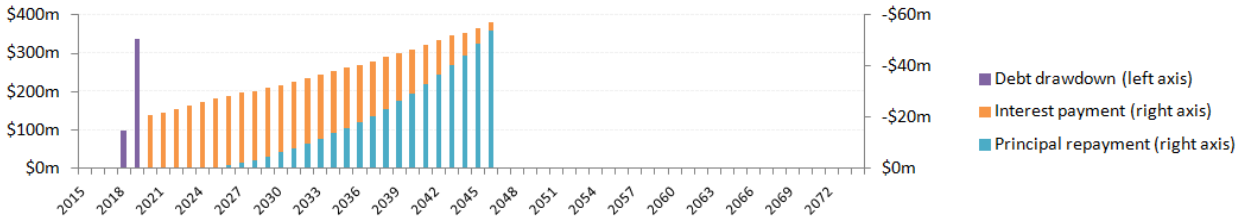
The total debt size under annuity-type debt service is determined by the minimum Debt Service Coverage Ratio (DSCR, an input) and the minimum cash flows available for debt service (CFADS), which typically occur in the early years. An example of an annuity-type debt service is shown in Figure 13 below.

Figure 13. Annuity-type Debt Service



Under a fully sculpted debt service (see Figure 14 below), the project's cash flows available for debt service (CFADS) in each year are used to create a perfectly sculpted repayment profile. This means that the DSCR will be constant throughout the debt service period. Under this approach, the total debt size is determined by the minimum DSCR and the CFADS over the entire debt service period. This may also lead to some interest capitalization during the early years of operation if CFADS in these early years is insufficient to make early interest payments. Although the CFADS under both debt service types are equal, a fully sculpted repayment makes more efficient use of these CFADS by "pushing back" debt service to future periods with higher revenues. As a result, the debt capacity of a fully sculpted debt solution will be larger than the debt capacity of an annuity-type debt solution.

Figure 14. Fully Sculpted Debt Service



In reality, P3 transactions will typically try to create a more or less sculpted debt profile using various debt instruments.

For our $100 million net revenue example, let us assume a 5.0 percent interest rate for two options:

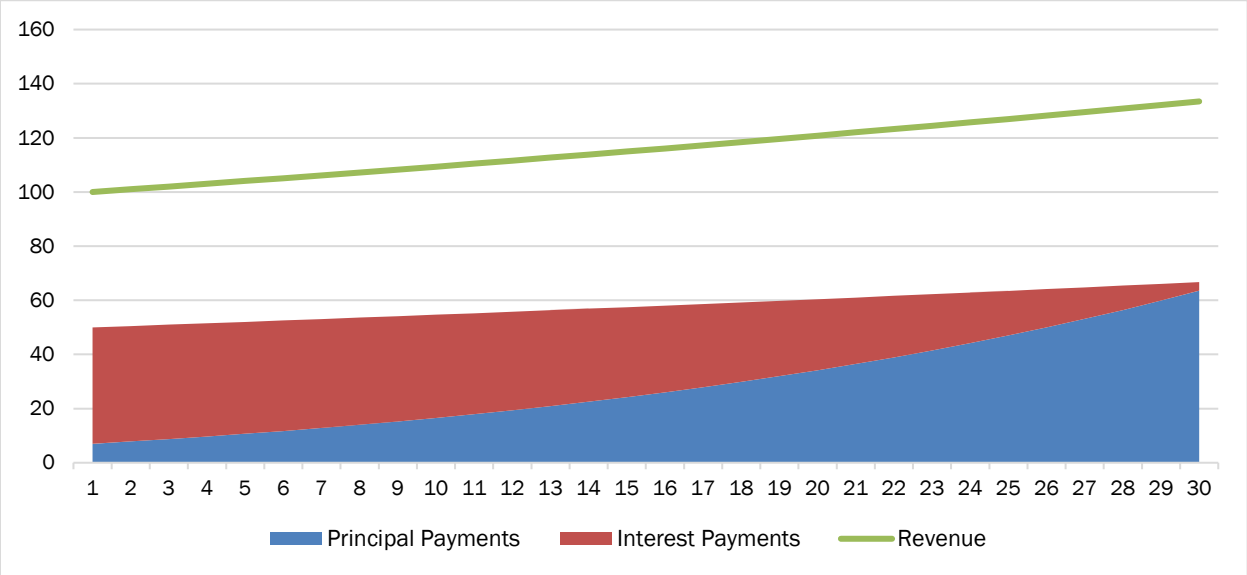
- Fully sculpted debt service.
- Level debt service, i.e., a loan requiring level debt service payments that include principal repayments throughout the term.

These options are displayed in Table 13 and Figure 15. If we assume Option 2, with a bond repayment structure the total amount of funds raised (principal) will be $769 million. If we assume Option 1 with fully sculpted debt service for the 33-year term, we can raise $860 million.

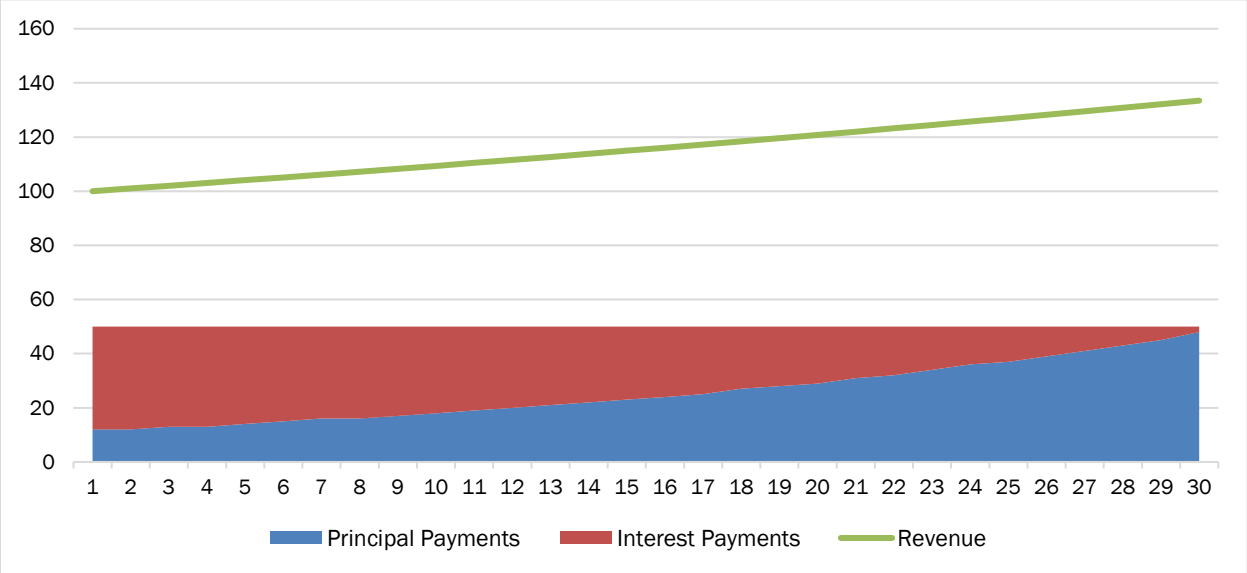
Table 13. Two Types of Repayment Structures

Revenue	Sculpted Debt Service				Level Debt Service			
	Interest rate:	5.00%			Interest rate:	5.00%		
	Tenor:	30			Tenor:	30		
	Total Principal:	860			Total Principal:	769		
	Total Interest:	879			Total Interest:	731		
	Total Debt Service:	1,739			Total Debt Service:	1,500		
	Principal Payments	Interest Payments	Total Debt Service	Outstanding Principal	Principal Payments	Interest Payments	Total Debt Service	Outstanding Principal
100	7	43	50	853	12	38	50	757
101	8	43	51	845	12	38	50	745
102	9	42	51	837	13	37	50	732
103	10	42	52	827	13	37	50	719
104	11	41	52	816	14	36	50	705
105	12	41	53	804	15	35	50	690
106	13	40	53	792	16	34	50	674
107	14	40	54	778	16	34	50	658
108	15	39	54	762	17	33	50	641
109	17	38	55	746	18	32	50	62311
110	18	37	55	728	19	31	50	604
112	19	36	56	708	20	30	50	584
113	21	35	56	688	21	29	50	564
114	23	34	57	665	22	28	50	542
115	24	33	57	641	23	27	50	519
116	26	32	58	615	24	26	50	495
117	28	31	59	587	25	25	50	470
118	30	29	59	557	27	23	50	443
120	32	28	60	525	28	22	50	415
121	34	26	60	491	29	21	50	386
122	36	25	61	454	31	19	50	355
123	39	23	62	416	32	18	50	323
124	41	21	62	374	34	16	50	289
126	44	19	63	330	36	14	50	254
127	47	16	63	283	37	13	50	216
128	50	14	64	233	39	11	50	177
130	53	12	65	180	41	9	50	136
131	56	9	65	123	43	7	50	93
132	60	6	66	64	45	5	50	48
133	64	3	67	0	48	2	50	0
3,478	**860**	**879**	**1,739**		**769**	**731**	**1,500**	

Figure 15. Plots showing Two Types of Repayment Structures



(a) Sculpted Debt Service



(b) Level Debt Service

Beyond these two simple examples, there are many variations and combinations that can be used to optimize debt financing. Banks may be flexible with coverage ratios and principal payments at the beginning of the project. Banks typically offer monthly draw schedules that allow the project company to borrow funds on an as-needed basis. Bond financing, on the other hand, typically features the raising of the total sum of principal in a single financing. This means that some of the funds are idle during the construction period. They are typically reinvested into short-term, low-risk securities such as Treasury obligations that offer an interest rate lower than the interest rate paid on the bond, producing "negative carry." The level payment structure of a bank loan may be more suitable for an availability payment deal, whereas the interest-only structure of bond financing may be preferred for a greenfield toll road that includes a ramp-up period. However, but investors in project financings will want to see an amortization schedule for the principal borrowed, based on forecasted

free cash flow. In the US most availability payment deals have featured large milestone payments that have reduced the need for long-term financing.

These features of different types of financing are some of the reasons alternative scenarios may be developed. For example, a short-term construction loan of 5 to 7 years may be coupled with a long-term bond financing of 25 years or longer. As described in section 3.4, bond financing usually includes the issuance of a series of bonds whose maturities are staggered over a period of 10 or more years. This has the same effect as the example Option 1.

For this example, let us assume that we prefer the bond financing with level debt service. We know we can raise $769 million. If the project costs less than $769 million, then it could potentially be financed with 100 percent debt. However, the lenders may require a minimum debt/equity ratio regardless of the total project cost and DSCR. And, the equity investors will require a minimum expected return for themselves. Estimating equity returns requires a more elaborate financial model that enables us to see the funds available after estimated debt service and other expenses are subtracted. This topic is discussed in Chapter 4.

Another element of financial optimization is the timing of accessing sources of financing. Since bonds usually are issued all at once, the proceeds are available from the date of issuance. This may reduce the need for upfront equity investments, and this strategy is in place in several US P3s. However, the bondholders and public authority typically require a letter of credit to be in place from financial close so that funds may be drawn as needed from equity investor creditors. One benefit of bank financing (as well as TIFIA loans) is that it can be drawn on a monthly basis to avoid raising a large sum of debt that may not be used for years, depending on the construction schedule. The use of state grants during project construction is another strategy to delay equity investments and/or debt financing. Table 14 shows the sources and uses of funds for the Midtown Tunnel project from financial close through substantial completion. This example is atypical, since toll revenues from the existing tunnel are available during construction. This type of pre-existing revenue stream is not normally available on most P3 projects.

Table 14. Midtown Tunnel Projected Cash Flows to the Substantial Completion of the New Project Assets Date (Dollars in Millions)

	Jun-12	Dec-12	Jun-13	Dec-13	Jun-14	Dec-14	Jun-15	Dec-15	Jun-16	Dec-16	Total
Sources											
Public Funds Amount	138.33	163.31	6.96	-	-	-	-	-	-	-	308.60
Series 2012 Bond Proceeds	84.67	-	52.53	90.19	109.49	99.49	113.73	124.91	-	-	675.01
TIFIA Loan	12.75	28.78	95.66	90.19	89.15	63.34	42.13	-	-	-	422.00
Interest Income on the Series 2012 Bond Proceeds	-	-	-	-	-	-	-	-	-	-	-
Toll Revenues	-	12.53	37.23	37.30	43.94	45.33	46.79	46.68	48.36	50.05	368.21
Base Capital Contributions	-	-	-	-	-	-	-	20.99	80.19	119.86	221.04
Total Sources of Funds	**235.74**	**204.63**	**192.38**	**217.68**	**242.58**	**208.15**	**202.65**	**192.58**	**128.55**	**169.92**	**1,994.86**
	Jun-12	**Dec-12**	**Jun-13**	**Dec-13**	**Jun-14**	**Dec-14**	**Jun-15**	**Dec-15**	**Jun-16**	**Dec-16**	**Total**
Uses											
Contract Price	125.51	162.42	149.04	174.18	198.41	170.96	164.52	152.76	88.80	34.29	1,420.89
Construction Reserve Account	-	-	-	-	-	-	-	-	-	47.57	47.57
Tolling Implementation Costs	2.34	6.03	-	-	-	-	-	-	0.15	2.87	11.38
Operating & Major Maintenance Costs	14.75	17.64	24.80	24.96	25.62	18.65	19.58	21.27	21.05	20.07	208.38
Interest on the Series 2012 Bonds	8.04	18.55	18.55	18.55	18.55	18.55	18.55	18.55	18.55	18.55	174.96
Development Fee and Transaction Costs	61.87	-	-	-	-	-	-	-	-	-	61.87
Underwriters' Discount	4.69	-	-	-	-	-	-	-	-	-	4.69
Debt Service Reserve Account	18.55	-	-	-	-	-	-	-	-	-	18.55
Major Maintenance Reserve Account	-	-	-	-	-	-	-	-	-	46.57	46.57
Total Uses of Funds	**235.74**	**204.63**	**192.38**	**217.68**	**242.58**	**208.15**	**202.65**	**192.58**	**128.55**	**169.92**	**1,994.86**

Source: Official Statement available for download at http://emma.msrb.org/ using CUSIP 928104LK2.

3.7 Rating Agency Considerations

Investors rely on ratings to convey the creditworthiness of a bond issuer and the likelihood of default for the bond. TIFIA also relies on credit rating agencies to provide ratings for its loans. Credit rating agencies consider dozens of criteria in reaching their conclusions about particular project credits. However, these criteria can be broken down into six different categories:

- Structure and quality of information relating to the project.
- Construction risk, including the risk of completion (assuming there are new facilities to be built as part of the project).
- Operational risk, which may be further divided into risks arising from revenue generation, obsolescence or economic life, and early termination.
- Macroeconomic risks.
- Debt structure, including refinancing risk.
- Debt service, including potential counterparty problems.

While the three rating agencies may approach their analysis somewhat differently from project to project, all agree that P3s should be considered from a risk perspective. There is further agreement among the rating agencies that a pure project finance structure—where creditors depend solely upon project revenues for repayment—must be assessed differently than a project supported by an availability payment from a public authority. In general, it can be said that the availability payment structure will be more stable over time, and therefore better rated, than a project depending only on toll revenues or other user fees.

The most important objective of the project developer or public authority with regard to ratings is to reach what is called "investment grade"—that is, a rating that is at least in one of the top four ratings of each of the rating agencies (without taking into account other subcategories). The notion of investment grade securities arises from the fact that, under applicable state law, many fiduciaries such as insurance companies or executors of trusts may only invest in securities of a certain minimum quality. The exact denotations for these investment grade ratings vary by agency, with Fitch and S&P starting at BBB- (the lowest investment grade category), followed by A, AA, and AAA (the highest), and Moody's starting at Baa3 (the lowest), followed by A1, Aa1, and Aaa (the highest). Below these rating levels, debt is referred to in the vernacular as "junk," which requires substantially higher interest rates to attract investors and may not attract buyers at any price.

In the context of toll roads, demand risk is always a concern to rating agencies, particularly for so-called greenfield projects, which by definition lack any history of usage. Traffic and Revenue (T&R) forecasts—even by firms expert in the field--have been proven to be unreliable predictors of actual usage and revenues. Appendix A discusses in more detail the manner in which rating agencies address traffic and revenue risk by subjecting T&R forecasts to various stress tests, to gauge the potential impact of lower growth in demand.

Once the demand risk has been addressed, the rating agencies look carefully at the project contracts to determine what toll pricing flexibility, if any, the private operator will have. The rating agencies would like to see a private operator have a fair amount of flexibility to increase tolls over time, as circumstances require. Failing that, rating agencies typically want to confirm that the operator can increase tolls periodically to match inflation, without the consent of the public authority.

The rating agencies also like to see strong covenants requiring the operator to spend money for O&M and to improve project assets over time, even at the cost of significant capital expenditures. These improvements typically include technology enhancements as they become available over time. These costs are deemed to be money well spent, as they maintain the quality of the asset and availability.

Finally, the rating agencies look carefully at the debt structure and other payment obligations compared to projected revenues, to determine the project's ability to meet unanticipated expenditures and future year's ongoing capital renewal. The quality of reserves and hedging counterparties also plays a role at this point in the financial assessment.

To address these criteria, each of the rating agencies will develop its base case for the project—one that they hope is realistic and avoids both pessimism bias and "irrational exuberance." Armed with their base case, they will then "stress test" the model to determine where the project may evidence weaknesses. For example, if there is a macro-level downturn in the economy, will the project weather the bad times? What if Federal monetary policy results in 3 or 4 years of higher interest rates? How will the project fare? This kind of assessment will also be developed by the financial advisor for the project, so project participants typically do not find themselves surprised by any outcome that the rating agencies reach.

Discussions with rating agencies usually begin early in the procurement process to understand their rating criteria and the conditions for achieving the desired rating. All of the agencies have published research and methodologies on rating P3s that can be reviewed by public authorities. Table 15 shows the ratings obtained by US P3 transportation project bonds.

Table 15. US P3 Project PAB Ratings

Project	Fitch	Moody's	S&P
East End Crossing	BBB		BBB
I-95 HOT Lanes	BBB-		BBB-
Midtown Tunnel	BBB-		BBB-
LBJ-635 Corridor	BBB-	Baa3	
North Tarrant Express	BBB-		
I-495 HOT Lanes Series A	BBB+		
I-495 HOT Lanes Series B	BBB+		
I-495 HOT Lanes Series C	AA		

Sources: Official Statements available from the MSRB EMMA database, news articles

Note: All I-495 HOT Lanes bond issues benefited from lines of credit.

4 Project Financial Model & Statements

4.1 Introduction

Financial models are one of the most important tools used to assess the financial feasibility of P3 projects. They incorporate a range of economic, financial, and project-specific input data and present this information in pro-forma financial statements and other formats. The models generate outputs such as the financial indicators discussed in chapter 3 that help public authorities and other parties make decisions about whether and how to proceed with P3 project implementation. The objective of this chapter is to provide an understanding of:

- The purpose and utility of financial models
- Financial model inputs and assumptions
- Project financial statements
- Amortization and depreciation
- Income tax issues related to P3s.

4.2 Financial Model Inputs

In general, the types of assumptions that are included in a P3 financial model (in addition to project details and general economic assumptions) include:

- Construction costs and other capital expenditures
- O&M costs
- Other project costs
- Various forecasted risk costs
- Traffic and revenue forecasts
- Depreciation, amortization, and taxes
- Project financing schedules
- Other revenues (including project subsidies).

This section discusses how to incorporate these assumptions into a P3 financial model. The focus is on the first five assumptions listed above. This section also covers key concepts related to the development of these assumptions for P3 projects, including optimism bias and private sector efficiency. An in-depth discussion on depreciation and amortization appears in the next section. Other items, such as project financing schedules and other revenues (e.g., grants and subsidies) have been addressed in detail in previous chapters.

Some inputs and types of analyses that are discussed in other FHWA P3 Toolkit publications are not discussed in detail in this guidebook. These include the discount rate and Value for Money Analysis. Readers can reference the relevant Toolkit publications on these topics for more information.

4.2.1 Capital Expenditures

The construction cost worksheet includes the schedule of project outlays to construct the capital assets required to operate the concession. Construction cost assumptions typically are derived by engineers with knowledge of contemporary engineering and construction techniques. Project costs typically are expressed in nominal terms based on specific forecasts of inflation for the construction industry. Design, permitting, related

development costs, including land and other acquisition costs, are typically rolled into the capital expenditure estimates for a P3.

Construction costs are not the only type of capital expenditure. Interest paid during construction is considered a capital expenditure. Fees paid to legal and financial advisors as part of the project may also count as capital expenditures. These items need to be added to construction costs to determine total capital expenditures. This is important since capital expenditures can be depreciated over time, thereby reducing the amount of taxes owed by the project company. Depreciation is addressed in the next section.

4.2.2 Operation & Maintenance Costs

O&M costs include labor, routine maintenance, payments to vendors (such as telecommunications service providers), and the like. Major maintenance, or structural maintenance, is considered a capital expenditure. These costs are typically developed by planners, engineers, and experienced facilities managers. Like construction costs, O&M costs typically are expressed in nominal terms based on specific inflation forecasts for the construction and property management industries. At an early stage in project financial assessment, it may be appropriate to use a ballpark figure to determine O&M costs, such as 5 percent of capital expenditure. However, as a project is more fully assessed, the specific line item expenses need to be estimated. This is especially important when comparing public and private costs using the Value for Money Analysis approach.

4.2.3 Other Project Costs

Other development costs include procurement, and any other costs incurred by the public sector or the private partner that cannot be categorized as project capital expenditures or O&M. These costs are typically estimated by planners and engineers based on typical project costs of similar scale and scope and in similar geographies. Other project costs are generally expressed in nominal terms.

4.2.4 Risk Costs

There are a number of risks that need to be accounted for by the private sector partner in a P3. These risks can be included in several different ways in a shadow bid estimate:

- As an implicit factor in the P3 project construction cost, O&M, and other cost assumptions.
- As an explicit expense line item associated with the cost of project delivery.

FHWA's P3-VALUE 2.0 uses the latter procedure. Risk costs are generally expressed in nominal terms and may be inflated at rates of similar costs in the financial model.

Risks associated with construction costs and other capital expenditures are rolled up into construction cost forecasts and flow through the financial model in the same manner. Therefore, capital expenditure risks will be represented in:

- Depreciation expenses.
- Capital expenditures recorded as cash outflows.

4.2.5 Revenue

As discussed in chapter 2, there are two main types of revenue for transportation P3s in the US: availability payments paid by the public authority and toll revenue. In practice, there are many other sources of revenue used to fund transportation infrastructure around the country, such as sales and property tax revenue, including those from special districts. Some of the grants used to fund P3 projects may be funded with the

proceeds of bond issuance that is expected to be repaid by some of these other revenue sources. However, these external revenue sources are outside the scope of this guidebook. The reader may refer to other publications on this topic.[23]

Availability Payments

As the name implies, availability payments pay for the availability of an asset. The term availability is well defined in project documents and is related to performance requirements that require an asset to be available for use. For example, a road that is covered in snow is not available. A lane that is closed for construction is not available. So, the full availability payment is made only when the asset is fully available.

The public authority typically makes an availability payment regardless of how much the asset is used. In this sense, if the asset is a tolled facility, the public authority accepts demand risk. However, some availability payment projects include some demand risk sharing with the private sector. One example is the case of shadow tolls that may be paid if traffic reaches certain levels or if certain types of vehicles use the road (e.g., heavy trucks that cause more damage and so increase maintenance costs). Another example is when usage is included as a performance indicator even when the revenue source is an availability payment. The main costs that need to be covered by an availability payment are the same items that appear in the cash flow waterfall, namely:

- Operational expenses
- Debt service
- Taxes
- Capital maintenance
- Equity dividends.

When upfront public subsidies or construction milestone payments are used, project debt and equity is reduced and, in turn, the required availability payment is reduced. Public authorities that pay directly for construction will have an availability payment that is similar to a long-term service contract.

The reliability of the availability payment is a function of the creditworthiness of the public authority and the performance of the project company. There is almost no financial risk associated with availability payments from a AAA-rated public authority (although there may be legal, political, or regulatory risks). Since P3 agreements are performance-based contracts, the availability payment is related to project company performance. If the project company satisfies all of the performance requirements in the project agreement, then the full availability payment is made. The certainty with which the project company can guarantee its own performance is the same as the certainty with which it can predict its own revenues from the stream of availability payments. As a general rule, the maximum deductions by the public authority due to "non-availability" will still leave sufficient annual payments for the private company to meet its debt service obligations.

Toll Revenues

Toll revenues carry a much higher level of risk than availability payments. Toll revenues depend on the level of usage of the facility and the rates charged. Both may be very sensitive to general economic conditions and other factors.

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[23] Vadali, Sharada. 2014."Using the Economic Value Created by Transportation to Fund Transportation". National Cooperative Highway Research Program Synthesis 459. Washington, DC: Transportation Research Board. Available for download at: http://www.trb.org/Economics/Blurbs/170750.aspx.

P3 financial models depend on traffic and revenue (T&R) forecasts to estimate project revenues for a toll concession. Traffic and revenue forecasts are impacted by a number of factors, including but not limited to (1) toll rates, (2) the availability of alternative routes or modes, (3) planned competing or complementary infrastructure investments, (4) the economic and land development contexts driving demand, and (5) economic factors (e.g. general state of the economy, inflation, etc.) that might constrain the amount by which tolls can be raised. Firms specializing in travel demand and transportation network modeling are typically hired to conduct the traffic and revenue study. In a P3, the offeror will likely conduct its own traffic and revenue study.

Appendix 1 provides a detailed explanation of the processes, options, and challenges in conducting traffic and revenue studies, especially for toll roads. In summary, there are several modeling options to consider:

- A four-step network assignment model forecasting regional travel demand and network behavior on the P3 roadway link at discrete times of day. These forecasts are developed based on observed average behavior within a series of small geographic zones (traffic analysis zones) and using these observations to estimate demand for and usage of the wider transportation network.
- An activity-based model that forecasts an individual's or household's travel demand and behaviors over the course of a given day as derived from assumptions about typical activities. Assumptions are made for individuals and households based on demographic and economic attributes and transportation availability.
- Other micro-simulation techniques that model dynamic behavior at a granular level.

The choice of modeling technique depends on project scale, scope, and budget, among other factors. Appendix 1 describes some of the strengths and weaknesses of each. Many P3s, especially those where the project company is remunerated with tolls, will want to employ the most granular level of analysis possible, as toll rates can have a major effect on the decision by drivers to use a P3 toll road or seek alternatives.

A good traffic and revenue forecast will employ a probabilistic approach to forecasting, similar to the approach for estimating distributions for cost-based risks. Appendix 1 provides a detailed discussion of how to conduct a quantified probability analysis for traffic and revenue studies.

Some traffic and revenue assumptions might be included implicitly in forecasts or explicitly in general model assumptions. These include, primarily, toll revenue leakage and toll revenue ramp-up. The former concerns loss of toll revenue due to evasion by motorists, technical problems affecting billing, etc. The latter refers to the observed phenomenon that traffic on new infrastructure, especially toll roads, tends to slowly ramp up over several years before stabilizing.

Generally speaking, revenues are expressed in project financial models in nominal terms, with any toll rate increases factored in.

4.2.6 Inflation

There are different measures of inflation. Consumer Price Index (CPI) measures the increase in the price level of a basket of goods and services over time. Construction inflation focuses only on the prices of construction materials and labor. General inflation is typically measured for an entire economy using weighted indices. Individual prices can fluctuate over time for many reasons based on demand and supply conditions.

When projecting future revenues and costs, inflation is an important consideration. The inflation rate chosen and how it is applied can greatly affect the projected profitability of a project (particularly when there are fixed costs such as interest payments or fixed revenues such as toll rate caps). In the financial model, inflation assumptions are used in several different ways:

- An explicit rate applied to some or all project costs and revenues.
- An implicit factor in any nominal revenue or expense forecast for other project inputs.
- An implicit element of the discount rate if reported in nominal terms.

Note, however, that inflation is different from individual changes in prices. Variable costs or revenues are estimated as well as possible and built into the expected costs and revenues of a project. For example, if it is known that a new government policy set to begin 2 years after the start of a project will raise the price of steel by 5 percent, this change would be built into the cost projections for the project.

Inflation is important for long-term projects because increases in the price level erode the purchasing power of the dollar. If, for example, the contract specifies that the project company cannot raise the toll rate more than 2 percent per year and the inflation rate in the economy turns out to be 3 percent per year, the real value of the per-unit toll revenue that the project company collects each year will be falling by 1 percent. Furthermore, if the nominal costs to the project company are rising by 3 percent each year, the financial viability of the project will be in jeopardy.

The rate of inflation is also closely tied to the concept of discount rates. The Risk Assessment Guidebook offers a thorough discussion of this relationship. The treatment of inflation in a financial model depends on the level of sophistication and detail of the model. A relatively simple model might apply an explicit rate across all or most model inputs using a single inflation indicator for the entire economy.

Various sources can be used for constructing or validating inflation inputs. A good place to start is with the US Bureau of Labor Statistics, which reports the CPI.[24]

Often, a financial model will incorporate inflation, to the extent possible, in nominal dollar forecasts for some project revenues and expenses. Prices for certain expenses, including many construction costs with volatile pricing such as fuel and steel, are often more precisely forecasted separately from the economy as a whole. Again, the CPI can provide guidance. Also, commercial publications are available to help practitioners develop or validate future-year assumptions. For example, developers typically use R.S. Means as a benchmark for construction cost and materials pricing and forecasts.[25] It is helpful to consult engineers and economists, either in-house or contracted, with strong geography-specific and subject-matter knowledge.

4.2.7 Optimism Bias

Optimism bias is the tendency of parties involved in the development of financial models to overestimate income or underestimate expenses of a capital project. This tendency has been studied in academic literature for years, but the cost over-runs of numerous large mega-projects across the world has helped focus attention on this issue and possible remedies.

Flyvbjerg, considered by many to be the authority on project cost forecasting at the planning stage, suggests there are two problems: optimism bias and strategic misrepresentation. The latter is difficult to address, as it relates to the political-economy and institutional incentives to secure funding.[26] The former is simply a psychological disposition towards overconfidence in forecasts which can be corrected for in financial modeling.

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[24] http://www.bls.gov/cpi/
[25] http://rsmeans.reedconstructiondata.com/
[26] Flyvbjerg, B. (2008). Curbing Optimism Bias and Strategic Misrepresentation in Planning: Reference Class Forecasting in Practice. *European Planning Studies*. Vol. 16, No. 1, pp. 3-21.

His proposed remedy is called reference class forecasting, where the modeler identifies a relevant reference class based on similar past projects and compares the project with a probability distribution derived for the reference class to estimate a range of outcomes.

Governments are increasingly adopting reference class forecasting and similar processes for large public works projects. The UK has been particularly aggressive in adopting procedures for adjusting all project appraisals to account for optimism bias.[27]

In the US, optimism bias is generally acknowledged as one of numerous risks and uncertainties in a major infrastructure project.[28] These are dealt with in several different ways. Contingency and reserve accounts are established to provide a buffer for over-optimistic forecasts. More advanced financial models derive probability distributions of the variation of key model assumptions and inputs and simulate the outcomes over numerous changes in the assumption scenarios. The result is a probability curve with a mean net present value (NPV) and a distribution mirroring historical volatility of assumptions. Depending on its complexity, the model may also produce distributions for any individual key line item in the financial model (e.g., net income in any given year).

Probabilistic approaches may be used to address optimism bias as a component of uncertainty. Techniques to build a financial model using probabilistic approaches are complex and typically require advanced knowledge of finance, probabilistic simulation, and programming.

The basic process for correcting for optimism bias as a component of uncertainty is as follows:

- Use historical knowledge of key model input values to define a mean, maximum, minimum, and probability distribution form for each.[29,30]
- Enter these values into the assumptions page in the financial model.
- Link these cells to a Monte Carlo simulation software package and run the program.
- Link simulation output to forecast cells in the financial model.

The generation of these distributions is covered in the Risk Assessment Guidebook.

Often, project decision-makers will choose to govern the concession on the assumption of a higher degree of confidence than mean input values. A typical rule of thumb is to use the values representing the 70th percentile (i.e., the cost outcome will be equal to or less than this value 70 percent of the time), which helps account for optimism bias and other uncertainties in transportation infrastructure financial model forecasts.

The most important consideration in assumptions for optimism bias is to acknowledge a process for addressing this phenomenon in a manner for which all parties to the transaction are comfortable.

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[27] https://www.gov.uk/government/publications/green-book-supplementary-guidance-optimism-bias
[28] See for example GAO's Cost Estimating and Assessment Guide.
[29] The most common and transparent distributions are the uniform distribution which assigns equal probability to all outcomes or the normal distribution aka the "bell curve", however, depending on the project, if large outlier events are possible ("black swans"), then distributions with fat tails, such as the Pareto distribution, could be used to account for this probability.
[30] In probabilistic approaches where distributions are defined for different inputs, one should also take into account measures of co-variance between these distributions.

Most practitioners involved in P3 decision-making are familiar with optimism bias, as the phenomenon is not limited to privately financed projects. Nonetheless, identifying optimism bias in financial model assumptions and input forecasts is challenging. Fortunately, processes have been developed to account for these biases and other uncertainties. Developing internal expertise in probabilistic risk assessment or the use of qualified consultants can help improve the detection and mitigation of optimism bias in financial models.

4.2.8 Private Sector Efficiency

Value for money refers to the public sector's goal of procuring a project in a way that offers the best value for the public agency. Under certain conditions the private sector can deliver greater lifecycle value on a transportation infrastructure project. Conclusions regarding the relative value for money of a P3 procurement versus an alternative approach are based on financial model assumptions and inputs that capture the impact of private sector innovation or lifecycle cost savings. These might include, for example:

- Lower design and construction cost estimates (including risk costs) feeding financial model capital expenditure forecasts.
- Lower long-term O&M cost estimates (including risk costs) feeding financial model forecasts of operating expenses.

There are many arguments for why P3s might justify some combination of higher revenues and/or lower costs for providing a certain level of service than might be expected under conventional public sector delivery. Research suggests there are three mechanisms by which private sector finance and project delivery can achieve greater efficiencies than conventional public procurement:[31]

- Economies of scope, or the bundling of tasks such as design and construction and O&M so as to encourage lifecycle cost-minimizing decisions.
- Allocating risks to parties best able to control and most cost-effectively manage them.
- Provision of contractually enforced incentives for performance.

Like optimism bias, it is important to understand if and how assumptions about private sector efficiency are addressed in the financial model. These will occur primarily in several places:

- Project design, construction, and O&M cost assumptions.
- Traffic and revenue forecasts.
- Risk assessment and adjustments.

These assumptions might be provided upfront, or be implicit in model assumptions and model input forecasts. Procurement officials and other planners and practitioners reviewing P3 financial models can apply their knowledge of typical assumptions for similar projects developed through conventional methods and gain a rough idea about the relative aggressiveness of the bidder's assumptions regarding private sector efficiencies. Offerors should be able to justify these gains from efficiency on the basis of the three mechanisms previously described.

[31] Macário, R., et al. (2009). ENACT – Design Appropriate Contractual Relationships, Deliverable 6. *Impacts and feasibility of SMC Pricing and PPPs*. FP6, EC DG-TREN.

4.3 Project Financial Statements

The three main financial statements are the income statement, cash flow statement, and balance sheet. The following sections discuss each of these in turn. This section is not meant to be an authoritative guide for accounting and financial statements. Each industry and firm has its own specific financial indicators of interest and its own way of presenting and interpreting those indicators. This section focuses on the elements of the financial statements that are key to the financial assessment of P3s. *Readers should consult professional tax advisors for guidance on their own projects and for specific questions and advice.*

It is important to remember while reading this section that most project companies are Limited Liability Companies (LLCs). As such, they do not typically pay taxes. Instead, the parent companies or member firms pay taxes. However, since member firm financial conditions can vary widely, it is standard practice to analyze financial statements at the project company level, including the estimation of taxes.

4.3.1 Income Statement

The income statement illustrates profits and losses in a given period based on the economic value of proceeds from operations and from the economic costs of employing plant, labor, and capital to secure those income streams. In essence, the income statement provides a snapshot of whether the value of goods and services produced exceeds the cost of producing them in any given year. A positive net income indicates that a project is generating greater value in sales and revenue for the facility in a given year than the economic costs associated with deploying assets to secure that income. For a greenfield P3, the practitioner can expect negative net income in the early years during construction before operations fully commence. Annual profits typically are expected to increase steadily once construction is complete before reaching a stable or modestly growing income stream over time.

Depreciation and Amortization

There are two basic approaches to accounting: cash-based and accrual-based. Under cash-based accounting, flows of funds are recorded as they occur. Under accrual-based accounting, assets are depreciated or amortized over their useful life. Tangible assets (like roads, bridges, and tunnels) are depreciated, and intangible assets (like tolling rights) are amortized, in both cases over prescribed periods.

Almost all US corporations use accrual accounting. Increasingly, public authorities are also using accrual accounting to more accurately reflect their finances.[32] Accrual accounting is particularly relevant for P3 projects since the concept of lifecycle costing is one of the most important rationales for P3s.

Accrual-based accounting helps public or private entities understand their financial position, in particular with respect to long-term assets. Special purpose vehicles also file their federal tax returns on an accrual basis, which allows depreciation expense to be recognized over a shorter period than financial accounting rules. Depreciation and amortization involve no cash disbursements, but are considered expenses and can be deducted from taxable income to reduce required tax payments. This is relevant to P3s because public agencies do not pay taxes; therefore, they cannot take advantage of this particular benefit of depreciation and amortization. On P3 projects, the private entities are required to pay income taxes. So, they can take advantage of depreciation and amortization thereby reducing tax payments.

In the early years of a greenfield project, the project company typically will not have any revenues, so no taxes will typically be due from its operations. Once post-construction revenues begin, the project company may owe taxes depending on the level of revenues and how they compare to the negative items on the income

[32] Cangiano, Curristine & Lazare (eds.) 2013. *Public Financial Management and Its Emerging Architecture*. Washington, DC: International Monetary Fund.

statement (operating expenses, interest payments, depreciation, and amortization). Assets typically may not be depreciated until they are put into use.

The income statement includes a line item for depreciation. This amount is deducted from operating income, or earnings before interest, taxes, depreciation, and amortization (EBITDA), along with interest expenses before taxes are assessed. So, the higher the amount of depreciation and amortization, the lower the tax bill, all else being equal. Depreciation is also added from year to year and cumulative depreciation appears on the balance sheet (discussed later in this chapter).

The US Internal Revenue Service (IRS) has determined different depreciation schedules depending on the type of assets and other factors. *Readers should consult professional tax advisors for guidance on these issues.*

A key limitation of the benefits of P3s with respect to depreciation is the requirement of tax ownership. For transportation P3s, assets generally remain the sole property of the public authority. Physical ownership is never transferred to the private partner; so if private partners are to take advantage of depreciation, they need to establish tax ownership. In order to establish tax ownership with a private operator of a publicly-owned facility, the concession or lease term generally must be 50 years or longer. It may be difficult for the public authority to pursue a P3 with a shorter term than the accounting useful life of the assets. This constraint is considered in developing the terms in the issuance of the P3 procurement documents. *Practitioners should consult IRS Publication 946 or a certified accountant or tax attorney to understand the specific application of tax laws to any given project.* [33]

Taxes

The income statement also determines the project company's required tax payments. As most project companies are LLCs, taxes are typically paid by the parent companies or member firms. However, it is standard practice in P3 financial modeling to estimate taxes at the project company level. Taxes are levied on income after certain deductions. Operating expenses, interest expenses, and depreciation are deducted from income before assessing taxes due. Once taxes are subtracted from earnings, the income statement displays net earnings, or profit. This figure is later used in the cash flow statement.

Typically one can assume that the US corporate tax rate will be 35 percent of net income. State corporate taxes may also typically apply based on the location of the P3 project. State taxes are typically deductible from Federal taxable income, and that calculation can be incorporated into the P3 financial model.

Other State and local taxes may apply. As mentioned above, P3 project companies typically do not own transportation assets and seldom have to pay property taxes on them. P3 legislation typically exempts P3 property from taxation. One exception is the Dulles Greenway, which is a special type of P3 project. Private investors bought the land required for the road and then sought permission from the Commonwealth of Virginia to operate a toll road on the property. Since the project company actually owns the road, it is required to pay property taxes which amount to approximately 3 percent of toll revenues.

4.3.2 Cash Flow Statement

The cash flow statement measures the financial liquidity of a project at any given period of time. This is the primary tool for tracking the actual flow of funds into and out of the project. A project must have sufficient funds in its accounts to cover capital expenses, current expenses, and payments on long-term obligations such as debt service. Lack of funds may require an infusion of additional equity or the securing of new debt, which might adversely affect the returns on investment to the project company. Whereas net income on the income statement may be negative in some years, and indeed will be expected to run negative in early years during

[33] http://www.irs.gov/pub/irs-prior/p946--2009.pdf

construction, the cash flow statement can never show negative ending cash, as this signifies an insolvent project.

High net cash flows in a given year do not necessarily signify financial health. Cash flow balances may be highest at the beginning of a concession term, when project risks are highest. This is because proceeds from equity raising and debt issuance may have been credited to the project accounts already while major construction costs and other expenses have yet to be paid. Meanwhile construction, traffic, and other major risks are still high. Beyond meeting project requirements, the cash flow statement also indicates when there is sufficient cash available to establish or replace reserve funds, increase the rate of debt amortization, or to pay out dividends. Cash flow statements can be constructed in two different ways:

- Direct Method: Cash flows in a given year are calculated from forecasted changes to various current accounts (i.e., accounts with cash and other short-term, liquid assets). In essence, this method provides a direct measurement of cash flows coming into and leaving the project in any given year.
- Indirect Method: Cash flows are calculated from the income statement by removing non-cash charges (i.e., depreciation) from net earnings.

The cash flow statement allows equity investors to determine how much money will be available each year for dividend payments. These are taken from the available funds line item. Each project will differ in terms of how much of the available funds can be paid out as dividends. A variety of reserve accounts may have to be established or replenished before paying out dividends. A certain amount of cash also needs to be kept on hand, such as an amount equal to the next quarter's operational expenses. Loan and bond covenants may also restrict equity payments. For example, dividends typically are not paid during construction. Lenders may require that principal payments begin or reach a certain level before dividend payments are allowed to begin. Once equity dividends are forecast for the entire contract term, a PV of dividends and Equity IRR can be estimated and compared to upfront equity investment requirements to determine if the project meets private investor hurdle rates of return.

4.3.3 Balance Sheet

The balance sheet provides a snapshot of the financial position of the project company at the end of each fiscal year. The balance sheet is a measure of the stock of value the project is creating over time in terms of assets, liabilities, and equity.

The income statement and the cash flow statement are the measures of flow each year that contribute to (or extract from) the stock of value measured on the balance sheet. The three main parts of the balance sheet are:

- Total assets, or total economic resources at the project company's disposal to operate and generate revenues.
- Total liabilities, or all of the obligations on the part of the project company in the future to pay for the assets.
- Owners' equity, which is the difference between total assets and total liabilities.

Essentially, any economic value retained in a project that exceeds long-term liabilities represents equity value to the project company or the owners of the equity position in the concession. This is represented by the accounting identity Assets minus Liabilities equals Equity (see Figure 16).

Figure 16. Calculation of Equity

$$A - L = E$$

Where

A	=	Assets
L	=	Liabilities
E	=	Equity

The balance sheet will always balance because Assets minus Liabilities plus Equity will always equal zero (see figure 17).

Figure 17. Relationship between Assets, Liabilities, and Equity

$$A - (L + E) = 0$$

Dividends paid out to owners will simultaneously reduce assets (cash on hand) and equity (retained earnings). A newly constructed highway segment will increase assets (economic value of the highway upon which to operate and collect revenues) and liabilities (debt incurred or equity raised to finance the construction).

The important take-away is to understand how assets, liabilities, and equity are accounted for in financial statements. In corporate finance the balance sheet will reflect the book value of equity in a given project at a given period of time, helping to inform whether it is advisable to pay dividends, retain earnings, pay debt, or make additional investments. In general, the dividend policy for project companies under project finance arrangements is very simple: pay out dividends whenever possible. In corporate finance, companies are constantly faced with a decision of whether to retain earnings to invest in new projects or to pay dividends. Under project financing, since the project company by design has only one project, it always pays dividends when it produces excess cash (see chapter 2 for more details).

We can use the financial statements to calculate the project IRR. One way is to calculate the project IRR on the free cash flow to the project. This is found by starting with net earnings from the income statement, adding depreciation, subtracting capital expenditures from the cash flow statement, and adding interest expense multiplied the tax effect. Then, we can use the IRR function in Excel to determine the project IRR.

5 Illustrative P3 Financial Viability Assessment

5.1 Introduction

This chapter provides a practical example of the topics covered in the preceding chapters using a hypothetical project. The chapter provides an overview and background of the project and then discusses its structure, sources of revenue, funding, and financing. The purpose is to illustrate in a very simplified way how the viability of a project with regard to financing through a P3 may be assessed.

The hypothetical Pennorado River Crossings project includes the following components:

- New 1-mile, two-lane tunnel under the Pennorado River.
- Maintenance and safety improvements to the existing Pennorado Tunnel.

5.2 P3 Structure

The Pennorado DOT is interested in undertaking a P3 with a concessionaire (i.e., project company) to design, build, finance, operate, and maintain the new project assets and to rehabilitate existing project assets. It will also be assigned the right to collect tolls for use of the project assets. The term of the agreement will be 50 years from the start of construction and the agreement will set out arrangements and remedies for delays, compensation events, and relief events in accordance with general norms as discussed in section 2.6, most notably timely completion (see section 2.6.6).

As discussed in section 2.5, the project company would enter into a set of contracts with subcontractors to transfer risks and responsibilities. The design-build contractor would be obligated to fulfill the project company's responsibilities relating to the design and construction of new project assets and the upgrading of existing project assets under the P3 Agreement.

There would be a separate tolling contract that would assign the project company's tolling responsibilities to a tolling system subcontractor. Several other subcontracts would be issued for the O&M of the project including for washing, landscaping, line striping, storm cleanup, street sweeping, and guardrail maintenance. The project company would enter into an Interface Agreement with the design-build contractor and the tolling contractor. As part of this agreement, the two subcontractors would agree to cooperate on fulfilling their individual contractual obligations and achieving overall project milestones.

The project company and Pennorado DOT would enter into an Electronic Toll Collection Agreement whereby Pennorado DOT would provide toll transaction account management services to the project company. An independent investment bank (which has no major sub-contractors) would become a critical means of assuring effective overall project management in the interests of the equity investors.

5.3 Project Revenues

Tolls were identified as the main source of revenue for the project. Potential equity investors in the project company and Pennorado DOT would rely on the traffic and revenue forecasts prepared by a transportation consulting firm. Another planning and engineering firm would provide an independent report on traffic and revenue forecasts for the bond underwriters. In the simple project financial model developed for the illustrative financial viability assessment presented in this chapter, it is assumed (based on the traffic and revenue forecasts) that toll revenues in Year 6, the first year of operation, will be $140 million and that this will increase by an annual rate of 4.5% in nominal terms.

The transfer of traffic and revenue risk to the private sector is one of the justifications for implementing the project as a P3. The P3 Agreement would establish a "concession fee" to be paid to Pennorado DOT if gross revenues exceed projections. It would establish five bands of potential revenues and assign a percentage-based fee to each band. Total revenues in a band would be multiplied by the appropriate percentage to calculate the fee for the given year. The percentages are:

- 0 percent for band 1 (all revenues up to $140 million).
- 5 percent for band 2 (revenues between $140 million and $[___x___] million).
- 15 percent for band 3 (revenues between $[___x___] million and $[___y___] million.
- 30 percent for band 4 (revenues between $[___y___] million and $[___z___] million).
- 60 percent for band 5 (revenues between $[___z___] million and $[___a___] million).

Operating expenses are estimated at $35 million for the first year and assumed to increase at an annual rate of 3.0% for the life of the project. The annual capital asset replacement rate is set at 0.5%.

5.4 Project Funding & Financing

The design-build contract is valued at $1.40 billion in real dollars, i.e., not accounting for inflation during the design-build phase. After accounting for inflation during the design-build phase and for capitalized interest on debt, nominal investment cost (i.e., "capex") rises to more than $2.1 billion. This is the amount to be raised for the project. In reality, many other costs are included as capital expenditures, including preparatory work and fees for advisory services and debt issuance. In our simple illustration, we account only for capitalized interest as an additional cost to be added to the design-build contract price. A combination of senior debt, subordinate debt and equity will be used to finance the project. Capital subsidies from the public sector area also likely (see Section 3.3.1 above).

Senior Debt

As discussed in section 3.1.1, senior debt providers are generally conservative and risk-averse, at least compared to other sources of financing for P3s. As such, they will assess a project with a critical approach to ensure the risk of default is minimal. The P3 structure described in section 5.2 is designed to minimize the construction and operational risks on the project. Another key project risk is revenue risk. Senior debt providers rely on the expertise of a specialized consulting firm to estimate toll revenues. Then, they determine cash flows available for debt service (CFADS) by deducting projected operating expenses and major maintenance expenses from the toll revenue estimates.[34] (See Appendix A for more information on traffic and revenue forecasting.)

If the risk to project revenues were minimal, such as in the case of an availability payment from an AAA-rated public authority, then the revenue projections would have minimal uncertainty. However, the revenues from the Pennorado Tunnel project feature quite a different risk profile. These are toll revenues to be collected from millions of trips by individual drivers who make their decisions on a daily basis on whether or not to pay to use the project's assets. Ultimately, these decisions rely on a large number of parameters, including individual drivers' valuation of time, the overall state of the economy, their preferences, etc. Each of these parameters carries a significant level of uncertainty, thus making project revenues uncertain. To better protect themselves from the risks inherent in toll revenues, the senior debt providers would select a relatively high

[34] We provide a highly simplified example for educational purposes. A more detailed calculation of CFADS would have to account for other projected cash flows into and out of the project, including taxes, and would address cash balances and reserve movements across periods.

required minimum DSCR, meaning that in any given year, CFADS are projected to be larger than debt service by a significant margin. The sample calculations in Table 16 use a DSCR of 2.0. (With a DSCR of 2.0, CFADS must be at least double the annual debt service in any given period). To make optimal use of the project's revenues, a sculpted repayment profile can be used. In that case, CFADS (project revenues minus operating expenses and capital maintenance expenses) are divided by the DSCR in each period to yield the senior debt service for that period.

Table 16. Senior Debt DSCR Example (Dollars in Millions)

Stylized Cash Flow Waterfall Senior Debt															
Project Year:		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Capital Subsidy		128.6													
Toll Revenue		-	-	-	-	-	140.0	146.3	152.9	159.8	167.0	174.5	182.3	190.5	199.1
Total Revenue		128.6	-	-	-	-	140.0	146.3	152.9	159.8	167.0	174.5	182.3	190.5	199.1
Operating Expenses		-	-	-	-	-	35.0	36.1	37.1	38.2	39.4	40.6	41.8	43.0	44.3
Operating Income (EBITDA)		128.6	-	-	-	-	105.0	110.3	115.8	121.5	127.6	133.9	140.5	147.5	154.8
Deduct Major Maintenance Expenses		-	-	-	-	-	11.5	11.9	12.4	12.8	13.2	13.7	14.2	14.7	15.2
CFADS (whole project term):	15,101.6	128.6	-	-	-	-	93.5	98.3	103.4	108.7	114.3	120.2	126.3	132.8	139.6
CFADS at DSCR of:	2.0	64.3	-	-	-	-	46.7	49.2	51.7	54.4	57.2	60.1	63.2	66.4	69.8
Total Debt Service, Sr Debt Tenor:	4,326.2														
Interest Rate:	5.00%														
Tenor:	40														
Total Interest:	2,884.2														
Total Principal:	1,442.1														
Check Total Debt Service (sum Total Interest & Total Principal):	4,326.2														

Stylized Cash Flow Waterfall Senior Debt														
Project Year:		**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**
Capital Subsidy														
Toll Revenue		208.1	217.4	227.2	237.4	248.1	259.3	270.9	283.1	295.9	309.2	323.1	337.6	352.8
Total Revenue		208.1	217.4	227.2	237.4	248.1	259.3	270.9	283.1	295.9	309.2	323.1	337.6	352.8
Operating Expenses		45.7	47.0	48.4	49.9	51.4	52.9	54.5	56.2	57.8	59.6	61.4	63.2	65.1
Operating Income (EBITDA)		162.4	170.4	178.8	187.5	196.7	206.3	216.4	227.0	238.0	249.6	261.7	274.4	287.7
Deduct Major Maintenance Expenses		15.7	16.3	16.8	17.4	18.0	18.7	19.3	20.0	20.7	21.4	22.2	23.0	23.8
CFADS (whole project term):	15,101.6	146.7	154.1	161.9	170.1	178.7	187.7	197.1	207.0	217.3	228.2	239.5	251.5	264.0
CFADS at DSCR of:	2.0	73.3	77.0	81.0	85.0	89.3	93.8	98.5	103.5	108.7	114.1	119.8	125.7	132.0
Total Debt Service, Sr Debt Tenor:	4,326.2													
Interest Rate:	5.00%													
Tenor:	40													
Total Interest:	2,884.2													
Total Principal:	1,442.1													
Check Total Debt Service (sum Total Interest & Total Principal):	4,326.2													

Stylized Cash Flow Waterfall Senior Debt														
Project Year:		**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
Capital Subsidy														
Toll Revenue		368.7	385.3	402.6	420.8	439.7	459.5	480.2	501.8	524.3	547.9	572.6	598.4	625.3
Total Revenue		368.7	385.3	402.6	420.8	439.7	459.5	480.2	501.8	524.3	547.9	572.6	598.4	625.3
Operating Expenses		67.1	69.1	71.1	73.3	75.5	77.7	80.1	82.5	85.0	87.5	90.1	92.8	95.6
Operating Income (EBITDA)		301.6	316.2	331.5	347.5	364.2	381.7	400.1	419.3	439.4	460.4	482.5	505.5	529.7
Deduct Major Maintenance Expenses		24.6	25.5	26.4	27.3	28.2	29.2	30.2	31.3	32.4	33.5	34.7	35.9	37.2
CFADS (whole project term):	15,101.6	277.0	290.8	305.1	320.2	336.0	352.5	369.8	388.0	407.0	426.9	447.8	469.6	492.5
CFADS at DSCR of:	2.0	138.5	145.4	152.6	160.1	168.0	176.3	184.9	194.0	203.5	213.5	223.9	234.8	246.3
Total Debt Service, Sr Debt Tenor:	4,326.2													
Interest Rate:	5.00%													
Tenor:	40													
Total Interest:	2,884.2													
Total Principal:	1,442.1													
Check Total Debt Service (sum Total Interest & Total Principal):	4,326.2													

Assume a 40-year term for the debt, which is ten years shorter than the 50-year concession period. The extra ten years (also referred to as the "debt tail") provides an additional buffer to debt financiers, should the project not be able to service its entire debt in the 40-year debt term. The sum of the first 40 years of CFADS for senior debt gives the total amount of senior debt service available for the project. This must then be divided into principal and interest payments. For this example, we use 5.0 percent as the assumed interest rate. We can arrive at an initial estimate of principal that can be raised by dividing the total debt service figure by the product of the interest rate and tenor plus 1. This is represented by the equation presented in Figure 18.

Figure 18. Equation. Calculation of Principal Payments

$$P = \frac{TDS}{[(r \text{ x } t) + 1]}$$

Where

P	=	Principal
TDS	=	Total Debt Service
r	=	Interest Rate
t	=	Tenor (years)

This is a simple model that assumes that the entire principal will be paid at the end of the financing term. It also assumes annual interest payments instead of semi-annual payments that are typical of bond financing. These assumptions keep the formulae and calculations simple for illustrative purposes.

Multiplying the estimated principal by the interest rate and tenor provides an estimate of total interest payments. Total interest and total principal can then be summed to verify that they equal total debt service. As shown in Table 16, total estimated principal is $1,442.1 million. Bringing forward principal payments would reduce the overall interest payments required. Note that the total CFADS ($15,101.6) in Table 16 is the sum for the entire project period of 50 years, while the total debt service calculated for senior debt ($4,326.2) is only for the 40-year financing term, and factoring in the 2.0 DSCR.

Subordinate Debt

As explained in section 3.1.2, subordinate debt providers have a different outlook and a different risk appetite than senior debt providers. They are less risk-averse than senior debt providers but not as "adventurous" as equity investors. They are still lenders in that they enter into a contract to be repaid, unlike equity investors who generally accept the possibility of losing their entire investment (against the expectation of a higher return). However, their repayment terms are typically more flexible than those of senior debt providers. They may allow repayment to be delayed, and by definition they always assume a ranking below senior debt providers in order of priority of payment from annual cash flows. Also, in the case of a default, senior debt will be paid ahead of subordinate debt. To determine the cash flows available for subordinate debt service, the senior debt must be factored out.

In terms of financial indicators, subordinate debt providers generally accept lower coverage ratios than senior debt providers. They typically demand higher interest rates than senior debt providers, though not as high as the expected returns for equity investors. Subordinate debt issuance is typically limited by covenants in senior debt documents, as senior debt will want to avoid the project defaulting on subordinate debt. For example, a bond covenant or loan agreement for senior debt may stipulate that while a senior DSCR of 2.0 must be maintained, the total DSCR (including both senior and any subordinate debt) must be maintained at 1.3. For an initial estimate of hypothetical subordinate debt on Pennorado Tunnel, we assume a target total debt service

coverage ratio of 1.3[35], a subordinate debt tenor of 30 years[36], and an interest rate of 10 percent. This yields a principal amount of $312.5 million (see Table 17).

Table 17. Subordinate Debt DSCR Example (Dollars in Millions)

Stylized Cash Flow Waterfall Subordinate Debt															
Project Year:		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Capital Subsidy		128.6	-	-	-	-	-	-	-	-	-	-	-	-	-
Toll Revenue		-	-	-	-	-	140.0	146.3	152.9	159.8	167.0	174.5	182.3	190.5	199.1
Total Revenue		128.6	-	-	-	-	140.0	146.3	152.9	159.8	167.0	174.5	182.3	190.5	199.1
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating Expenses		-	-	-	-	-	35.0	36.1	37.1	38.2	39.4	40.6	41.8	43.0	44.3
Operating Income (EBITDA)		128.6	-	-	-	-	105.0	110.3	115.8	121.5	127.6	133.9	140.5	147.5	154.8
Deduct Major Maintenance Expenses		-	-	-	-	-	11.5	11.9	12.4	12.8	13.2	13.7	14.2	14.7	15.2
		-	-	-	-	-	-	-	-	-	-	-	-	-	-
CFADS (whole project term):		128.6	-	-	-	-	93.5	98.3	103.4	108.7	114.3	120.2	126.3	132.8	139.6
CFADS at DSCR of:	1.3	98.9	-	-	-	-	71.9	75.6	79.5	83.6	87.9	92.4	97.2	102.1	107.4
Total Debt Service, Sub Debt Tenor:	3,570.9														
Less Sr Debt Service	2,321.1														
Subordinate Debt Service:	1,249.8														
Interest Rate:	10.00%														
Tenor:	30														
Total Interest:	937.4														
Total Principal:	312.5														
Check Total Debt Service (sum Total Interest & Total Principal):	1,249.8														

Stylized Cash Flow Waterfall Subordinate Debt														
Project Year:		**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**
Capital Subsidy		-	-	-	-	-	-	-	-	-	-	-	-	-
Toll Revenue		208.1	217.4	227.2	237.4	248.1	259.3	270.9	283.1	295.9	309.2	323.1	337.6	352.8
Total Revenue		208.1	217.4	227.2	237.4	248.1	259.3	270.9	283.1	295.9	309.2	323.1	337.6	352.8
		-	-	-	-	-	-	-	-	-	-	-	-	-
Operating Expenses		45.7	47.0	48.4	49.9	51.4	52.9	54.5	56.2	57.8	59.6	61.4	63.2	65.1
Operating Income (EBITDA)		162.4	170.4	178.8	187.5	196.7	206.3	216.4	227.0	238.0	249.6	261.7	274.4	287.7
Deduct Major Maintenance Expenses		15.7	16.3	16.8	17.4	18.0	18.7	19.3	20.0	20.7	21.4	22.2	23.0	23.8
		-	-	-	-	-	-	-	-	-	-	-	-	-
CFADS (whole project term):		146.7	154.1	161.9	170.1	178.7	187.7	197.1	207.0	217.3	228.2	239.5	251.5	264.0
CFADS at DSCR of:	1.3	112.8	118.5	124.5	130.8	137.4	144.3	151.6	159.2	167.2	175.5	184.3	193.4	203.0
Total Debt Service, Sub Debt Tenor:	3,570.9													
Less Sr Debt Service	2,321.1													
Subordinate Debt Service:	1,249.8													
Interest Rate:	10.00%													
Tenor:	30													
Total Interest:	937.4													
Total Principal:	312.5													
Check Total Debt Service (sum Total Interest & Total Principal):	1,249.8													

Stylized Cash Flow Waterfall Subordinate Debt														
Project Year:		**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
Capital Subsidy		-	-	-	-	-	-	-	-	-	-	-	-	-
Toll Revenue		368.7	385.3	402.6	420.8	439.7	459.5	480.2	501.8	524.3	547.9	572.6	598.4	625.3
Total Revenue		368.7	385.3	402.6	420.8	439.7	459.5	480.2	501.8	524.3	547.9	572.6	598.4	625.3
		-	-	-	-	-	-	-	-	-	-	-	-	-
Operating Expenses		67.1	69.1	71.1	73.3	75.5	77.7	80.1	82.5	85.0	87.5	90.1	92.8	95.6
Operating Income (EBITDA)		301.6	316.2	331.5	347.5	364.2	381.7	400.1	419.3	439.4	460.4	482.5	505.5	529.7
Deduct Major Maintenance Expenses		24.6	25.5	26.4	27.3	28.2	29.2	30.2	31.3	32.4	33.5	34.7	35.9	37.2
		-	-	-	-	-	-	-	-	-	-	-	-	-
CFADS (whole project term):		277.0	290.8	305.1	320.2	336.0	352.5	369.8	388.0	407.0	426.9	447.8	469.6	492.5
CFADS at DSCR of:	1.3	213.1	223.7	234.7	246.3	258.5	271.2	284.5	298.5	313.1	328.4	344.4	361.2	378.8
Total Debt Service, Sub Debt Tenor:	3,570.9													
Less Sr Debt Service	2,321.1													
Subordinate Debt Service:	1,249.8													
Interest Rate:	10.00%													
Tenor:	30													
Total Interest:	937.4													
Total Principal:	312.5													
Check Total Debt Service (sum Total Interest & Total Principal):	1,249.8													

It should be noted that the estimated total combined debt capacity of senior and subordinate debt would be subject to limits based on the debt-to-equity ratio required by debt providers, to ensure that equity investors

[35] The calculation of coverage for subordinate debt is cumulative, not residual. That is, the coverage factor would be calculated by comparing 100% of CFADS to the sum of senior and subordinate debt service.

[36] While subordinate debt often features tenors shorter than senior debt, recent examples such as the US 36 project in Colorado show that the market can support subordinate loans with tenors of 30 years or even longer.

have sufficient skin in the game. To keep this illustration simple, we will assume that the required debt-to-equity ratio is met.

Equity

As discussed in section 3.2, equity investors seek to maximize their returns. One of the core elements of this strategy is to maximize leverage, or debt/equity ratio. We have already pursued this strategy by maximizing senior and subordinate debt for the project at the most beneficial terms and arrangements. Equity investors typically have a higher target return from a project. Using market-based information from projects with a similar risk profile, we estimate that investors in this project would seek a pre-tax target equity return of 11.7 percent.

Now that we have estimates of project costs and revenues and estimates of potential senior debt, subordinate debt and targeted equity returns, we can analyze the project's financial feasibility as a P3 by estimating the equity IRR that can be achieved by the project given different levels of public subsidy, assuming that the required debt-to-equity ratio will be met.

The cash flow available to equity investors may be calculated by subtracting operational and major maintenance expenses, senior debt service and subordinate debt service from revenues. (We ignore reserve requirements to keep the illustration simple). This provides an estimate of the total amount of cash flows available to be paid out as dividends. However, not all of these funds can be paid out as soon as they become available. Minimum reserve requirements need to be satisfied and the project needs to maintain positive cash flows throughout the full term. Therefore, actual dividend payments are limited to ensure these other conditions are met.

Using a simplified financial model (see Table 18), we can first estimate the equity IRR assuming that the entire balance of funding needed for investment, over and above the total of senior and subordinate debt, can be provided by equity investors. (For simplicity, we will ignore other potential criteria such as requirements for reserves).

The table shows the seniority of project cash flows. Since the project has a five-year construction period, revenues do not begin until Year 6. The same is true for operational expenses (Opex) and Major Maintenance expenses. Senior and subordinate debt service are also shown to begin in Year 6. However, interest is in fact due during the first five years. As no revenues are being generated yet that could be used to pay interest, additional sums are borrowed for this purpose and included in the principal amounts for both types of debt. In other words, interest is being "capitalized." The figures in the second column are summations of the amounts for the project term.

Note that for both senior and subordinate debt, the total amount of debt service paid is less than the estimate from our raw calculations in the preceding tables. This is because our raw debt sizing estimates assume interest-only payments until the end of the project term with a bullet (lump sum) principal payment at the end of the debt tenor. In reality, principal on both types of debt is paid down as project cash flows permit so less interest is paid over debt tenors. In the illustration, debt is assumed to be fully "sculpted" to fit CFADS (as discussed in Section 3.6.1). This allows for efficient use of project funds. The debt providers also offer a grace period during which no principal payments are required. In our example, the grace period is 10 years so principal payments begin in Year 11.

The Cash Flow Available to Equity is calculated by subtracting Opex, Major Maintenance, Senior Debt Service and Subordinate Debt Service from Revenues. This provides an estimate of the total amount of cash flows available to be paid out as dividends. Note that the values are negative in the first few years. A negative value indicates that additional funds will need to be injected by equity investors. In order to support the project during these early years, equity investors provide an additional injection of equity in Year 6, 7 and 8 which covers the negative cash flow in Years 6, 7 and 8. Equity IRR can be calculated using the IRR function in Excel,

using the cash flows available to equity line item in the table below. As indicated in Table 18, the equity IRR calculated is much lower than the required return of 11.7%, and would not be feasible from the equity investors' point of view.

Table 18. Cash Flow Waterfall (in Millions of Dollars) Assuming Equity Can Provide Funding Balance

CASH FLOW WATERFALL WITH SUBSIDY COUNTED AS EQUITY														
Project Year:		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Revenue	19,439.0	-	-	-	-	-	140.0	146.3	152.9	159.8	167.0	174.5	182.3	190.5
Opex		-	-	-	-	-	35.0	36.1	37.1	38.2	39.4	40.6	41.8	43.0
Major Maintenance	1,220.8	-	-	-	-	-	11.5	11.9	12.4	12.8	13.2	13.7	14.2	14.7
Sr Debt Service	3,408.4	-	-	-	-	-	77.4	77.4	77.4	77.4	77.4	77.4	80.7	83.8	86.7
Sub Debt Service	854.6	-	-	-	-	-	31.2	31.2	31.2	31.2	31.2	32.7	33.9	35.0
Cash Flow Available to Equity	10,710.0	-	-	-	-	-	(15.2)	(10.4)	(5.3)	0.0	5.6	6.8	8.6	11.1
Equity Investment	(357.9)	(167.5)	(38.9)	(38.9)	(38.9)	(38.9)	(35.0)	-	-	-	-	-	-	-
Net Equity Flows	9,736.7	(167.5)	(38.9)	(38.9)	(38.9)	(38.9)	(35.0)	-	-	-	-	-	-	-
Equity IRR:	9.80%													

CASH FLOW WATERFALL WITH SUBSIDY COUNTED AS EQUITY														
Project Year:		**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
Revenue	19,439.0	199.1	208.1	217.4	227.2	237.4	248.1	259.3	270.9	283.1	295.9	309.2	323.1	337.6
Opex		44.3	45.7	47.0	48.4	49.9	51.4	52.9	54.5	56.2	57.8	59.6	61.4	63.2
Major Maintenance	1,220.8	15.2	15.7	16.3	16.8	17.4	18.0	18.7	19.3	20.0	20.7	21.4	22.2	23.0
Sr Debt Service	3,408.4	89.5	92.1	94.5	96.7	98.8	100.7	102.4	103.9	105.3	106.5	107.6	108.4	109.1
Sub Debt Service	854.6	35.9	36.7	37.3	37.8	38.1	38.3	38.3	38.1	37.8	37.3	36.7	35.9	35.0
Cash Flow Available to Equity	10,710.0	14.1	17.9	22.3	27.4	33.2	39.7	47.0	55.0	63.8	73.4	83.9	95.2	107.4
Equity Investment	(357.9)	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Equity Flows	9,736.7	-	-	-	-	-	-	95.1	79.1	73.0	73.2	77.4	84.5	93.7
Equity IRR:	9.80%													

CASH FLOW WATERFALL WITH SUBSIDY COUNTED AS EQUITY														
Project Year:		**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**
Revenue	19,439.0	352.8	368.7	385.3	402.6	420.8	439.7	459.5	480.2	501.8	524.3	547.9	572.6	598.4
Opex		65.1	67.1	69.1	71.1	73.3	75.5	77.7	80.1	82.5	85.0	87.5	90.1	92.8
Major Maintenance	1,220.8	23.8	24.6	25.5	26.4	27.3	28.2	29.2	30.2	31.3	32.4	33.5	34.7	35.9
Sr Debt Service	3,408.4	109.6	110.0	110.1	110.1	110.0	109.6	109.1	108.4	107.6	106.5	105.3	103.9	102.4
Sub Debt Service	854.6	33.9	32.7	31.2	15.6	-	-	-	-	-	-	-	-	-
Cash Flow Available to Equity	10,710.0	120.4	134.4	149.4	179.4	210.2	226.4	243.4	261.4	280.4	300.5	321.6	343.8	367.2
Equity Investment	(357.9)	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Equity Flows	9,736.7	104.4	116.4	129.6	149.5	173.8	194.8	214.3	233.1	252.0	271.4	291.5	312.4	334.3
Equity IRR:	9.80%													

CASH FLOW WATERFALL WITH SUBSIDY COUNTED AS EQUITY												
Project Year:		**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
Revenue	19,439.0	625.3	653.4	682.8	713.6	745.7	779.2	814.3	850.9	889.2	929.2	971.1
Opex		95.6	98.5	101.4	104.5	107.6	110.8	114.2	117.6	121.1	124.8	128.5
Major Maintenance	1,220.8	37.2	38.5	39.8	41.2	42.7	44.1	45.7	47.3	48.9	50.7	52.4
Sr Debt Service	3,408.4	51.6	-	-	-	-	-	-	-	-	-	-
Sub Debt Service	854.6	-	-	-	-	-	-	-	-	-	-	-
Cash Flow Available to Equity	10,710.0	440.9	516.5	541.6	567.9	595.4	624.2	654.4	686.0	719.2	753.8	790.1
Equity Investment	(357.9)	-	-	-	-	-	-	-	-	-	-	-
Net Equity Flows	9,736.7	417.0	456.8	490.7	521.6	551.1	580.3	610.0	640.4	671.9	704.7	1,096.8
Equity IRR:	9.80%											

To address financial viability, we could resort to increasing the toll rates. However, increasing the rates may not lead to the required increase in revenues, given that higher rates could dissuade some drivers from using the road. Also, there could be concerns about potential public opposition to higher toll rates. Another option to address financial viability is to offer a public capital subsidy for the project.

While we have maximized debt based on DSCR alone in this example, it should be noted that debt providers will limit the debt-to-equity ratio to ensure that equity investors have sufficient "skin in the game". This is an additional and important criterion that will need to be taken into account in determining financial viability. The optimal public subsidy (i.e., the lowest possible cost to the public agency) will need to simultaneously satisfy the requirements for minimum DSCR, debt-to-equity ratio (i.e., leverage), and required equity return. Due to the interdependence of these elements, calculations need to be performed iteratively to arrive at the optimal public capital subsidy.

Through iterative calculations using a financial model, we may determine an optimal funding plan by changing the upfront subsidy that is required to satisfy all financing criteria (minimum DSCR, equity return and

leverage). The end result is represented in Table 19 on the next page as Cash Flow Waterfall with Public Subsidy counted as Revenue. It includes a $128.6 million public capital subsidy (shown as "Revenues" in Year 1), and $229.3 million of equity. Under this scenario, cash flow remains positive, our DSCRs are satisfied and our equity investors achieve their required pre-tax return of 11.7%.

As mentioned above, debt providers may require a lower debt-to-equity ratio than represented by the above funding plan. To reduce the debt-to-equity ratio, a larger equity contribution would be needed along with lower total debt. This would likely increase the weighted average cost of capital (WACC). To calculate the required public subsidy under a lower debt-to-equity ratio requirement, further iterations of the model would be needed.

Table 19. Cash Flow Waterfall (in Millions of Dollars) with Public Subsidy Counted as Revenue

CASH FLOW WATERFALL WITH SUBSIDY COUNTED AS REVENUE

Project Year:		1	2	3	4	5	6	7	8	9	10	11	12	13
Revenue	19,439.0	128.6	-	-	-	-	140.0	146.3	152.9	159.8	167.0	174.5	182.3	190.5
Opex	-	-	-	-	-	-	35.0	36.1	37.1	38.2	39.4	40.6	41.8	43.0
Major Maintenance	1,220.8	-	-	-	-	-	11.5	11.9	12.4	12.8	13.2	13.7	14.2	14.7
Sr Debt Service	3,408.4	-	-	-	-	-	77.4	77.4	77.4	77.4	77.4	80.7	83.8	86.7
Sub Debt Service	854.6	-	-	-	-	-	31.2	31.2	31.2	31.2	31.2	32.7	33.9	35.0
Cash Flow Available to Equity	10,838.6	128.6	-	-	-	-	(15.2)	(10.4)	(5.3)	0.0	5.6	6.8	8.6	11.1
Equity Investment	(229.3)	(38.9)	(38.9)	(38.9)	(38.9)	(38.9)	(35.0)	-	-	-	-	-	-	-
Net Equity Flows	9,865.3	(38.9)	(38.9)	(38.9)	(38.9)	(38.9)	(35.0)	-	-	-	-	-	-	-
Equity IRR:	11.70%													

CASH FLOW WATERFALL WITH SUBSIDY COUNTED AS REVENUE

Project Year:		14	15	16	17	18	19	20	21	22	23	24	25	26
Revenue	19,439.0	199.1	208.1	217.4	227.2	237.4	248.1	259.3	270.9	283.1	295.9	309.2	323.1	337.6
Opex	-	44.3	45.7	47.0	48.4	49.9	51.4	52.9	54.5	56.2	57.8	59.6	61.4	63.2
Major Maintenance	1,220.8	15.2	15.7	16.3	16.8	17.4	18.0	18.7	19.3	20.0	20.7	21.4	22.2	23.0
Sr Debt Service	3,408.4	89.5	92.1	94.5	96.7	98.8	100.7	102.4	103.9	105.3	106.5	107.6	108.4	109.1
Sub Debt Service	854.6	35.9	36.7	37.3	37.8	38.1	38.3	38.3	38.1	37.8	37.3	36.7	35.9	35.0
Cash Flow Available to Equity	10,838.6	14.1	17.9	22.3	27.4	33.2	39.7	47.0	55.0	63.8	73.4	83.9	95.2	107.4
Equity Investment	(229.3)	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Equity Flows	9,865.3	-	-	-	-	-	-	95.1	79.1	73.0	73.2	77.4	84.5	93.7
Equity IRR:	11.70%													

CASH FLOW WATERFALL WITH SUBSIDY COUNTED AS REVENUE

Project Year:		27	28	29	30	31	32	33	34	35	36	37	38	39
Revenue	19,439.0	352.8	368.7	385.3	402.6	420.8	439.7	459.5	480.2	501.8	524.3	547.9	572.6	598.4
Opex	-	65.1	67.1	69.1	71.1	73.3	75.5	77.7	80.1	82.5	85.0	87.5	90.1	92.8
Major Maintenance	1,220.8	23.8	24.6	25.5	26.4	27.3	28.2	29.2	30.2	31.3	32.4	33.5	34.7	35.9
Sr Debt Service	3,408.4	109.6	110.0	110.1	110.1	110.0	109.6	109.1	108.4	107.6	106.5	105.3	103.9	102.4
Sub Debt Service	854.6	33.9	32.7	31.2	15.6	-	-	-	-	-	-	-	-	-
Cash Flow Available to Equity	10,838.6	120.4	134.4	149.4	179.4	210.2	226.4	243.4	261.4	280.4	300.5	321.6	343.8	367.2
Equity Investment	(229.3)	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Equity Flows	9,865.3	104.4	116.4	129.6	149.5	173.8	194.8	214.3	233.1	252.0	271.4	291.5	312.4	334.3
Equity IRR:	11.70%													

CASH FLOW WATERFALL WITH SUBSIDY COUNTED AS REVENUE

Project Year:		40	41	42	43	44	45	46	47	48	49	50
Revenue	19,439.0	625.3	653.4	682.8	713.6	745.7	779.2	814.3	850.9	889.2	929.2	971.1
Opex	-	95.6	98.5	101.4	104.5	107.6	110.8	114.2	117.6	121.1	124.8	128.5
Major Maintenance	1,220.8	37.2	38.5	39.8	41.2	42.7	44.1	45.7	47.3	48.9	50.7	52.4
Sr Debt Service	3,408.4	51.6	-	-	-	-	-	-	-	-	-	-
Sub Debt Service	854.6	-	-	-	-	-	-	-	-	-	-	-
Cash Flow Available to Equity	10,838.6	440.9	516.5	541.6	567.9	595.4	624.2	654.4	686.0	719.2	753.8	790.1
Equity Investment	(229.3)	-	-	-	-	-	-	-	-	-	-	-
Net Equity Flows	9,865.3	417.0	456.8	490.7	521.6	551.1	580.3	610.0	640.4	671.9	704.7	1,096.8
Equity IRR:	11.70%											

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Appendix A Traffic & Revenue Methodologies

Estimates of future annual revenue levels are of interest to three types of participants in most P3 projects: equity investors, debt providers, and government sponsoring and oversight agencies. Government agencies may consider debt guarantees; subsidies via availability payments, grants, or other means; procurement methods; pure revenue issues; and a wide range of combinations of the foregoing. All require reliable estimates of future revenues.

Equity investors expect a substantial internal rate of return on their investment. Consequently, they are often willing to accept more risk than others, and P50 forecasts. The business model of equity investors is also relevant. Some accept a high level of risk but look to sell their equity share and position as rapidly as possible. Thus, their risk exposure is limited by the time interval between financial close and sale of their shares. Other equity investors are in "for the long haul" and are often more reliable P3 partners as a result.

Project debt may range from long-term bonds to short-term bank notes and loans, or bridge financing. Lenders expect interest rates/payments that they will receive to be only a few points above treasury bonds or other indices. They thus insist on prudent and conservative T&R forecasts in the P80 to P90 range to minimize their risk exposure. Thus, "risk-reward" ratios for equity and debt providers are quite different.

A government agency may have one or more of several roles and responsibilities in a P3 project, with each requiring evaluation of project revenues and its sources and uses. An agency must first represent the public and ensure that a project, its method of implementation, and its use of public funds and other resources is in the public interest and consistent with prevailing laws and regulations. This is an oversight role common to State DOTs.

A second government agency role can be that of project sponsor. This requires that an agency be completely familiar with all aspects of a project, including projected revenues and expenditures. This could be to advance a P3 project deemed in the public interest without accepting any financial obligations; that is, the P3 concessionaire takes full T&R, construction, and all other risks. Or the government agency could provide various financial and other incentives so that potential P3 bidders would be more likely to respond. Or the government agency could subsidize the project completely, either with or without tolls, and have tolls, if levied, flow directly to the government.

If the last alternative is a series of payments made to the concessionaire it is often termed "availability payments," whereby the government is paying for the "availability" of the facility. Under this situation, the government solicits bids from prospective DBFOM concessionaires, and the qualified bidder requesting the lowest series of availability payments is selected, all else being equal. Thus, all T&R risk is taken by the government, with the toll revenue stream (if levied) covering a portion of the availability payments. Toll revenue could conceivably exceed availability payments, particularly in the later years of a P3 contract if the government escalates toll rates and traffic growth occurs.

Revenue sources for a toll facility typically include toll receipts from traditional toll or managed lanes, service area/concession rentals, special vehicular permitting, and leasing of right-of-way for fiber optic cables or other utilities. All sources other than tolls produce minimal income with respect to total facility revenues, and the overwhelming predominance of toll revenues is clear. This section will hence focus on that revenue source.

A.1 Forecast Methodology

The commonly used logic and model consists of four steps: trip generation, trip distribution, modal split, and trip assignment. There are many computer-based model programs, and in the US the models are typically

developed by or under the auspices of metropolitan planning organizations (MPOs). These are Federally mandated and used primarily for long-range transportation planning and air quality conformance purposes. These purposes do not produce the ideal model for project evaluation needs, so a regional model must often be modified or re-focused, possibly re-calibrated, and validated for a specific study area within the MPO region.

Model inputs include traffic analysis zone definitions, land use, transportation network, and observed travel characteristics. Zones are relatively small, often based on census tracts, homogeneous land uses, major traffic generators, and understandable geographic boundaries. Land use for each zone reflects permitting zoning/uses and other measures such as population, employment, and floor space by typical categories.

The transportation network consists of a region's highways and roads and public transportation systems. These are represented by a coded link-node network or diagram. The network includes HOT lanes and bus lanes, truck routes, "one way" or restricted access roadways, and (most importantly) toll amounts and locations. Each link is described by length, its travel time to volume/capacity relationship, and free flow average speeds. Zonal data are assumed at a zone's centroid, which is connected to the network with a connector link having specified link characteristics.

Observed travel characteristics include zones of trip origins and destinations; proportions of trips being made for various trip purposes (work, business, social, shopping, school, etc.); traffic volumes; trip-making frequencies; vehicle occupancies; and hourly, daily, and seasonal variations as well as transit usage. Origin-destination information is crucial, and there are two types of surveys utilized. One is "revealed preference," whereby data on actual travel performance in the field are compiled. The other is "stated preference," which ask a statistically valid sample of potential network users what changes in their current travel preferences might occur if a new (carefully described) facility were available which had both trip time savings and toll costs associated with its use. Stated preference surveys typically ask for responses to a series of toll costs and time savings and employ "trade-off" analytic techniques to calculate a representative value of time for subsequent toll diversion analyses.

Outputs of the modeling process are link assignments/traffic volumes for future analysis years and future travel times, speeds, and generalized traffic conditions. These outputs can then be used to calculate fuel consumption and air pollutants in addition to revenues on a toll facility.

There are many other model and toll revenue estimation factors that must be considered. Regional models are developed to identity future traffic and network capacity needs, so that making data and analysis judgments that produce "upside" values is "conservative." For toll estimation purposes, "conservative" means making judgments that produce reasonable (and generally lower) traffic and toll revenue estimates that will make it most likely that revenue and debt service target levels will be met. These two forecasting perspectives may be addressed and reconciled, often on a "case" basis. (Probability analysis methods that accomplish this will be discussed later in this appendix.)

Related to the above, regional models often focus on peak hour conditions, a common "driver" to develop future improvement needs. Toll road forecasts require annual estimates of demand and toll revenues. Thus, factors to substantiate shoulder, off-peak, daily, weekly, monthly/seasonal, and ultimately annual traffic and revenue must be developed.

Truck and commercial traffic can be a major revenue component of a toll road, and many regional models only handle them as a proportion of overall link volumes. If truck volumes and revenues are significant, particularly if truck peaking characteristics do not resemble those for autos, then a separate truck model may be created and used.

The four-step model is based on zonal averages, can produce reasonable replicas of future conditions, and is relatively low cost and technically manageable. As a result, it is widely used. However, a more precise micro-analytic modeling approach which is based on individuals and households is used in some large/populous regions. This approach better addresses travel behavior variations and schedules through the use of activity-based models, and activities are modeled rather than only trips.

Network micro-simulation models are sometimes used to simulate the dynamics of corridor and network traffic flows. These models represent flows as a series of individual vehicles and track each one at a resolution of one second or less. Micro-simulation models are particularly useful in the forecasting of managed lane usage since they can simulate the dynamics of individual lanes and the shifts of drivers between lanes and lane categories.

A.2 Reviews of Traffic and Revenue Forecasts

The professionalism, accuracy, and credibility of traffic and revenue forecasts, and the reports presenting them, are always subject to review. A senior-level peer review, internal and/or external, is therefore necessary. An internal review concurrent with the analyses and report preparation can be very effective (i.e., quality assurance and quality control). An external peer review by an independent third party can greatly improve its credibility with potential investors, lenders, government officials with oversight and approval responsibilities, and others. To improve the credibility of the reviewer, his or her background, contractual charge, timeframe, and budget/cost may be revealed.

The first task of a reviewer is to examine the forecast purpose, study level, and client objectives. "Purpose" may reflect the position of the client and/or a designated government agency, lender, or investor and their preferences with respect to forecast conservatism or lesser prudence (producing an upside forecast). Study levels are typically termed I, II, or III, with Level I being conceptual and based on available information. Level II requires current and comprehensive survey data and a full analysis, while Level III is investment grade with the toll plan and other pertinent factors and assumptions detailed with full support, necessary commitments from others when appropriate, and complete documentation. Client interests and positions may also be summarized.

As noted above, the regional transportation model is the primary forecasting tool and is typically carefully assessed. This assessment considers experience with the model program; regional coverage; zone sizes in the study area itself; network detail, particularly in the study area; network improvements assumed for the forecast years; bases, commitments, and/or funding likelihood for these improvements; future traffic conditions and congested links focusing on the study area and competing/feeder routes; analysis time periods; the extent and currency of traffic data; and socioeconomic data for the region and its zonal breakdowns. How the selected economic information and its projections compare to other projections of public agencies and private organizations is also of importance. The calibration and separate validation of the model, or its subarea model derivative, in the study area may also be requested and examined.

Major traffic generators and special project attributes are typically identified and assessed, including managed lanes, unusual design features, and Intelligent Transportation System measures. Sensitivity analyses of major model inputs are crucial (as noted below), as is the quality and completeness of the report document, particularly if it is investment grade.

Managed lanes (or HOT lanes) fundamentally differ from a traditional toll road because the T&R of the managed lanes depends greatly on traffic volumes and conditions (travel speeds, level of congestion) in the adjacent general purpose lanes. These can make managed lane T&R forecasts more volatile than those for traditional toll lanes; that is, a small change in a key input such as study area population growth will typically produce an appreciably larger change in managed lane traffic volumes than in the general purpose lanes.

Whether toll rates for managed lanes are set to optimize revenue, traffic, speed, or some combination is also of interest.

A.3 Risk Assessments and Probability Analyses

A key step in both risk assessments and probability analyses is to identify possibly significant model input variables and perform sensitivity tests on each. These tests show the relationship of changes in these variables to changes in the "bottom line," annual toll revenues. Initially, judgments regarding revenue effects of changes in these input variables can provide a good perspective on the robustness of the forecast and likely or possible variations in the project's revenue stream.

A better way to determine the quantitative probability of revenue forecasts being achieved or exceeded is called Quantified Probability Analysis (QPA). It is a practical approach permitting both debt and equity participants in a deal, and developers, government agencies, and other interests, to be satisfied that their (possibly differing) revenue forecast needs are properly addressed.

Historically, financial analysts have been giving forecasts completely arbitrary reductions, sometimes considering the results of sensitivity tests of major input variables such as population growth and competitive facilities. But sensitivity tests are not intended to address the probability of a particular input variance actually occurring.

The QPA requires both expert transportation planning and statistical capabilities. It first recognizes and quantifies inherent uncertainties in the modeling and forecasting process. Specific steps are:

1. Clear identification and assessment of factors that could significantly affect project revenues.
2. Development, using analysis or judgment, of the probability distribution for each of these factors individually.
3. Combination of these probability distributions for significant input factors to produce a single overall revenue/probability distribution function.

Typically the calculated values can be for a 90 percent probability of attainment, or investment grade; a 50 percent probability, often considered to be a "central" or "most likely" case; or other values requested by project participants for their risk assessments and financial models. Traditional reductions can be omitted or based on rigorous analysis.

Numerous input variables for the modeling process need to be screened and selectively analyzed, including:

- Toll rates or public transportation fares.
- Perceived traveler value of time.
- Regional transportation network characteristics and changes.
- Land use types, intensities, patterns and trends.
- Socioeconomic parameters (population, employment, etc.).
- Modal splits and trip purpose mix.
- Energy costs/environmental constraints.

The methodology relies on sensitivities of project revenues to variations in each of the significant inputs. The preferred source for this is successive model runs which will permit the sensitivity of traffic to individual input variations to be ascertained. These model runs may also be carried out for scenarios combining variables in reasonable combinations, running each scenario for future years of interest. In some cases there may be inputs

whose values are highly uncertain; in this case, special methods borrowed from the field of statistical design can be usefully employed.

The development of the combined probability distribution function can use a surface response model, Monte Carlo series, or similar analysis tool to develop and present a combined probability function for possible future year revenue outcomes. The resulting matrix of overall annual revenue levels versus estimated probabilities of attainment or exceedance for selected years is the information of interest to project participants. Financial analysts of debt or equity providers will now know the probability of various levels of future revenues occurring and will be able to compare the project's financial performance (IRR, debt coverage, etc.) with the probability of achieving that performance. "Appetites for risk" will be clear, and decision-making will be improved.

A.4 Traffic and Revenue Forecast Concerns

The following are reasons that some traffic and revenue forecasts and reports do not meet their objectives, user purposes, and professional standards.

A.4.1 Complex Modeling and Analysis and "Garbage In, Garbage Out"

Extensive data needs and inputs, if not properly conceived, monitored, and checked can lead to problems in quality and credibility of data as well as cost problems. Calibration and validation tasks can be time-consuming. Managed lane forecasts can be particularly "fragile" due to general purpose lane "leveraging" of managed lane traffic demand, either plus or minus.

A.4.2 Inadequate Consultant Contract Provisions

Well-defined study objectives and scopes of work, budgets, and schedules are essential if misunderstandings and misdirections of effort are to be avoided. Contractual flexibility to modify scopes and terms if necessary is most desirable, and often overlooked.

A.4.3 Optimism Bias

Pleasing the client (and improving the chances for additional assignments) and making favorable judgments regarding individual inputs may have a compounding effect on study outputs; normal economic dips can be overlooked, historical data may not be indicative of the future (hindcast vs. forecast), and "normal" optimism and an urge to help make "it" happen can contribute to poor forecasts.

A.4.4 Unreasonable Expectations

The accuracy of the forecasting process may vary substantially, and adding complexity does not assure accuracy or precision. The perspectives and risk "appetites" of debt and equity deal participants are different, developer business models may greatly affect their expectations, and risk management and mitigation is often not understood.

A.4.5 Major Variables in the Process

Major variables include toll rates and their escalation bases; values of time, demand elasticity, and willingness to pay; population, employment, and economic cycles; land use patterns and intensities; environmental constraints; roadway network characteristics and improvements, including managed lanes; modal splits; and current and future trip purpose mixes. Particularly in an investment grade report, the assessment and proper representation of variables must reflect commitments of cognizant parties, checks by third parties where feasible, and clear statements and sensitivity analyses of variations and effects on future revenues.

A.5 Effective Use of Consultants

Consultants are utilized to bolster client organization staff size, augment client staff capabilities and pertinent experience, and possibly increase the cost-effectiveness of a study effort. Consultant personnel who have worked on projects throughout the nation and often internationally generally have deep and broad experience to draw upon.

The responsiveness, efficiency, and usefulness of consultants depend on contractual provisions and client directions and management as well as those of the consultant. Steps that may be followed with respect to consultant procurement, project execution, and report approval by the client are outlined below.

A key step is for the client to develop study objectives, scope of work, and schedule and budget parameters. This information clearly identifies the type of toll facility, whether it is a brownfield or greenfield project, and whether it includes managed or HOT lanes alongside general use lanes. Other significant improvements, such as additional interchanges or traffic-carrying capacity upgrades, may also be noted. New users of the proposed facility and major benefitting parties and stakeholders may also be identified and outlined. This leads to the selection of an appropriate study level—1, 2, or 3, as described earlier.

Project objectives, study scopes, and related information may be summarized in an RFQ sent to a broad field of consultants. A two-step selection procedure may be followed. This includes the issuance of RFQs to a large number of consultants, the creation of a short list of three or four clearly qualified firms, and the issuance of an RFP to just those pre-qualified firms.

RFQ responses emphasize consultant qualifications pertinent to the summarized scope and contract terms. RFP responses include complete work plans/proposed scopes that best meet client needs, as well as staff commitments, schedule, and cost. Time and budget can then also be factors in a final consultant selection. The use of this two-step process maximizes the number of consultant firms responding, and also encourages the "best" consultants to enthusiastically prepare in-depth proposals since they know that competition is limited.

Coordination between client and consultant staffs during execution of the work is essential, as are exchanges of information and task interpretations. Unofficial reviews of preliminary draft text can also be encouraged. The review and approval of the final report document by the client will typically consider:

- Suitability of report language, format, and level of detail, as well as content.
- Summary of study purpose and scope, as well as any limitations/concerns.
- Project description and regional context.
- Socioeconomic forecasts, applicability to study area, and independent confirmations.
- Study methodology and modeling.
- Factors used in the development of traffic and revenue forecasts (toll plan, escalation and CPI, revenue annualization, etc.).
- Traffic and revenue over the forecast period, and compound annual growth rates.
- Key assumptions and special risks.
- Sensitivities and probability of forecast attainment.
- Signature of the consultant's principal-in-charge and identification of key project staff.

Properly selected and utilized, a consultant can add substantially to the credibility of the project and its acceptance by the financial community, government officials, and the general public.

Appendix B Public Sector Financing Options

B.1 Introduction

This Appendix provides an overview of public sector financing for highway projects. It provides a frame of reference for comparing P3 project delivery to current practice in publicly financed project delivery. "Governmental" project financings (i.e., user charge-backed standalone projects financed with non-recourse debt) are an alternative to project financing through P3s. Examples of government-financed projects are:

- SH 130 Segments 1-4, TX
- I-35E Toll Road, TX
- Foothill Eastern/Foothill South Toll Road, CA
- San Joaquin Hills Toll Road, CA
- Alameda Corridor, CA
- 183-A Turnpike, TX
- Intercounty Connector, MD
- Denver E-470, CO
- Triangle Parkway, NC

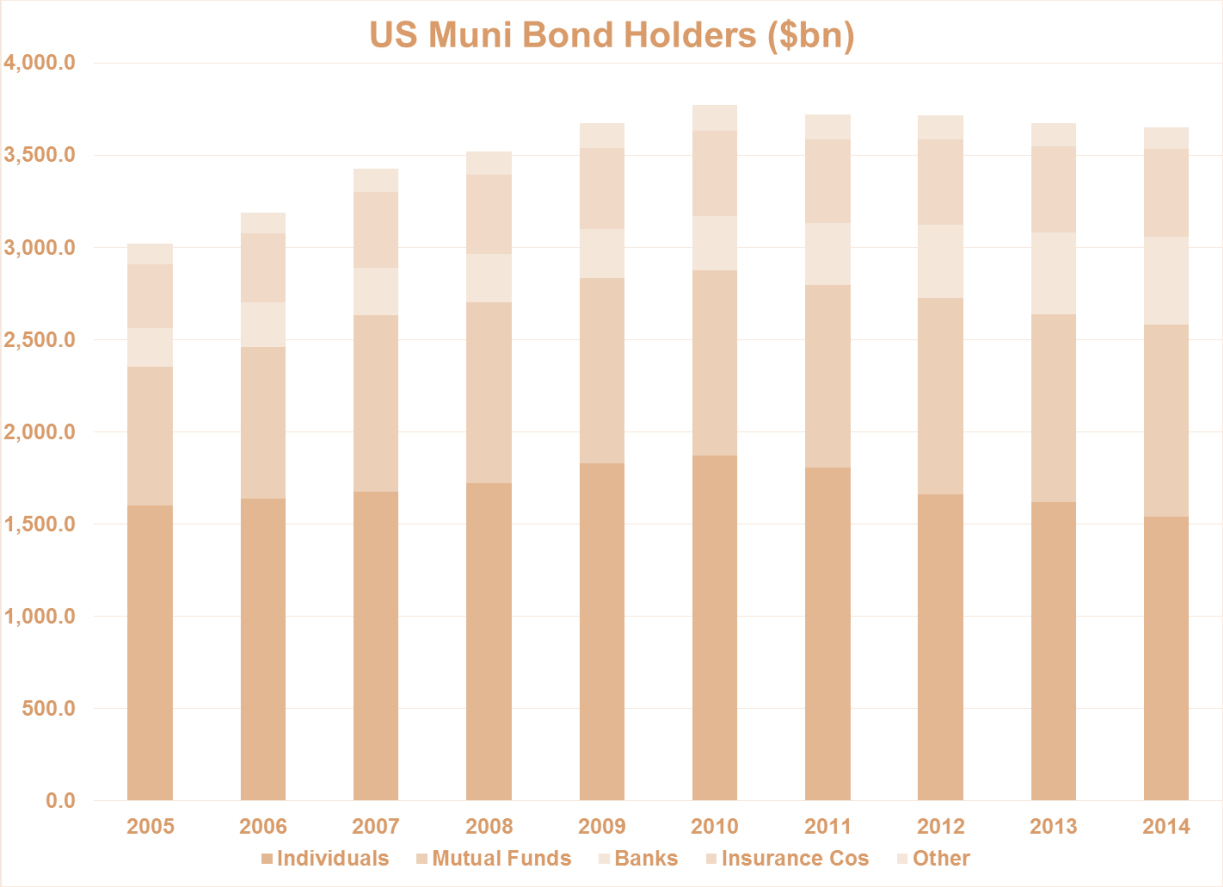
The Appendix begins with a summary of the municipal bond market, the main source of financing for transportation infrastructure projects among US state and local governments. Credit enhancement is then addressed, including a focus on bond insurance, one of the most common forms of credit enhancement for bond financing. The Appendix then addresses risk transfer on publicly financed projects, including both construction and O&M risk transfer through contracts. The Appendix ends with a case study of a greenfield toll road, the Triangle Expressway in North Carolina.

B.2 Muni Bond Market

The US municipal bond market is unique in the world. No other country in the world features such a diverse array of financing instruments. Maximum tenors on US muni bonds are longer than those of many countries' sovereign bonds. It is now a $3.7 trillion market with thousands of individual bond issuers.

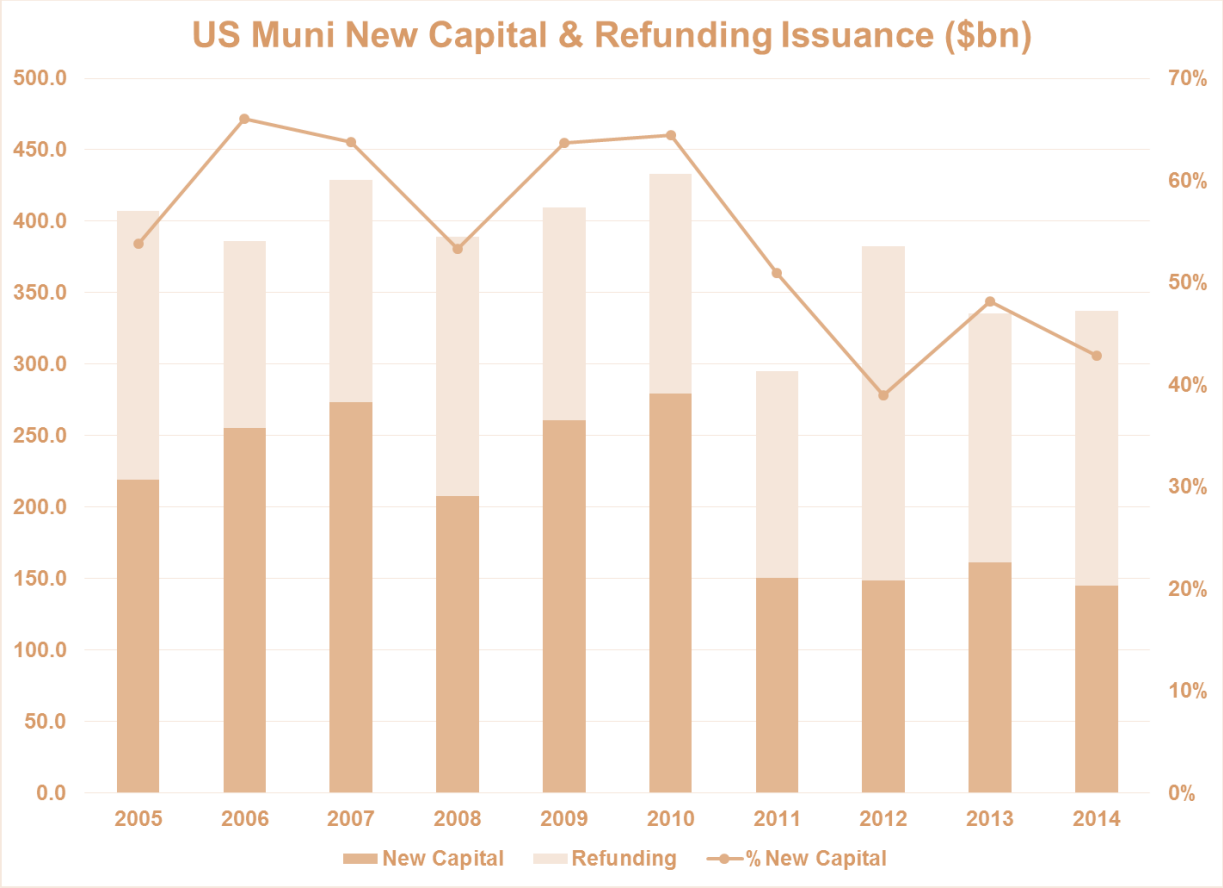
The vast majority of muni bonds are tax-exempt, i.e. the interest income earned by investors from the bonds is not subject to federal income tax. It is also often exempt from state and local income taxes, in the jurisdiction of the issuer. These tax exemptions help to lower borrowing costs for state and local governments because investors can accept a rate that is lower than the taxable rate.

As the graph below illustrates, individuals are the largest group of muni bondholders, typically representing 40-50 percent in any given year. Other significant bondholders are mutual funds (30-40 percent), banking institutions (7-13 percent), insurance companies (11-13 percent) and others (3-6 percent). Since most muni bonds are Federally tax-exempt, they pay lower nominal interest rates than like-rated taxable debt. Certain financial market participants such as pension funds and international investors do not benefit from this tax-advantaged treatment: Pension funds are tax-exempt entities and as such derive no value from the tax-exempt status of the interest income, and international investors that do not have US corporate tax liabilities similarly are not attracted to US tax-exempt investments.



Source: Securities Industry and Financial Markets Association (SIFMA)

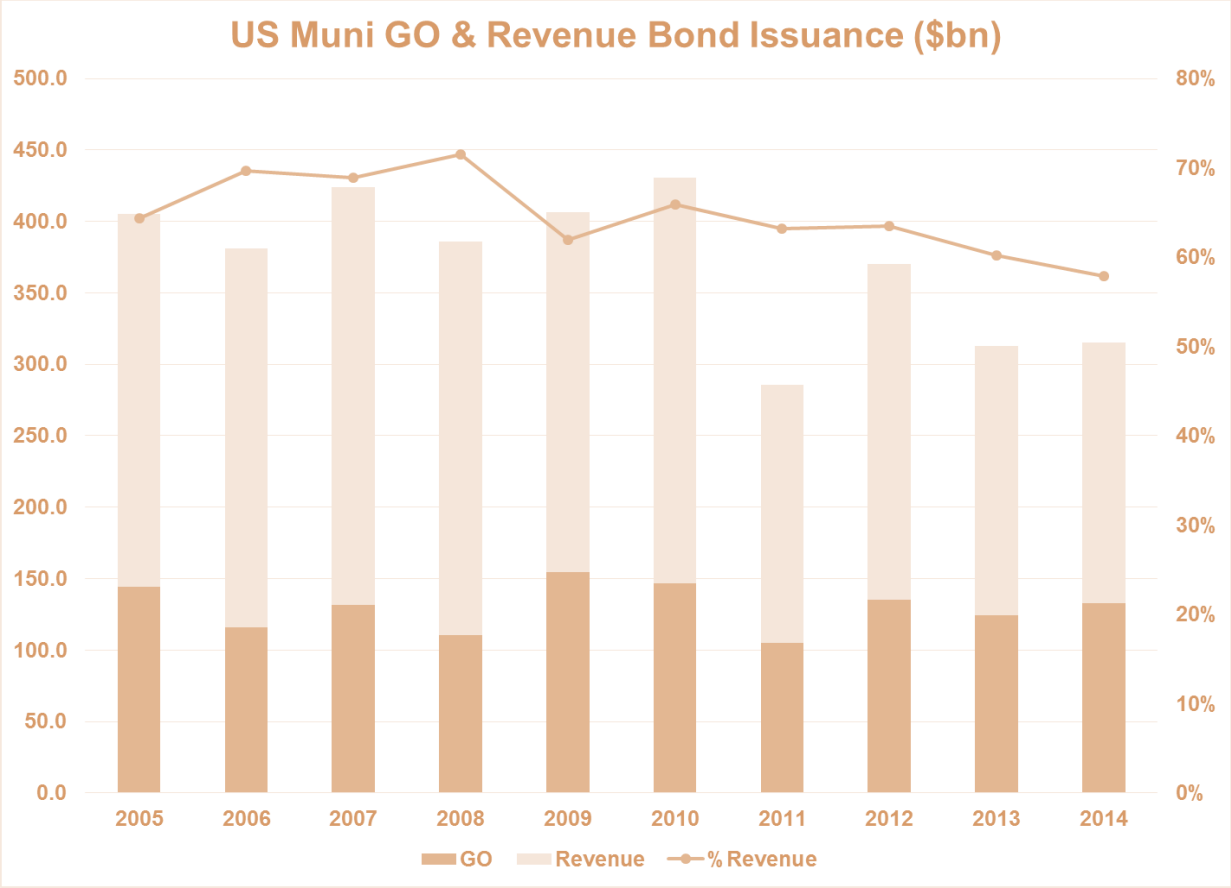
While muni bonds are the main source of financing for public infrastructure projects in the US, not all muni bonds are issued for new investments. A high percentage of annual issuance is for refunding (refinancing) previous bond issues. The graph below indicates the level of New Capital and Refunding each year for the 2005-2014 period[1]. New Capital reached approximately 65 percent of issuance during the pre-recession boom and also in the wake of stimulus efforts post-recession before dropping to less than 40 percent in 2012 and then rising again.



Source: Securities Industry and Financial Markets Association (SIFMA)

[1] SIFMA includes bond issues that are a mix of new capital and refunding in its refunding category so their data understates new capital issuance to some extent.

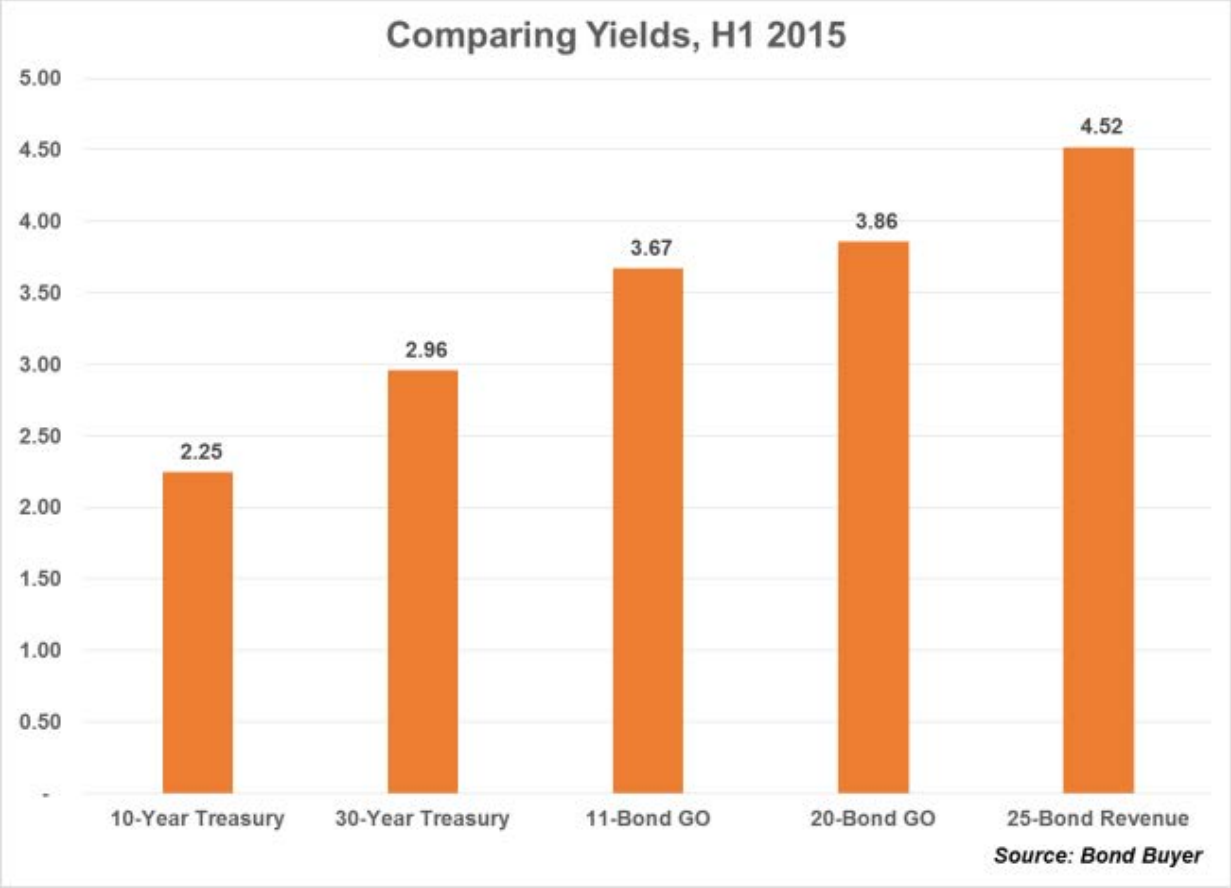
Most muni bonds are not in fact backed by state or municipal balance sheets or General Funds. Instead, most are backed by a dedicated revenue stream. These bonds are referred to as revenue bonds instead of General Obligation bonds which are backed by the "full faith and credit" of the issuing authority. As the graph below illustrates, revenue bonds typically represent 60 percent or more of total muni bond issuance in any given year.



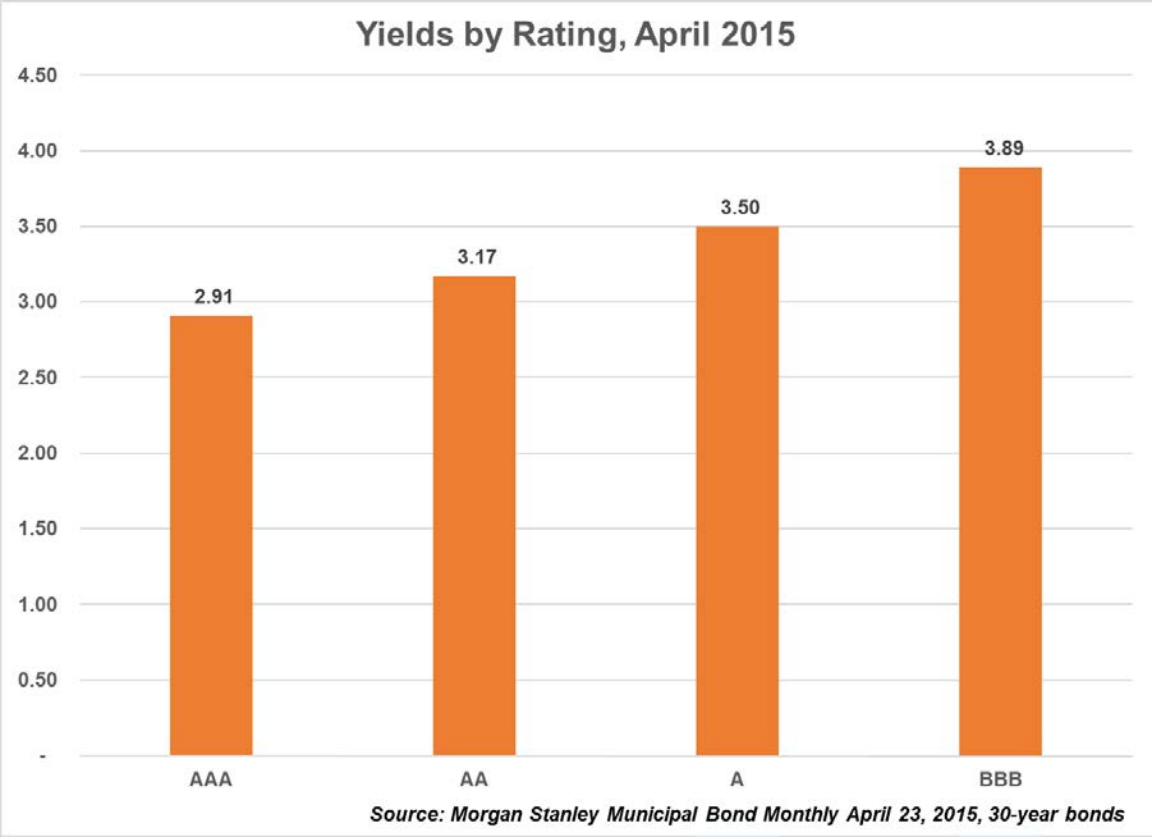
Different bond issues feature different yields and spreads depending on the perceived creditworthiness of the issuer. A large state like New York will typically pay lower yields on its bonds than a small city like Boise, Idaho, even if both are AAA-rated. This is likely not due to perceived creditworthiness based on issuer name recognition. Rather, it may be due to the fact that large numbers of New York investors are willing to pay a higher price for NY State bonds because of the substantial value of the interest being exempt from high New York City and State taxes. Similarly, a revenue bond issued by an individual agency in New York, such as the Buffalo Sewer Authority, will typically pay a higher yield than a NY State GO bond issue. The chart below includes data from the Bond Buyer *2015 in Statistics Midyear Review*. It shows average yields for different types of bonds for the first half of 2015[2]. As can be seen in the chart, the benchmark (A-rated) 30-year revenue bond

[2] The 20-Bond Index consists of 20 general obligation bonds that mature in 20 years. The average rating of the 20 bonds is roughly equivalent to Moody's Investors Service's Aa2 rating and Standard & Poor's Corp.'s AA. The 11-Bond Index uses a select group of 11 bonds in the 20-Bond Index. The average rating of the 11 bonds is roughly equivalent to

offers a yield of 4.52 which is a spread of 156 basis points (or 1.56%) above the 30-year US Treasury bond. The second chart below displays yields by credit rating. As can be seen, bonds rated BBB, the lowest rating still considered investment grade, are on average approximately 100 basis points higher than AAA-rated yields. The highest rating typically assigned to greenfield toll roads is BBB given the risks related to construction completion and traffic and revenue projections. Higher yields help to attract investors that seek higher investment returns. However, higher yields represent increased borrowing costs for bond issuers.



Moody's Aa1 and S&P's AA-plus. The Revenue Bond Index consists of 25 various revenue bonds that mature in 30 years. The average rating is roughly equivalent to Moody's A1 and S&P's A-plus. The indexes represent theoretical yields rather than actual price or yield quotations. Municipal bond traders are asked to estimate what a current-coupon bond for each issuer in the indexes would yield if the bond was sold at par value. The indexes are simple averages of the average estimated yields of the bonds.
The 10-year and 30-year Treasury yields are the market quotes for those securities at the time that the indexes are calculated. (Excerpt from http://www.bondbuyer.com/marketstatistics/search_bbi.html?details=true)

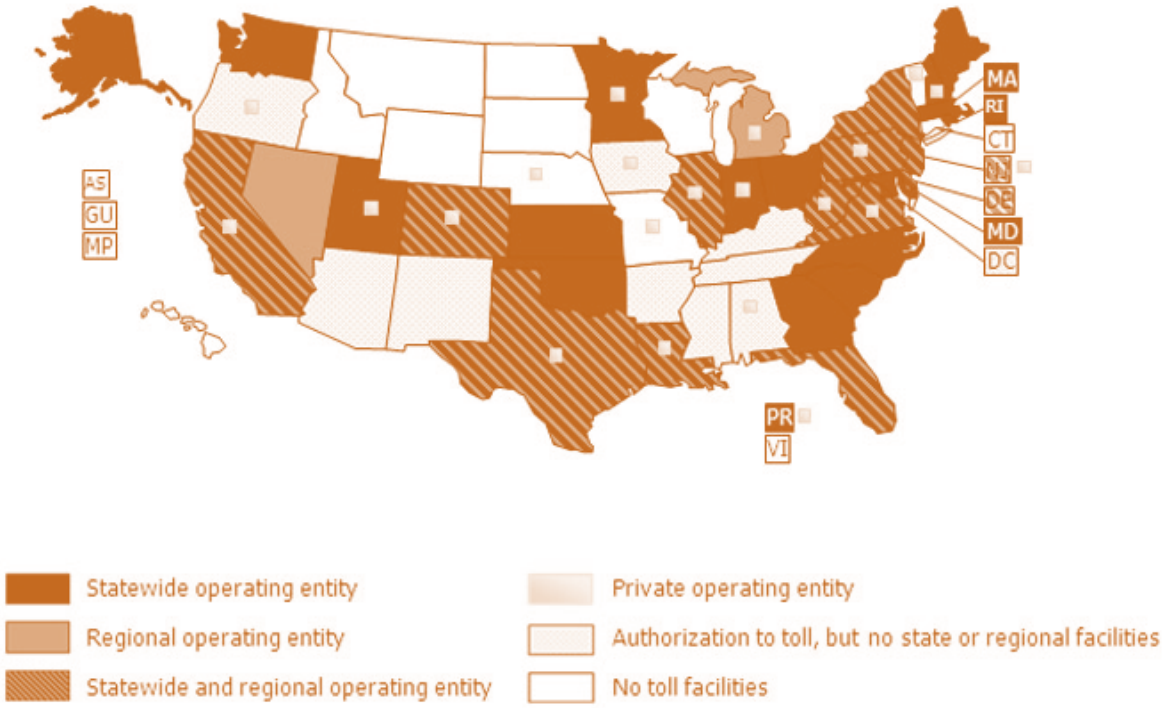


When managing their budgets, state and local governments may also want to isolate themselves from certain risks by transferring these risks to other parties. In fact, that is exactly what they do when they allow individual authorities and projects to issue project-backed revenue bonds (as opposed to special tax revenue bonds such as sales tax or fuel tax-backed bonds). Investors buy revenue bonds because they offer higher yields than GO bonds or US Treasury bonds (on a tax-adjusted basis). Those higher yields come with higher risks since revenue bonds are issued on the basis of individual projected revenue streams and are not backed by the balance sheets of state and local governments. If actual revenues fall short of projected revenues, those bonds may default. Although the tax-exempt market is considered second only to Treasury and Federal agency bonds in terms of safety, muni bond defaults occur every year. Investors must analyze the economics of the projects to understand the risks related to the revenue bonds they purchase. Typically, investors rely on rating agencies for this analysis and buy bonds on the basis of their rating.

B.3 Transportation Muni Bond Financing

Toll revenue bonds represent one such case. Toll revenue bonds typically are backed only by future toll revenues. State and local governments typically do not provide guarantees for toll revenue bonds. In this way, transportation agencies transfer revenue risk to bondholders and they do not need to include debt service in their own budgets, even on a contingency basis. If net toll revenues are insufficient to meet debt service requirements, the bonds default. The government is not obliged to prevent the default or to compensate bondholders in the case of default. The map below indicates the extent of tolling in the US by type of operating entity.

Toll Facilities in the United States[3]

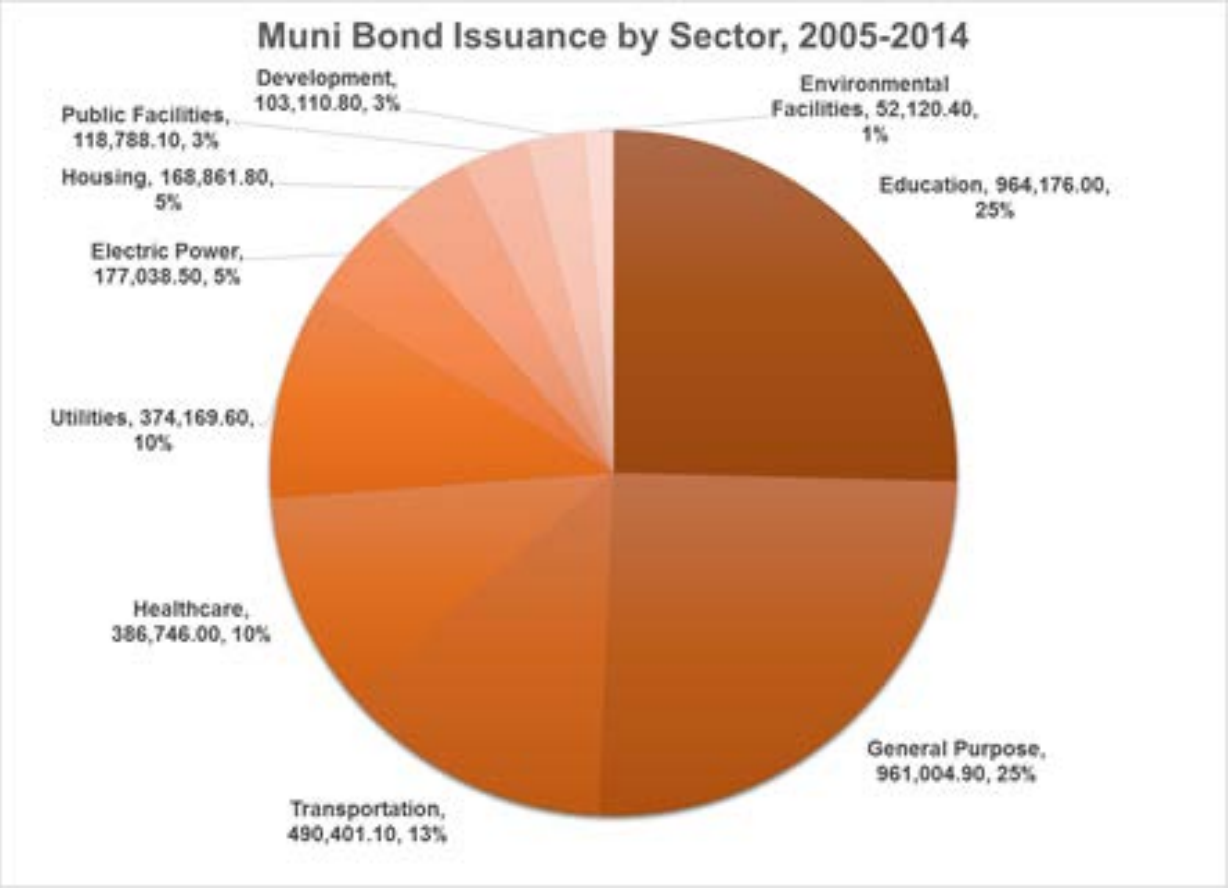


Another kind of muni bond used in the transportation industry is the Grant Anticipation Revenue Vehicle (GARVEE bond), which can be issued by a state, public authority or a political subdivision. GARVEEs are beneficial because they can increase access to capital markets and allow a state both to expedite construction timelines and distribute the cost of a transportation facility beyond the construction period (generally over a 10-15 year period). Specifically, GARVEEs are a kind of anticipation vehicle, which are securities (debt instruments) issued when funds are expected from a particular source, to advance the upfront funding of a specific need. In transportation finance, expected Federal-aid grants serve as the revenue source for the anticipation vehicles.

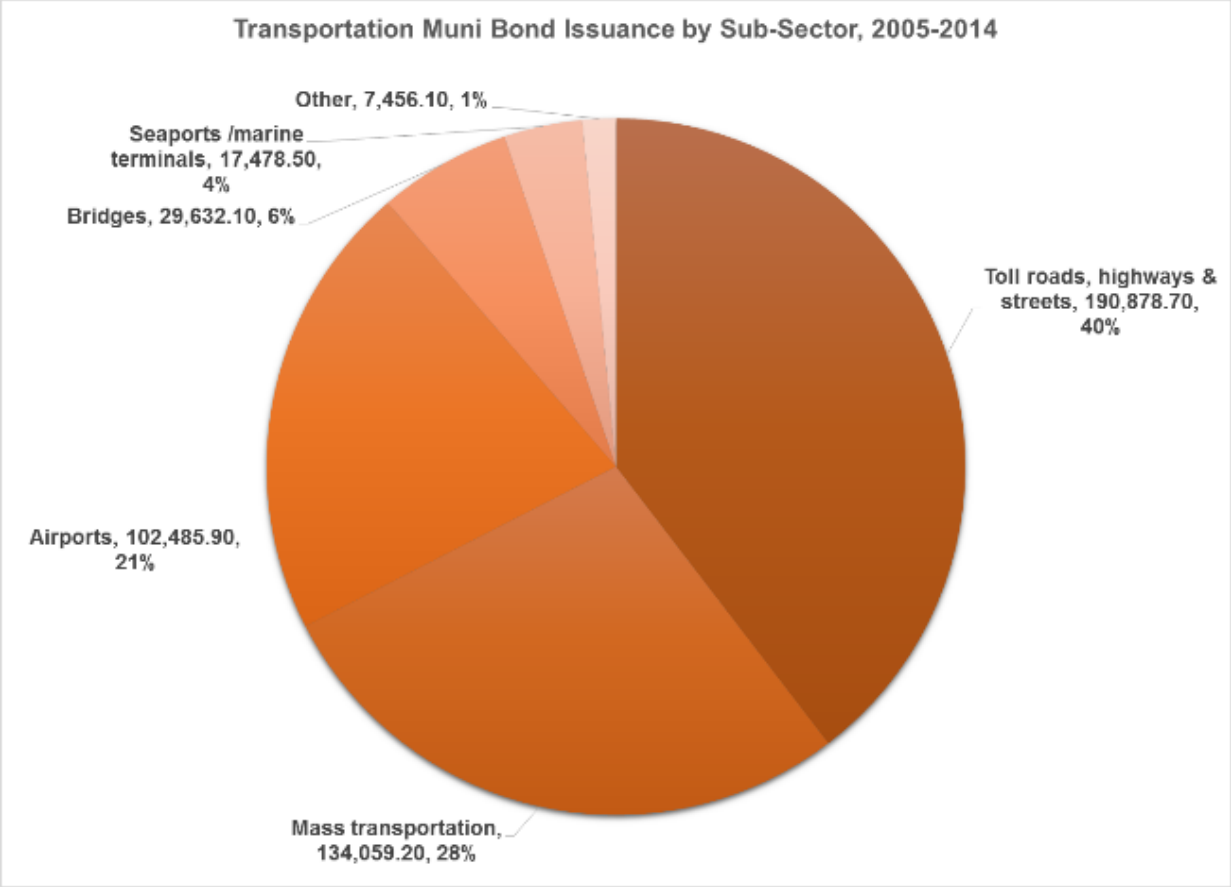
Regarding highways, GARVEEs are used as a term for a debt instrument that has future Title 23 Federal-aid funding pledged to it, in the form of Federal reimbursement of debt service and the related financing costs. Hence, a state can receive Federal-aid reimbursements for a number of debt-related costs incurred in connection with an eligible debt financing instrument (such as a bond, certificate, note, lease or mortgage), and the proceeds provide capital for a project that is eligible for Title 23 assistance. When backed by future Federal-aid highway funding, each of the aforementioned instruments is deemed a GARVEE, with bonds as the debt instrument used most often. Section 122 of Title 23 indicates that debt financing instrument-related costs that are eligible for Federal-aid reimbursement include retirement of principal, interest payments and all other costs that are incidental to the sale of an eligible debt issue.

[3] http://www.ncsl.org/research/transportation/toll-facilities-in-the-united-states.aspx#Map_1_Toll_Facilities

As indicated in the graph below, transportation has represented approximately 13 percent of total muni bond issuance during the past 10 years. Within the transportation sector, as the next graph shows, highway, toll road and street projects along with bridges represent approximately 46 percent of issuance, or approximately $20 billion of issuance each year. The second largest sub-sector is mass transportation which accounts for approximately 28 percent of issuance. Airports account for approximately 21 percent of issuance, seaports for four percent and issuance for other sub-sectors accounts for one percent.



Source: The Bond Buyer *($ in thousands)*



Source: The Bond Buyer *($ in thousands)*

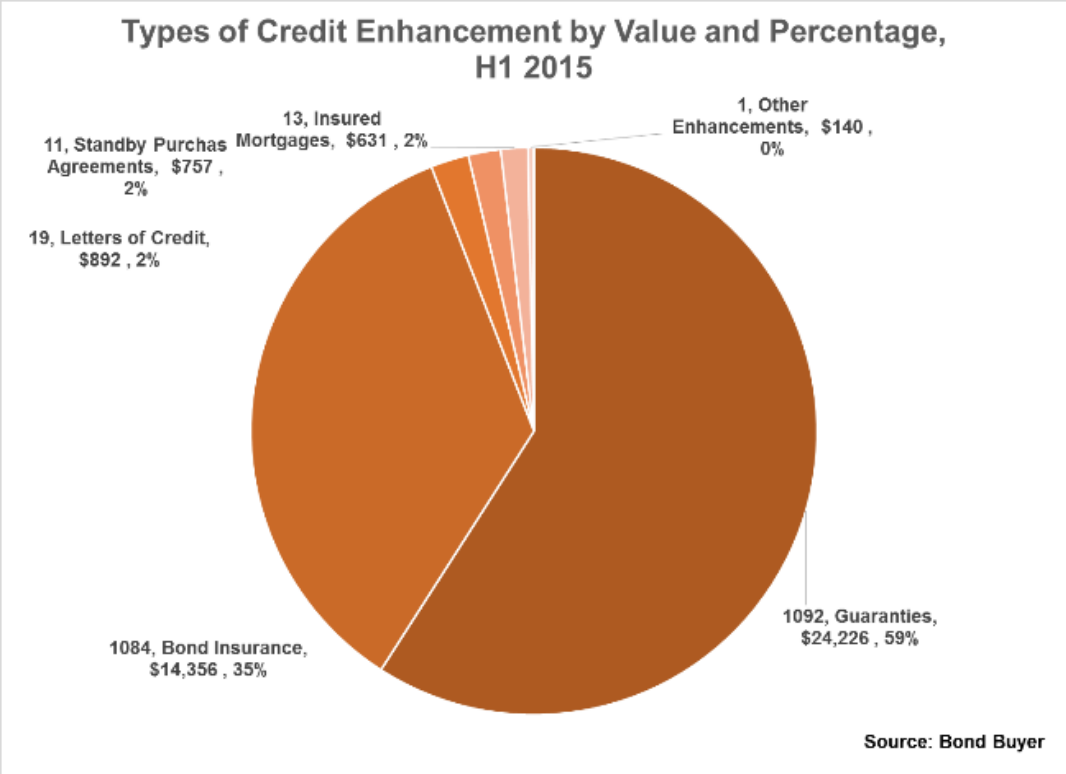
As with the overall muni market, the preference within the transportation sector is also for revenue bonds. This is indicated by the data in the table below. Also, revenue bond issues are on average much larger than GO bonds issued for transportation purposes. While toll revenues provide the easiest example of transportation revenue bond financing, other types of revenues can also be pledged as repayment for bonds issued to fund transportation improvements. These include revenues from gas tax, vehicle registration fees and others. They also can include increased property (and potentially other) taxes expected to be raised as a result of transportation investments that yield economic development. Some of these financings are raised on the basis of Transportation Improvement Districts, Transportation Development Districts or other Special Purpose Districts. Under such scenarios, a specific geographic region is identified that is expected to benefit from a specific transportation investment such as an upgrade to a road or interchange. Special taxes or fees are assessed on the district, often in the form of additional property taxes. The additional taxes are then leveraged through a bond issue whose proceeds are used to fund the investment.

H1 Transportation Muni Bond Issuance						
	2015			2014		
Type	Volume ($mlns)	#Issues	Avg Size	Volume ($mlns)	#Issues	Avg Size
Revenue	$17,704	132	$ 134	$21,446	136	$ 158
GO	$ 2,902	110	$ 26	$ 4,868	109	$ 45
Source: The Bond Buyer						

B.4 Credit Enhancement

Credit enhancement in general is discussed in Section 3.5 of this Guidebook. This section provides additional discussion specific to governmental project financing. The three most cited types of credit enhancement used on municipal bonds are guarantees, bond insurance and letters of credit, as indicated in the graph below. Guarantees may be extended by the federal government under specific programs such as the Department of Energy's Loan Guarantee Program or the Department of Transportation's Maritime Administration Loan Guarantee Program. State and local governments may also extend guarantees to projects directly or through targeted programs. Bond insurance is discussed in detail below. Letters of credit are generally provided by banks to support debt service in case of credit or liquidity challenges.

In addition to these explicit types of credit enhancement, most bonds also feature reserve accounts, such as debt service reserves, and most projects supported by muni bond issues also feature a range of guarantees, warranties and insurance by contractors and their insurers.



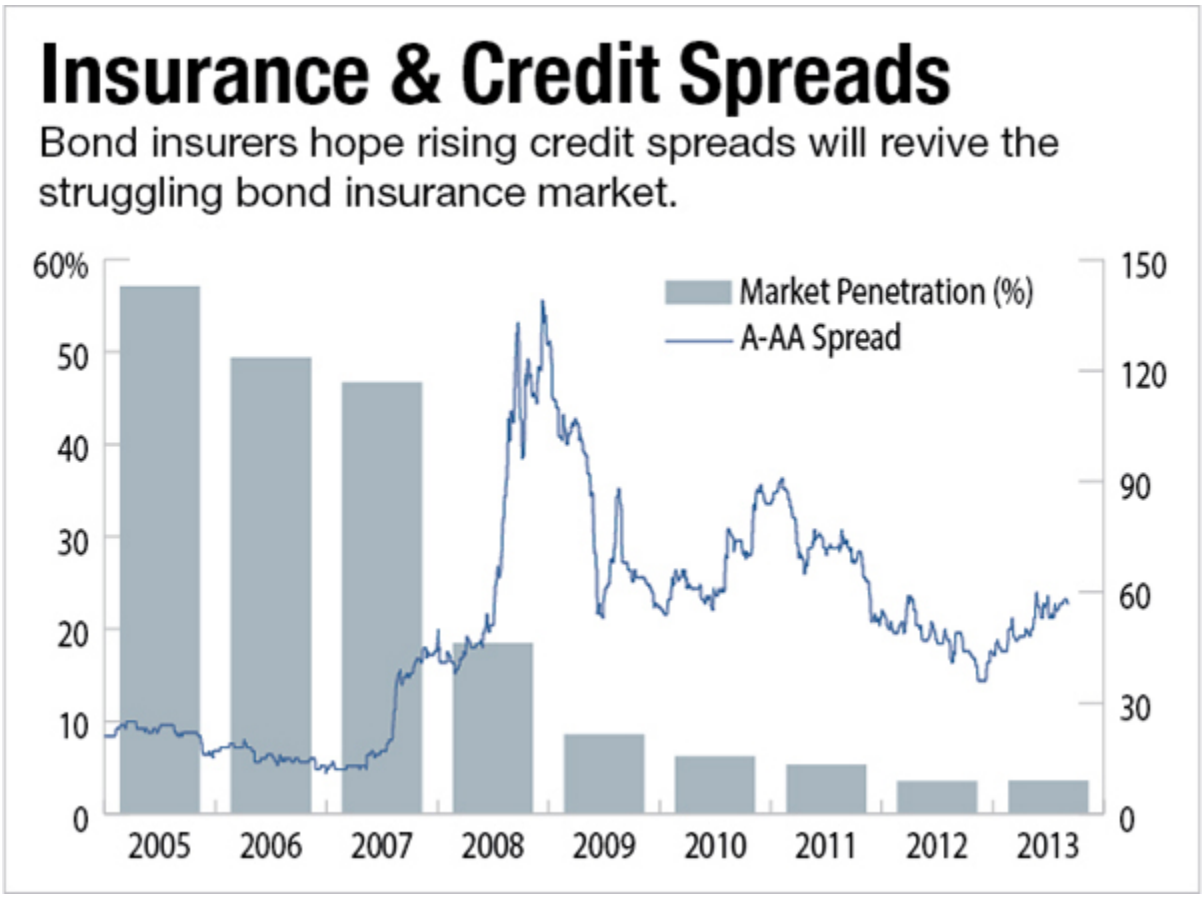
B.4.1 Bond Insurance

Bond insurance (also referred to as a "wrap") is provided by specialized insurance companies ("monolines") that agree to make principal and interest payments in the event that bond issuers cannot. As shown in the graph below, bond insurance reached a high of 57 percent of the face amount of all new issues before the 2008 financial crisis and subsequent recession. It currently stands at less than 10 percent. Ambac which pioneered muni bond insurance in the 1970s filed for bankruptcy in 2010 along with Financial Guaranty Insurance Co. Assured Guaranty emerged as the market leader. A new insurer, Build America Mutual, was launched in 2012. Whereas the insurers carried AAA ratings pre-crisis, the market leader now carries only a AA rating.

In April of 2014, an A-rated issuer would save approximately 46 basis points on a 10-year bond by purchasing bond insurance from a AA-rated bond insurer. Premiums for muni bond insurance, which are usually paid

upfront, range from 25 bps to more than 100 bps of total principal and interest depending on the type of credit, and the corresponding yield cost is roughly estimated at one fifth of the premium. Average premiums for an A-rated GO, for example, would be in the range of 25 bps, corresponding to approximately 10 bps of yield. It would save approximately 50 basis points on a 20-year bond. This compares to savings of 160 basis points on a 10-year bond in 2009. Proponents argue that as interest rates rise, bond insurance will offer greater value and become more popular[4].

Bond insurance reached a post-recession high of 6.45 percent of total issuance in the first half of 2015. The market leader was Assured Guaranty with 61.4 percent of the insured bond issuance market, including insurance provided by its subsidiary Municipal Assurance Corp. Build America Mutual reached a market share of 37 percent and National Public Finance Guarantee, a muni bond insurance subsidiary of the Municipal Bond Insurance Association reached 1.6 percent of insured new issuance[5].



Source: Bond Buyer

B.5 Construction Risk Transfer through Contracts

State DOTs and other transportation agencies may transfer project risks on publicly financed projects through innovative construction contracting. Typically, design, schedule and cost risks are the most often transferred

[4] Bonello, Maria and Oliver Renick. April 30, 2014. "Bond Insurance Then & Now: The Revival of an Industry" in *The Bond Buyer*. New York.
[5] BondBuyer. 2015. *2015 in Statistics Midyear Review*. New York: BondBuyer.

in this manner. As of 2013, 45 state DOTs have been authorized to use design-build contracting, and some states have implemented Construction Manager/General Contractor (CM/GC) projects. The USDOT has supported the state interest in innovative contracting by preparing sample P3 state enabling legislation and publishing reports and other material, including this guidebook. Note that it is possible that a state may have legislation for one form of innovative contracting, but not for all of the forms. State DOTs can face issues regarding legislation, local finance and market issues, and their own departmental culture. Some innovative contracting methods are described below.

There are several variations on the design-build model, including:

- *Modified Design-Build*: The owner finishes a significant portion of the design while one party finishes the remaining part of the design as well as the construction under one contract.
- *Design Sequencing*: The project is divided into numerous design packages. Construction bidding occurs before all of the design packages are finished.
- *Design-Build-Operate*: Under a single contract, a single party designs and constructs the project, and then operates it for a designated period.
- *Design-Build-Maintain*: A single party designs and constructs the project and later maintains it for a designated period.
- *Design-Build-Warranty*: A single party designs and constructs the project, and also makes guarantees about certain elements for a time period.
- *Design-Build-Finance:* A single party designs, constructs and provides either full or partial financing for a project (but is not responsible for long-term maintenance and operation).

Construction Manager/General Contractor (CM/GC) also known in some states as Construction Manager at Risk (CMR). Under the CM/GC contracting method, the construction manager and owner form a contract for project management and construction that is in line with the construction manager's expertise, construction price goal, and management fees.[6] When the design of the project is being determined, the contractor provides pre-construction services and during the construction functions as the general contractor. The owner is able to receive information from the contractor about possible risk. In some cases the construction manager has the responsibility of finding competitive bids for all of the work packages that are to be subcontracted. The contractor's involvement in the process at an early stage fosters a stronger comprehension of the contract, creation of a Guaranteed Maximum Price (GMP) that can help create a clearer budget, a good relationship among the contractor, owner, and designer, and improved risk allocation. Further, the owner is able to maintain control over the final stage of the design process. Fast-tracking and determining the construction price can be challenging; also, there is possibly less competition for the general contractor. The method might be useful for more significant multi-phase highway projects. Though "CMR" is often used interchangeably with "CM/GC," and there is no difference regarding design issues, CMR can have a self-performance element that differs from those found in some CM/GC deliveries.[7]

Indefinite Delivery/Indefinite Quantity (ID/IQ), also known as Task Order contracting or Job Order contracting. Under this arrangement, a contractor will bid on a particular unit of the project

[6] http://www.fhwa.dot.gov/construction/contracts/acm/cmgc.cfm
[7] http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_787.pdf

where the contract has a specific minimum of work units.[8] Work requirements are clear but there may be labor staffing issues, escalation costs for construction, and larger unit bid prices.

Cost + Time (A + B) bidding. When determining the low bid, both cost and time can be examined. "A" is the dollar amount needed for items in the contract and "B" is the number of days needed to complete the project. This model can help minimize construction time.

Best-Value Contracting A + B + C (also referred to as Multiple-Parameter Bidding or source selection). This method is similar to A + B bidding, with the addition of the "C" factor, an additional criterion such as the existence of a warranty.[9]

Alternative Technical Concepts (ATCs). This highway contracting procurement method can be used in combination with other delivery methods, like design-build. It features the solicitation of innovative design concepts.[10]

Lane Rental. Under this method, contractors are charged a rental fee for closing lanes while they work, which provides an incentive for timely work, with reduced traffic disruption.

State experience with these innovative contracting methods includes the following:

- Michigan has been using design-build since the 1990s for freeway reconstruction and bridge projects and has also used CMR and CM/GC. They deemed the latter to be "unique projects with unique risks."[11]
- West Virginia has completed four warranty highway resurfacing projects and is proceeding with more.[12] Its authorization includes 10 pilot projects with a budget of $150 million over a three-year period.[13]
- Utah relied on design-build to deliver new infrastructure at an accelerated pace for the 2002 Winter Olympics.[14] Utah also uses CM/GC, claiming that it allows them to combine benefits from both design-build and design-bid-build.
- North Carolina began using design-build in 1998, and bid selection requires a review of quantitative and qualitative issues.[15]

B.6 O&M Risk Transfer through Contracts

State DOTs and other agencies transfer risk to the private sector through operations and maintenance (O&M) contracts. These contracts enable public authorities to transfer management and cost risk to the private sector. Through the implementation of asset management plans, these contracts also enable public authorities to transfer lifecycle cost risks to the private sector.

State leaders in performance-based maintenance contracting include Virginia, Texas and Florida. Virginia's 1995 Public and Private Transportation Act authorized not only DBFOM P3s but also maintenance contracts.

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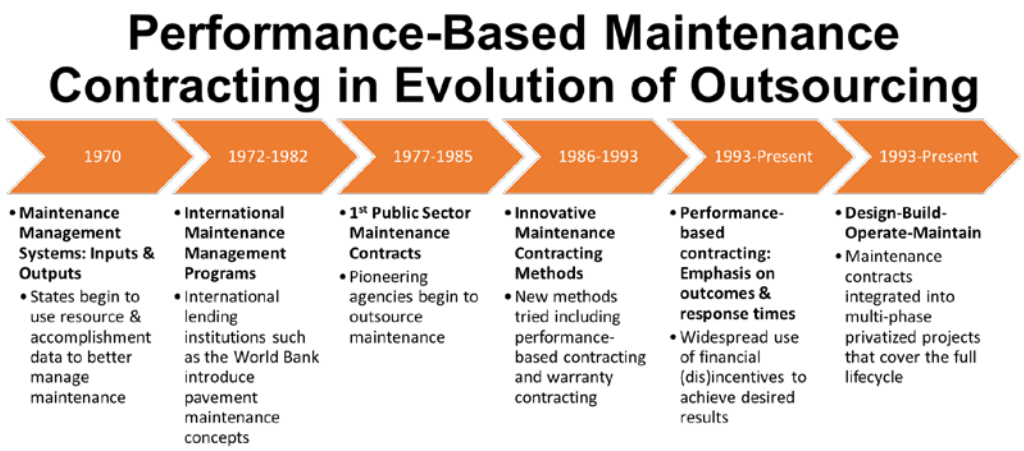
[8] https://www.codot.gov/business/designsupport/innovative-contracting-and-design-build/icac/DEFINITIONS.pdf
[9] http://onlinepubs.trb.org/onlinepubs/archive/NotesDocs/20-24(43)_FR.pdf
[10] http://www.fhwa.dot.gov/construction/contracts/acm/atc.cfm
[11] http://www.michigan.gov/documents/mdot/Design_Build_Chris_Youngs_381837_7.pdf
[12] http://www.transportation.wv.gov/highways/contractadmin/ipd/Pages/Warranty-Contracting.aspx
[13] http://www.transportation.wv.gov/highways/engineering/designbuild/Pages/default.aspx
[14] http://blog.udot.utah.gov/2013/07/innovative-contracting/
[15] http://www.dot.ga.gov/BuildSmart/research/Documents/11-21.pdf

One of the first unsolicited proposals the state received was for maintenance of 250 miles of highway including parts of I-95, I-81, I-77 and I-381. The five-year, $131.6 million contract was awarded in December 1996. The contractor received much higher grades than publicly maintained portions of roadway. A Virginia Tech study found that the contract saved the state between $6.5 and $22 million depending on the assumptions used. The contract was renewed after its first term.

In 1998, Washington, DC, awarded a five-year, $69 million performance-based maintenance contract for 75 miles of national highway within the District of Columbia. The contract featured incentive and disincentive payments for the contractor. After the first year of the contract, ratings for maintenance rose from the high 20s to the low 80s on a scale of 100.

In 1999, Texas DOT entered into two performance-based maintenance contracts, one for 120 miles of I-35 and another for 60 miles of I-20. The contract included required standards for every type of O&M activity on these two sections of highway.[16]



Source: Hyman 2009

Florida began performance-based maintenance contracting (which it refers to as "asset maintenance") in 2000. Between 2000 and 2005, FDOT entered into 22 such contracts with a total value of $672 million. It currently has more than $1.2 billion worth of active O&M contracts. The average contract size is $7 million. Most contracts are for seven years while some are for five and others 10. Contractors include Transfield, DBI, ICA, Jorgensen, TME and Louis Berger. There are four main contract types:

- Road corridor contracts centered around a core roadway such as a limited access facility
- Geographic contracts containing multiple transportation facility types within a region
- Facility contracts including rest areas, weigh stations and welcome centers
- Fixed and moveable bridge maintenance and inspection contracts.

[16] Hyman, William. 2009. "Performance-Based Contracting for Maintenance: A Synthesis of Highway Practice." Synthesis 389 of the National Cooperative Highway Research Program. Washington, DC: Transportation Research Board of the National Academies.

FDOT has claimed many benefits from the contracts, including: long-term fixed pricing; cost savings; risk transfer; streamlined administration; and performance results[17]. FDOT has developed a Maintenance Rating Program (MRP) to manage the contracts, which include the following activities:

- Mowing
- Signs
- Guardrail
- Pavement striping
- Replacement of raised markers
- Fence repair
- Shoulder maintenance
- Cleaning drainage systems
- Environmental compliance
- Incident response
- Natural disaster preparedness
- Inspection of bridges
- Highway lighting
- Motorist aid service patrols.

B.7 Case Study of Publicly Financed Greenfield Toll Road: Triangle Expressway[18]

The Triangle Expressway is an example of a project developed, financed and operated by a governmental entity—the North Carolina Turnpike Authority. The project is North Carolina's first modern toll road. It is approximately 20 miles long, extending from the interchange of I-47 and NC 147 to the NC 55 Bypass near Holly Springs, NC. It completes a portion of the outer loop of Raleigh and provides a six-lane, controlled access alternative to the parallel NC 55. It improves access to Research Triangle Park and other regional employment centers.

The project was delivered through two main fixed-fee, lump-sum, design-build contracts, one awarded to S.T. Wooten Corporation for $137 million and the other to Raleigh-Durham Roadbuilders (Archer Wester Contractors, Ltd and Granite Construction Corp) for $447 million, both in August 2008. Both contractors provided payment and performance bonds equal to their respective contract amounts. The contracts included price adjustments for asphalt, cement and diesel fuel. The combined bonus for on-time completion of both contracts was $4.5 million. The contracts also featured liquidated damages for a combined amount of $35,000 a day for delays in substantial completion and $15,000 a day for delays in final completion.

Roadside tolling equipment and back office systems were procured for $14.2 million and $8 million respectively from Affiliated Computer Services (ACS). URS Corp (now AECOM) was contracted for operations, including 18 months of development and five years of management. Transcore won the $5.9

[17] http://www.dot.state.fl.us/statemaintenanceoffice/asset.shtm
[18] Source: information largely from the Official Statement available for download at http://emma.msrb.org/ using CUSIP 65830RAK5.

million contract for transponders[19]. NCDOT has agreed to fund O&M on the project in the event toll revenues are insufficient.

The Triangle Expressway was financed with three tranches of toll-backed debt (two series of senior tax exempt Series 2009 revenue bonds and a TIFIA loan) along with a series of state-appropriations-backed Build America Bonds. The Series 2009 bonds include both current interest bonds (a bond whose interest payments are provided semi-annually to the bondholders) and capital appreciation bonds (a municipal security whose investment return on a starting principal amount is compounded at a specified rate until the bond matures). The principal amount of the current interest bonds is $235 million and is scheduled to be paid from 2019 to 2039. The capital appreciation bonds have an initial amount of $35 million and mature (together with compounded interest) in the amount of $206 million from 2030 to 2038. The Series 2009 bonds were insured by Assured Guaranty. This increased their ratings by Moody's, S&P and Fitch at time of issuance from Baa3, BBB- and BBB- respectively to Aa2, AAA and AA respectively. The Series 2009 bonds debt service on the $387 million TIFIA loan was scheduled to begin in 2015 and to end in 2043.

State appropriations in the amount of $25 million per year from the State Highway Trust Fund have been pledged to the project over a 40-year period. They are being used to support the toll revenue bonds during the ramp-up phase and during the final five years of the TIFIA loan. In addition, state appropriations are paying the debt service on $352 million of state appropriation revenue bonds issued under a separate trust agreement by the Authority

Toll revenue was expected to increase from zero in 2011 to nearly $170 million in 2049. It is now exceeding forecasts. For 2014, the projected toll revenue was $17.6 million while the actual was $19.7 million. The Expressway is credited with fueling economic development in the region and the DOT is moving forward with new interchanges and other enhancements[20].

Unusually for project financings, debt service payments rank higher in priority claim on annual cash flows than annual operations and maintenance expenses. That is because NCDOT has agreed to pay O & M costs from the State Highway Trust Fund should toll revenues be insufficient after meeting annual debt service requirements. This represents a form of governmental credit enhancement described in section 3.3 of this guidebook.

[19] Samuel, Peter. December 19, 2009. "North Carolina Pike Say Got Good Prices for All-Electronic Toll Systems – Nearly 20% Off" in *Toll Road News*. Pine Street Publications LLC.
[20] Siceloff, Bruce. July 10, 2015. "Two New Interchanges Will Bring More Paying Customers to Triangle Expressway" in *The News & Observer*. Raleigh.

Sources and Uses for Triangle Expressway	
SOURCES	**US $ millions**
State Appropriation Revenue Bonds	$352
Series 2009 Bonds	$269
TIFIA Loan	$387
Annual Appropriations for FY09	$25
Total Sources	**$1,032**
USES	
Construction and Acquisition Costs	$878
Senior Lien Debt Service Reserve Fund	$27
State Appropriation Revenue Bonds Reserve Fund	$8
Capitalized Interest[21] on Series 2009 Bonds	$49
Capitalized Interest on State Appropriation Revenue Bonds	$42
TIFIA Loan Origination Charge	$11
Cost of Issuance	$18
Total Uses	**$1,032**

[21] Capitalized interest is interest paid during construction; therefore, it needs to be borrowed up front and is in fact added to the principal of the debt. Under generally accepted accounting principles, interest expense during construction is considered a capital expenditure and is included in the project's construction costs.

B.8 References

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B.9 Glossary

Term	Description
Bidder	A respondent to a Request for Expressions of Interest or an invitation to submit a bid in response to a project brief. Typically, a bidder will be a consortium of parties, each responsible for a specific element, such as constructing the infrastructure, supplying the equipment, or operating the business. The government normally contracts with only one lead party (bidder), who is responsible for the provision of all contracted services on behalf of the consortium.
Brownfield	Projects that focus on improving, operating, and/or maintaining an existing asset (contrast to greenfield). P3 brownfield projects in transportation typically are long-term operation and maintenance contracts or lease concessions. Blended greenfield–brownfield projects also exist, for example, improving an existing asset by adding new capacity (e.g., more lanes).
Concession Period	Total construction and operating periods.
Concessionaire	Private entity that assumes ownership and/or operations of a given public asset (i.e., train station, bus operation) under the terms of a contract with the public sector.
Contingency	An allowance included in the estimated cost of a project to cover unforeseen circumstances.
CPI	Consumer Price Index.
DB	Design–build: Under a DB, the private sector delivers the design and construction (build) of a project to the public sector. The public sector maintains ownership and operations and maintenance of the asset. Build refers to constructing the road, which includes reviewing conditions at the building site, providing construction staff and materials, selecting equipment, and when necessary, amending the design to address problems discovered during the construction phase.
DBFOM	Design–build–finance–operate–maintain. Under DBFOM, the private sector delivers the design and construction (build) of a project to the public sector. It also obtains project financing and assumes operations and maintenance of an asset upon its completion.
Debt Maturity	Maturity date for project bond.
Discount Rate	Percentage by which a cash flow element in the future (i.e., project costs and revenues) is reduced for each year that cash flow is expected to occur.
Discount Rate, Nominal	Discount rate that factors in the inflation rate.
Discount Rate, Real	Discount rate that does not account for inflation.
DSCR	Debt service coverage ratio.
Finance	Phase or delivery aspect of the project that includes providing capital for the project, which may include issuing debt or equity and verifying the feasibility of plans for repaying debt or providing returns on investment.
Greenfield	Projects that focus on developing and/or building a new asset (contrast with brownfield). Many P3 structures are available for greenfield projects, including design–build, design–build–operate–maintain (DBOM), design–build–finance–operate–maintain/manage (DBFOM), and others. Blended greenfield–brownfield projects also exist.
Inflation Consumer Price Index	Used as a base rate for inflation assumptions.
IPD	The Office of Innovative Program Delivery (IPD), a part of the Federal Highway Administration, provides tools and expertise in use of different public–private partnership (P3) approaches.
Leveraging	Degree to which an investor or business is utilizing borrowed money.
Maintenance	This phase includes keeping the project in a state of good repair, which includes filling potholes, repaving or rebuilding roadways, and ensuring the integrity of bridges and highways.
Net Present Value (NPV)	Present value of the expected future revenues minus the net present cost.
Private Activity Bond	New type of financing that provides private developers and operators with access to the tax-exempt bond market, lowering the cost of capital significantly.
Public Sector Comparator (PSC)	Represents the most efficient public procurement cost (including all capital and operating costs and share of overheads) after adjustments for competitive neutrality, retained risk, and transferrable risk to achieve the required service delivery outcomes. This benchmark is used as the baseline for assessing the potential value for money of private party bids in projects.
Ramp up	Period after opening of a new toll facility during which traffic steadily increases as users become more familiar with the facility
Retained Risk	The value of those risks or parts of a risk that government proposes to bear itself under a partnership arrangement.

Term	Description
Revenue Leakage	Assumed annual revenue losses for a tolling facility.
RFP	Request for proposal.
ROW	Right of way
Risk Allocation	The process of assigning operational and financial responsibility for specific risks to parties involved in the provision of services under P3. Also see risk transfer.
Risk Transfer	The process of moving the responsibility for the financial consequences of a risk from the public to the private sector.
Routine Maintenance	Work that is planned and performed on a routine basis to maintain and preserve the condition of the highway system, or to respond to specific conditions and events, that restore the highway system to an adequate level of service.
Technical Risk	Risks arising from deviations from the project's original technical assumptions, specifications, or requirements.
T&R	Traffic and revenue.
Transportation Infrastructure Finance and Innovation Act (TIFIA)	This program provides Federal credit assistance in the form of direct loans, loan guarantees, and standby lines of credit to finance surface transportation projects of national and regional significance (FHWA, 2013).
Transferrable Risk	Any risk that is transferrable to the bidder.
Value for Money (VfM)	The procurement of a P3 project represents VfM when—relative to a public sector procurement option—it delivers the optimum combination of net life-cycle costs and quality that will meet the objectives of the project.