INFRASTRUCTURE PUBLIC PRIVATE PARTNERSHIPS AND CONTINGENT LIABILITIES: A VALUE CAPTURE CASE STUDY FROM TEXAS*

Rafael Aldrete, Ph.D. & Sharada Vadali, Ph.D.
Texas Transportation Institute, Texas A&M University, United States
r-aldrete@tamu.edu

ABSTRACT

Transportation infrastructure needs throughout the United States are at levels that governments are unable to meet their capacity needs from traditional funding sources. One innovative financing method that is a form of public private partnership (PPP) is value capture (VC). VC initiatives involving municipal bond financing are all a non-commercial alternative form of PPP that like many PPPs, also involve contingent liabilities. This paper presents a VC mechanism recently established in the state of Texas that is innovative from a municipal transportation financing standpoint because it allows for the establishment of Transportation Reinvestment Zones (TRZ). The paper uses a case example to demonstrate that TRZ's are a way for cities to leverage state and local funds for infrastructure construction and uses the case example to discuss financial risk issues implicit in contractual arrangements of this type of PPP especially those stemming from risk allocation. The paper argues that there is a need to better define this risk allocation and understand the contingent liabilities implicit in these forms of partnerships. Finally, the paper proposes a contingent claims analysis approach to value the liability implicit in the TRZ model using a corridor example.

1. INTRODUCTION

1.1. Funding needs, capacity shortfalls and role of Public Private Partnerships

Over the past two decades, public private partnerships (PPP) have surfaced into transportation finance discussions and numerous examples of PPP initiatives can now be found both in the international arena and to a smaller extent within the United States (US). One of the primary reasons for the development of PPP initiatives around the world has been the difficulty in financing infrastructure projects from traditional state budgets. Transportation needs throughout the country are at levels that governments are unable to meet capacity needs through traditional revenue collection methods. Among the other factors responsible for the emergence of innovative finance based PPP funding methods are delays in traditional project delivery methods "pay-as-you-go" financing, cost overruns, project management inefficiencies, and a recognition that PPPs allow an infusion of private sector innovation into infrastructure delivery. PPPs have been seen by governments as a tool to make possible the development of important and necessary projects that neither the government nor the private sector would be willing to undertake alone by: a) accelerating project delivery, making economic benefits from completed projects accrue sooner rather than later; and b) transferring risk to the private sector. While the concept of PPP has only recently been used to describe infrastructure projects in the US, over the years many projects have been financed through the US municipal finance market, which is also a form of private sector involvement. Commonly known examples of such PPPs are tax-increment-finance (TIF) and tax-increment-reinvestment-zones (TIRZ) seen across the country.

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1.2. Contingent liabilities in PPPs

However, PPPs come with fiscal costs. Government agencies using PPPs as a mechanism to finance infrastructure face a greater degree of fiscal risk and uncertainty (Schwarz et al. (*1*)) related to the share of project risk borne by the public sector. The contingent nature of this risk is what leads to the creation of contingent liabilities via the potential for a sudden or larger than expected change in the nature of obligations over a short period of time. These contingent liabilities create latent fiscal risks for governments and create hazard in the markets (Almeyda and Hinojosa (*2*)). An integrated risk management approach for governments should systematically record, assess, budget, and publicly acknowledge the risk exposure resulting from their contingent liability holdings (Lewis and Mody (*3*), Aldrete, (*4*)). Cebotari (*5*) and Polackova (*6*) conduct a detailed typology of such fiscal risk and develop a fiscal risk matrix classifying the sources and nature of contingent liabilities. Liabilities in general, could be direct (materialize in any event), or contingent (materialize if only a certain event occurs); and either explicit (legally binding) or implicit (binding by social norms, habits, and traditions, Brixi and Mody (*7*)).

This paper looks at the fiscal risk related to land market-based financing as defined by the municipal Transportation Reinvestment Zone (TRZ) model recently created in the State of Texas. More specifically, this paper discusses the fiscal risks stemming from TRZ financing and possible options for managing these risks.

1.3. Organization of the Paper

This paper is organized in five sections, including this introduction. Section 2 introduces value capture (VC) as a specific form of a land market based PPP, and describes the Texas TRZ VC model. Section 3 focuses on the identification and management of the revenue risk implicit in the flow of funds of a TRZ, and argues that there is a need to better define the allocation of this risk and the contingent liabilities associated with TRZ revenue. Section 4 discusses the valuation of contingent liabilities and proposes an approach to value TRZ revenue contingent liability using an example from the City of El Paso TRZ No. 2. Finally section 5 wraps up with a summary and conclusions.

2. VALUE CAPTURE AS A PPP – THE TRZ MODEL IN TEXAS

This section starts with an introduction to VC as a specific form of a land market based PPP, describes the Texas TRZ VC model and illustrates its conceptual flow of funds using an example from the City of El Paso.

VC is an innovative financing method that relies on leveraging the real estate potential brought by urban asset improvements. It can be traced back to 18th century when the theory of public finance first emerged, but interest in the concept has been renewed by the US Department of Transportation as it explores innovative approaches for infrastructure financing. VC refers to the process by which all or a portion of increments in land value attributed to "community efforts" rather than landowner actions are recovered by the public sector. Most simply defined, it is the means by which capital infrastructure investment is financed through means of “capturing” either some or all of the added value of real estate property that results directly from that investment. VC is essentially a benefit-capture method that offers an approach to ensure that the transportation system will remain adequate to serve mobility needs for the future when implemented with appropriate screening criteria.

VC is also a way of using and recycling transportation project public benefit revenue streams to fund specific projects within those zones. These revenue streams provide the opportunity to adopt project bond financing in designated zones. As such, it is a non-commercial form of PPP, a feature which distinguishes it from other forms of PPP, and seeks to obtain funds from within the region as opposed to relying on outside sources of capital. The urban economic development literature indicates that such mechanisms, including the whole gamut of PPP-type projects, might assume a new role during periods of budget stringency (Dye and Merriman (*8*)) and offer municipalities an innovative opportunity to collaborate with other non-profit governmental entities or private sector to achieve mutual public objectives. VC techniques can occur via two fundamental approaches: recouping benefits from properties directly, and through joint ventures with the private sector (developers). This paper is largely directed to the former approach.

Legislation adopted by the State of Texas in 2007 makes specific provisions for the development of municipal TRZs, a concept that encapsulate the principles of VC to supplement roadway project financing. TRZs are a mechanism for local governments to leverage local and state funds for infrastructure construction by using the Texas Department of Transportation's (TxDOT) "Pass-Through" mechanism at minimal risk to the municipality's credit rating (*9*).* After designating a contiguous area along a corridor as a TRZ, a local government entity (a City or a County) can securitize the incremental tax revenues along with TxDOT Pass-Through financing to obtain the funds necessary to bring a project to fruition. Funds generated from the securitization will be used to pay for infrastructure projects in the TRZ, and investors will be repaid from the combined revenue stream - the incremental tax revenues and TxDOT Pass-Through funds. Once the securitized debt is repaid, the additional revenues generated by the TRZ are redirected towards other municipal services. The Texas TRZ model is similar in many ways to the TIF or TIRZ model in its implementation and also involves municipal bond financing.

One of the first examples of the application of the TRZ model is in El Paso, Texas. A local governmental entity in El Paso, the Camino Real Regional Mobility Authority (CRRMA) has entered into an agreement with TxDOT and the City of El Paso to finance a series of transportation improvement projects within the City of El Paso's TRZs No.2 and No. 3 using a mix of TRZ and Pass-Through funds. The CRRMA will be responsible for securitizing bonds backed by property tax revenues from the TRZ and TxDOT Pass-Through funds.

The flow of funds as conceptualized in the SB 1266 TRZ model is shown in Figure 1 (Vadali et al. (*10*)). Every year during the life of its TRZs, tax revenue collected over and above an agreed-upon base would go into an ad valorem tax increment account established by the local government. From the ad valorem tax account, these funds would flow to the designated local entity (the local government itself or a Regional Mobility Authority), where they would be complemented with pass-through funds. Finally, the designated local entity would securitize this annual revenue stream to obtain debt and fund construction of the transportation facilities. In terms of revenue risk, the TRZ legislation is neither clear nor explicit regarding its allocation, while the flow of funds shown in the figure seems to implicitly allocate the risk of financial non-performance to the municipality or to

* TxDOT defines Pass-Through Financing as a mechanism for project developers to finance and be reimbursed for the capital costs of constructing or expanding a state highway project. The public agency (e.g. a local government) or private entity developing the project finances, builds, maintains and/or operates a road project, and TxDOT reimburses a portion of the project cost by making periodic payments for each vehicle that drives on the highway. The remainder of the project capital costs may be met via a combination of traditional construction funds, toll revenue, or TRZ revenue.

the designated local entity issuing debt. Finally, the municipality or the locally designated entity will securitize bonds against this annual revenue stream and fund construction of the transportation facilities.

In practice, the annual cash flow projections from the TRZs are estimated prior to its establishment and represent simply a projection. Depending on the arrangement between the municipality and the designated local entity, these projections may not necessarily represent a binding commitment for the municipality. The municipality may commit the entire tax increment in any given year over the TRZ life, regardless of whether the amount falls short or exceeds the projection, or it may commit to meet the projected cash flows. The case of El Paso is an example of the latter, where the municipality has committed to deliver a fixed cash flow stream to the designated local entity (the CRRMA). Hence, the City of El Paso is exposed to the risk that the property tax increment revenue expected does not materialize, while its obligation to the CRRMA remains firm, creating a contingent liability. The risk to the CRRMA and its bondholders in such a situation can be defined as the risk that property values within the TRZs do not perform as expected or development does not occur as planned. In such a case, the City or El Paso would face a shortfall in revenue, while keeping the obligation to meet its debt service to the CRRMA according to schedule.

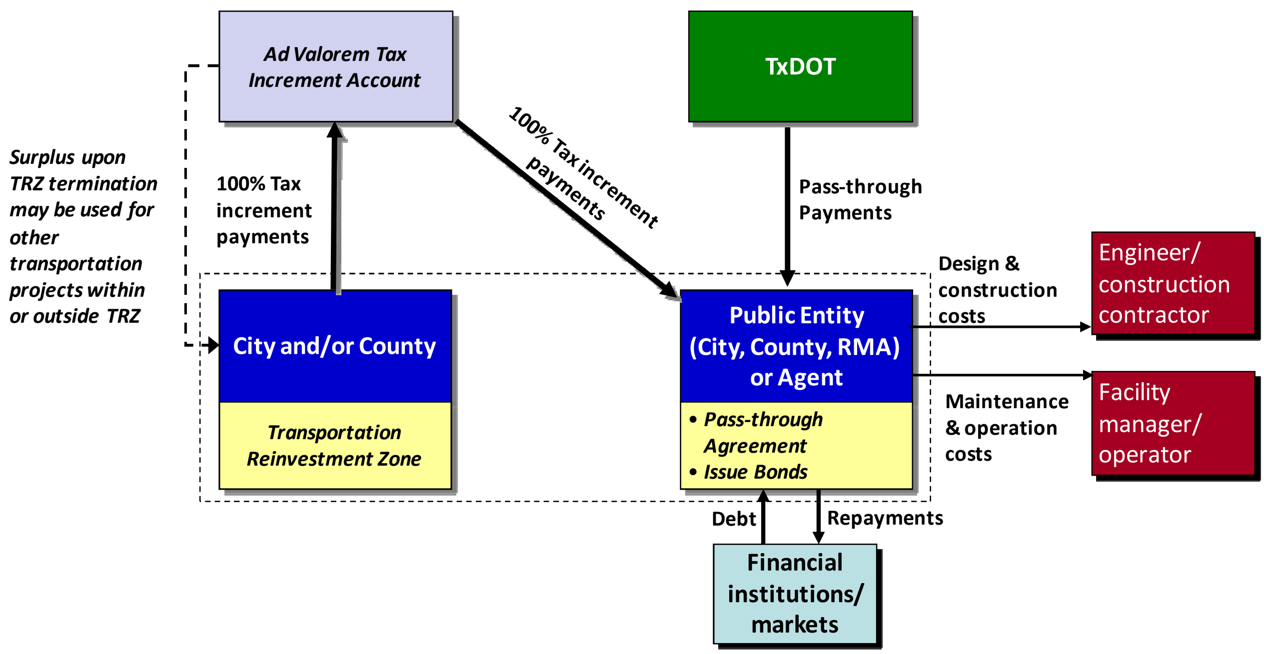


FIGURE 1 - Conceptual Flow of Funds for TRZ Financing (Vadali et al., 2011 (*10*))

3. TRZ RISK IDENTIFICATION AND MANAGEMENT

This section focuses on the identification and management of the revenue risk implicit in the flow of funds of the TRZ model described in the previous section, and argues that there is a need to better define the allocation of this risk and the contingent liabilities that are associated with TRZ revenue.

3.1. TRZ Risk Identification

Risk can be defined in general as the possibility of deviation in the actual project outcome—that is, the benefits and costs accruing to each party with an interest in the project—from the expected, or most likely outcome. In transportation infrastructure risk can be defined as the exposure to possible economic loss or gain arising from involvement in the planning, construction, and/or operation of a transportation facility. These risks can be classified into three categories: (a) project risks (those related to the complexity of the project itself); (b) commercial risks (those related to market conditions and price elasticity of demand); and (c) financial risks (those related to sharp variations in the cash flows that make the project financially viable). In the context of this paper, TRZ risks clearly belong to the latter category.

Recognizing and identifying the various sources of risk in the Texas TRZ model, their characteristics and evolution over time, and the opportunities they present is critical in order to develop a framework to manage them. Figure 2 identifies the key sources of risk in a TRZ, and highlights revenue as the single most critical source of risk, as is the case of most transport sector PPPs, occurring either individually, temporally and/or cumulatively.

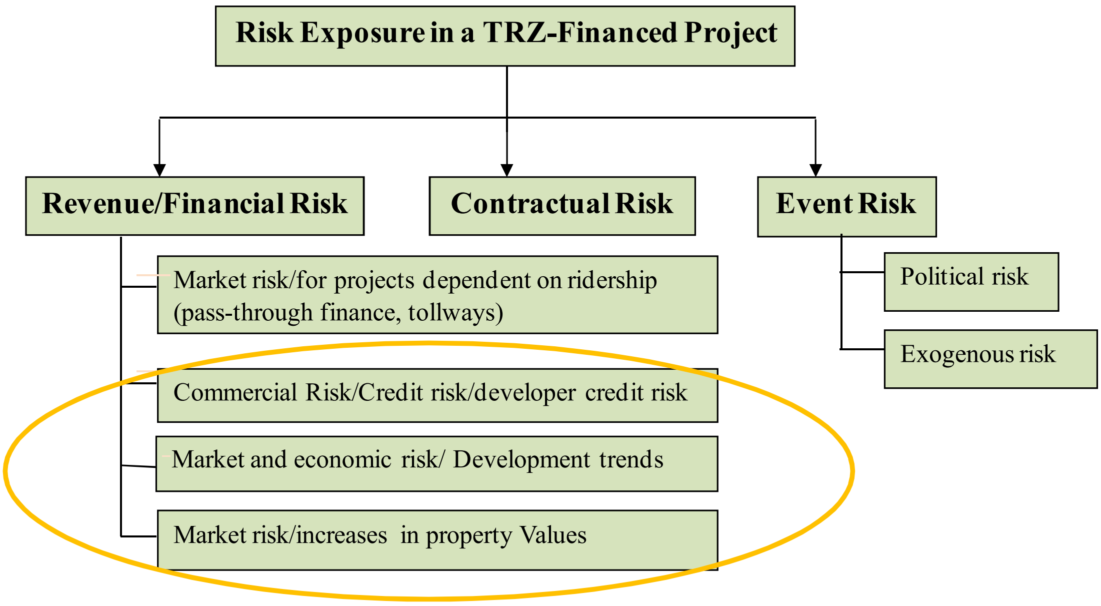


FIGURE 2 - Most Salient Sources of Risk in TRZ Finance (Adapted from Lewis and Mody, 1998 (*3*))

Like PPP projects, benefit-capture schemes like TRZ initiated projects have a risk profile that evolves over the life of the TRZ and demands a risk management strategy that can equally evolve with each project lifecycle phase. Understanding these risk stages allows one to develop appropriate risk management strategies. Figure 3 illustrates the temporal evolution of risk when combined with a TRZ-based project lifecycle.

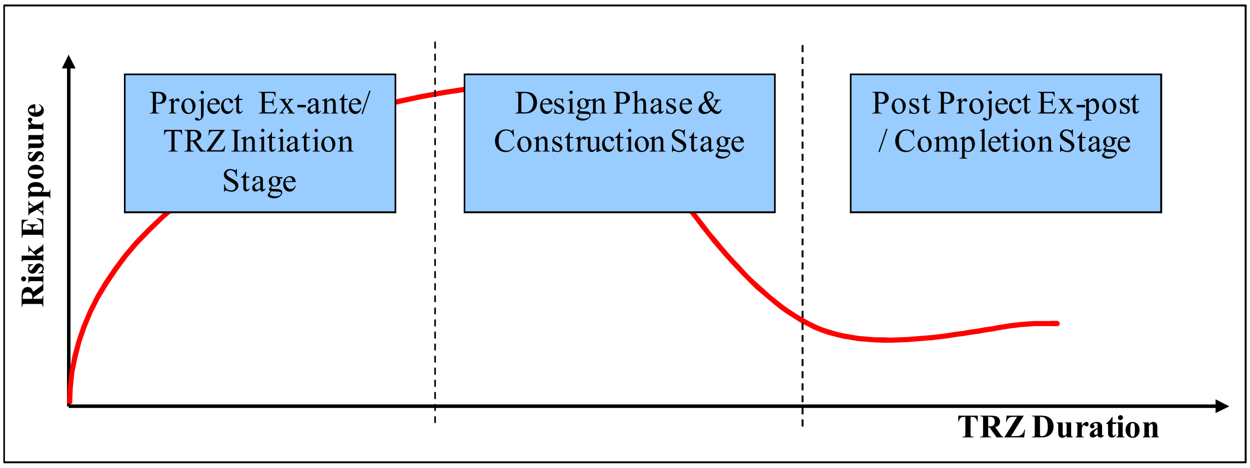


FIGURE 3 - Temporal Evolution of Risk during the Life of a TRZ Project

As shown in Figure 3, there are three distinct risk stages in the TRZ, each with its own set of possible risks, as follows:

- **Pre-Project or Ex-Ante Stage.** This is the stage during which the TRZ is initiated, and its timing could range anywhere from 3-5 years prior to the start of the actual transportation project to which the TRZ is tied to. During this phase, risks emanate primarily from obtaining financing for a project, including bankable revenue projections from both Pass-Through funds and TRZ revenues as independent, yet complementary sources of revenue. Some of the most significant risks include:
  - *Inability to obtain financing*. For example: high revenue risk over the TRZ life.
  - *Decline in assessed values.* For example: TRZ property assessed values may decline due to a recession or natural disaster; property can be acquired by tax-exempt entities; assessment appeals made by major landowners may negatively affect the assessed value. These risks can emanate from improper assessments of change in assessed property values which form the base for revenue calculations.
  - *Development realization*. For example, development does not progress on a timely basis, or the projected level of development does not occur. Private developers and their financing sources weaken over the term of the TRZ, thus failing to produce the projected development activity.
  - *Lack of definition of partner roles*. Poorly defined roles between state and local government agencies and other parties may lead to contractual delays or other issues.
- **Design and Construction (Interim) Stage.** This is the stage during which the transportation project to which the TRZ is tied to is being designed and built and ends with the beginning of project operations. Its timing will depend on the size and type of project, and lasts anywhere from 2 to 4 years. Significant risks at this stage include:
  - *Decline in assessed value.* Similar to the corresponding Pre-Project Phase risk.
  - *Development realization.* Similar to the corresponding Pre-Project Phase risk.
  - *Identification and acquisition of Right-of-Way (ROW)*. For example, late identification of ROW acquisition needs erodes the tax base and alters the values for other properties. Additionally, private and commercial property owners will likely be affected during construction and some value losses may occur on properties immediately located along the ROW.
- **Post-Project Stage.** This stage is characterized by the least amount of risk exposure and begins right after the facility is open to traffic and lasts until the expiration of the TRZ. Decline in assessed value and development realization linked to market risks remain as the most salient risks at this stage.

3.2. TRZ Risk Mitigation

Risk mitigation at every stage requires structured efforts at reducing the variance between actual and anticipated outcomes. This can be accomplished using a multi-pronged strategy to address risks specific to each stage, as summarized in Table 1.

3.3. TRZ Risk Allocation

Allocating project risk means apportioning responsibility for bearing the costs that result from each identified project risk materializing. This particular research focuses on costs stemming from revenue sharing implicit in these agreements. Risks in a PPP project may be allocated to one of the parties to the PPP contract or shared between those parties. Despite the fact that TRZ finance is a much simpler form of a PPP and that the only active parties to a TRZ agreement are state and local government entities and bondholders (there is no other private party other than private agents who contribute a portion of their taxes or the bondholders), it is important to address the allocation of project risks by understanding the factors that drive optimal risk allocation. Optimal risk allocation is defined as the apportionment of risk between parties to a contract that minimizes the total cost of risk bearing to the project.

Based on the example shown Figure 1, there are three parties to a TRZ agreement: TxDOT, the City of El Paso, and the CRRMA. Of these, TxDOT is the ultimate beneficiary as the facility owner, the City of El Paso is the collaborator, while the CRRMA is the entity that facilitates the bonding. It is this governance aspect that ultimately differentiates it from the more commonly known TIF. As discussed earlier, the largest risk arises from revenue risk when development fails to progress along hypothesized lines. According to modern risk management principles, risks should be allocated to the party who can manage it best (Irwin, 2002 (12)). This in turn, leads to three separate criteria for risk allocation:

- To the party best able to control the likelihood of the risk event occurring
- To the party best able to control the impact of the risk on project outcomes—for example, by anticipating the risk event or by reducing its potential cost
- To the party best able to absorb the risk at lowest cost

These criteria combined with the agents in a TRZ partnership lead to the allocation shown in Table 2. The table suggests that despite the sensibility of these criteria, they do not always lead to similar guidance in terms of who should bear the risk in a TRZ arrangement. The direction of arrows in Table 2 suggest the hierarchy of risk bearing going from highest to lowest feasible in this context. Table 2 also suggests an alternate allocation based on origin of risk and principal-agent theory (Oudot, 2005 (13)). These tend to suggest a preponderance of scenarios where the State is theoretically better positioned to manage TRZ revenue shortfall risks in the TRZ arrangement discussed above. This might not be the case in the case of VC joint ventures, where private developers become part of the PPP and the government might be able to pass some risk to private parties. Research by the World Bank indicates that to the extent that revenue risks are driven by market conditions and risk, there is a potential role for the government to play in risk-sharing and recommend revenue guarantees as a support mechanism (Estache and Strong, 2005, World Bank (14)). The authors also note that in the case where a pure private party is involved in the contract, it is not uncommon to see government guarantees despite that theory would dictate the private party bears the financial risk. This mechanism for allocation of risk to the government creates a contingent liability.

TABLE 1 - TRZ Risk Factors and Possible Risk Mitigation Strategies

Stage	Risk Factors	Risk Mitigation Strategy
Project Ex-Ante/ TRZ Initiation	• Obtaining finance • Decline in assessed value • Development realization • Lack of definition of partner role	• In ex-ante forecasting: – Ensuring good quality data as inputs into the forecasts – Improving all revenue forecasting assumptions and considering the multitude of factors that impact tax base – Implementing risk analysis in the provision of probabilistic assessments and subjecting all estimates to stress testing – Assessing macroeconomic conditions as a way of dealing with economy-wide risk. – In regional assessment, by exploring development conditions and real estate market conditions. • In screening candidate TRZs, by ensuring that microeconomic rationale is maintained in the decision-making process. This process can enhance fiscal receipts to all taxing entities including those like schools, college and hospitals in the region while enabling capture of a City's portion to fund the transportation project. This can be accomplished via: – Analysis of how project specific factors might impact regional growth as a way of mitigating project related risk. – Analysis of location specific factors, including current and future regional trends, and conditions in and near the project area. – Developing a priority project list based on screening criteria, regional significance, connectivity and other metrics. • In risk allocation, by ensuring a clear allocation of risks to parties to the TRZ agreement (Lewis and Mody (*3*)). • In TRZ zone design, by adopting a coordinated approach to individual projects to allow risk pooling while allowing TRZ revenues to be tied to projects that originated them. • In early planning, by considering transportation project alternatives that maximize transportation synergies and provide opportunities for alternative modal choices like integrating mass transit options with planned projects and express lanes. • In the design of evaluation and monitoring mechanisms, by: – Establishing a dynamic risk monitoring system for all project phases, ex-ante, during, and ex-post. Such a system can help anticipate and address problems, including contingent liability triggers (Polackova (*6*, *11*)). – Identifying and quantifying risks and expected losses via quantitative methods and case studies (Polackova, *6*, *11*)).
Design & Construction	• Decline in assessed value • Development realization • ROW Identification / acquisition	• Early identification of parcels and ROW limits for expansion projects and new projects is important to address revenue risk from property value losses on properties along the ROW. • By moving acquisition to the planning stage, where options and areas for capacity improvements are known in advance • By communicating business impacts to property owners alongside so to mitigate any negative outcomes of construction including those on property.
Project Ex-Post / Completio	• Decline in assessed value • Development realization	• By continuation of the evaluation of revenues and bond payoffs upon project completion through TRZ termination combined with a delineation of surplus management of excess revenues, if any. Legislation in Texas dictates that surplus funds should be directed towards the funding of additional projects within the zones and/or towards the development of transit options.

TABLE 2 - Allocation of Revenue Risk to Agents in TRZ Finance

PARTNER BEST ABLE TO MANAGE RISK	PARTNER BEST ABLE TO ANTICIPATE/RESPOND TO RISK	PARTNER BEST ABLE TO ABSORB RISK AT THE LEAST COST
PPP Format: Dept. of Transportation, Local Governments, Taxpayers		
Dept. of Transportation (via screening procedures for projects)	City (at all phases is in a better position to respond to the risk via its policies and actions to encourage development)	Department of Transportation, as a less risk averse partner in the PPP and the consideration of pass through funds in conjunction with TRZ funds. (Flow of funds, Figure 1).
Local Governmental Entities (City) (via proactive policies: this is amply evident in the City of El Paso)	Department of Transportation	
Origin of Risk is Internal	**Origin of Risk is External**	**Blurred or Obscure Origin**
Dept. of Transportation (via screening procedures for projects)	Department of Transportation, as a less risk averse partner in the PPP	Department of Transportation, as a less risk averse partner in the PPP and the consideration of pass through funds in conjunction with TRZ funds. (Flow of funds, Figure 1).
Local Governmental Entities (City) and Appraisal District (via proactive policies: this is amply evident in the City of El Paso)	Local Government Entities	

4. CONTINGENT LIABILITY VALUATION

Contingent liabilities are a common element of many infrastructure PPPs, including toll road PPPs and municipal bond financing type PPPs, like the Texas TRZs. This section discusses the valuation of contingent liabilities using the contingent claims approach (CCA) and proposes this methodology to value the implied guarantee resulting from a TRZ using as an example from the recently established City of El Paso TRZ No.2.

4.1. Valuation of Contingent Liabilities using a Contingent Claims Approach

The valuation of contingent liabilities proposed in this paper follows the CCA (see Lewis and Mody, *(3)* for an excellent history and applications of CCA; Irwin, 2002 *(12)*) given the robust history and data quality requirements of alternate approaches. Despite the fact that revenue in our example is built up upon some history of price trends and econometric interactions between various variables in the revenue forecast, the intrinsic complexity of real estate markets and other market risks, limit the use of alternate approaches.

Contingent claims are assets/liabilities whose values at a future point in time are determined by other traded securities. The governmental guarantee is based on revenue, which could be assumed to follow a stochastic process in which the value of risk is equal to a systematic component linked to lagged revenue (when applicable) and a random component. The revenue or taxes generated for existing development in any year t is given by TF_{Et} and for new developments by TF_{Nt} where μ and η are purely random components. This approach assumes a random walk approach to revenues.

$$TF_{Et} = TF_{E,(t-1)} + \mu_T$$

$$TF_{Nt} = \eta_T$$

Alternatively, revenues can also be modeled as a geometric Brownian motion or via the Black and Scholes model. In the case study used, and guided by the experience in many applications across the world (Lewis and Mody, *(3)*) an alternate approach was adopted for valuing the guarantee in the absence of historical revenues and lack of volatility measures to capture the mean and variance. The approach devised in this research to evaluate the case study draws from a statistical model of disaggregate revenue forecasts from existing and new developments, and where attempts are made to capture the systematic components by capturing the variation in appreciation trends in the region, and consequently influencing revenues. Additionally, this approach uses a schematic assessment of the variety of factors influencing the random component including, but not limited to, variations across projects and their influences on connectivity, access, location, appraisal practices, interest rates, and macro-conditions. In the case of new developments, all of the above factors are considered in addition to at least three different parameters describing the development process (including the pace, type and timing of development *(15,16)*). Monte Carlo simulation is used to approximate the unknown revenue risk and the simulated outputs provide the probability density functions of future revenues *(15,16)* which are then used to approximate maximum possible gains/losses, expected annual discounted and undiscounted cash flows, and the value of the guarantee itself. The outputs of the revenue forecasting model are therefore designed to produce revenue projections on the basis of many assumptions impacting the random error. Key outputs of the evaluation include cash flows and bonding capacity over the term of the zone (which has an approximate duration of 16 years). These outputs are presented in the evaluation at 90 percent confidence level to reflect a “safety factor” in cash flow forecasts. Event risk could also be brought into this framework, however, it was not considered as significant risk in the case study.

4.2. Valuation of a TRZ’s Implied Guarantee: Corridor Example

As part of the evaluation of value capture potential of several El Paso TRZ corridors conducted by the authors, a financial cash flow model was developed to produce TRZ revenue forecasts. The model, its structure and data sources were developed to evaluate revenue risk stemming from land-market responses only and excluded Pass-Through finance. The key premise guiding this financial and risk analysis model was the consideration of the notion that the forecast is to provide a sense of magnitude– a reasonable sense thereof and one that should be combined with reasonable assumptions on key factors and to allow a statistical assessment on the relevant variables in the model. Using the CCA, the value of the TRZ revenue contingent liability assumed by the municipality (the City of El Paso) was priced by using the simulated TRZ cash flow and interpreting it as a put option. In such a hypothetical put option, the CRRMA would have the right to “sell” the project’s value and receive the guaranteed amount from the City of El Paso (i.e. the TRZ annual cash flow). When TRZ performance matches or exceeds projections, the City of El Paso’s contingent liability would have no value. Conversely, when the TRZ underperforms and projected revenues fail to materialize, the contingent liability trigger becomes operative with a positive guarantee value.

Following the approach used by Cheah and Liu (2005 (*17*)) for a toll road PPP, the theoretical contingent liability exposure of the City of El Paso in a TRZ was analyzed for its TRZ No.2 corridors, which included pre-determined probability assumptions captured by probabilistic distribution functions *(15,16)*. The TRZ No.2 was projected to yield about a present value of $67 million at a 50 percent confidence interval over a period of 30 years (2010-2040).[*] As discussed earlier, the City of El Paso's contingent liability trigger becomes active if TRZ revenue derived from actual property taxes (TF_{ia}) in any year *i* falls below the level projected in the TRZ pro forma cash flow model and the Department would have to theoretically face the liability to make up the shortfall. The municipality's obligation to pay to the CRRMA to cover the TRZ No.2 revenue shortfall in each year (SF_i) would depend on the relative value between TF_{ia} and TF_{ip}, as shown in Figure 4.

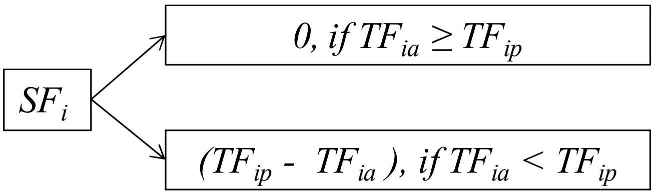


FIGURE 4 - Evaluation Model for TRZ Revenue Shortfall (adapted from Cheah and Liu, 2005 (*17*))

Therefore, the present value of the total TRZ No. 2 revenue shortfall (*SD*) that the City of El Paso would be liable to provide over the life of the TRZ (assumed to be 30 years, from 2010 to 2040) would be estimated by the equation below:

$$SD = \sum_{i=1}^{i=30} \frac{SF_i}{\left(1+R_f\right)^i}$$

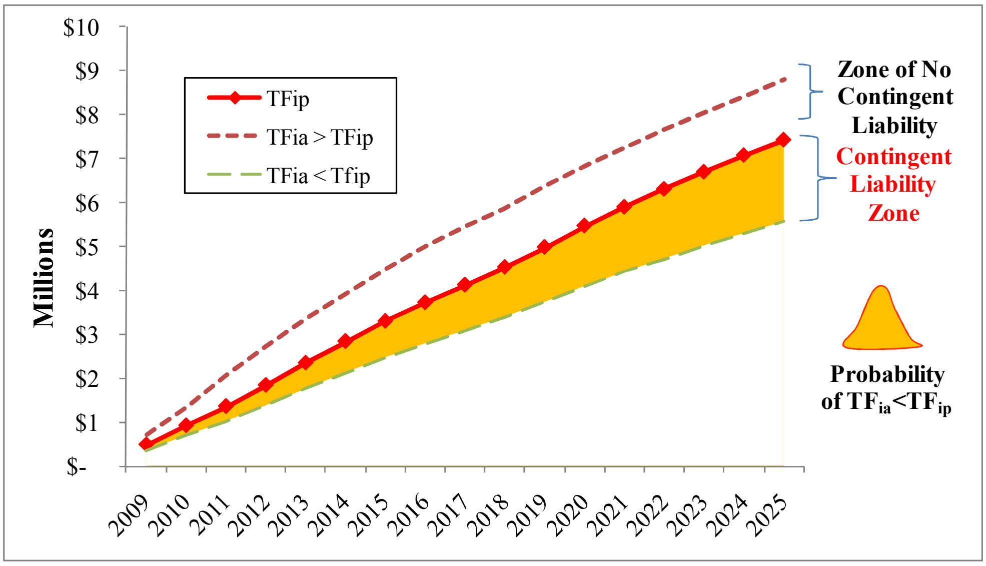
where R_f is a risk free discount rate assumed appropriate for public sector discounting.

Because of the uncertainties in property values and pace of development, the value of *SD* is not predictable and follows a probability distribution, which can be obtained by using the simulated cash flows from the TRZ financial model. The annual revenue projections for the TRZ No.2 committed to by the local government are calculated using the expected value for all simulation variables, producing a "static" pro-forma cash flow where $TF_{ia} = TF_{ip}$. Monte Carlo simulation is then used on the financial model to produce a probability distribution for each cash flow year where $TF_{ia} < TF_{ip}$. The resulting simulated *SD*, is calculated as the present value of the sum of the differences between the "static" annual cash flow values and the values simulated, as illustrated in Figure 5a. Figure 5b shows the *SD* probability distribution for the corridor example (Aldrete et al., 2010 (*18*)). In addition to the probability distribution of *SD*, the use of Monte Carlo simulation allows for the calculation of key statistics of *SD*. A key issue is to determine which of the SD statistics represents a fair value of the "put option" (or contingent liability/guarantee). Literature indicates the use of statistics such as the mean and the median, but recognizes that the actual percentile adopted will really depend on the negotiation and bargaining among the parties involved (Cheah and Liu, 2005 (*17*), and Razgaitis, 2003 (*19*)). The guarantee

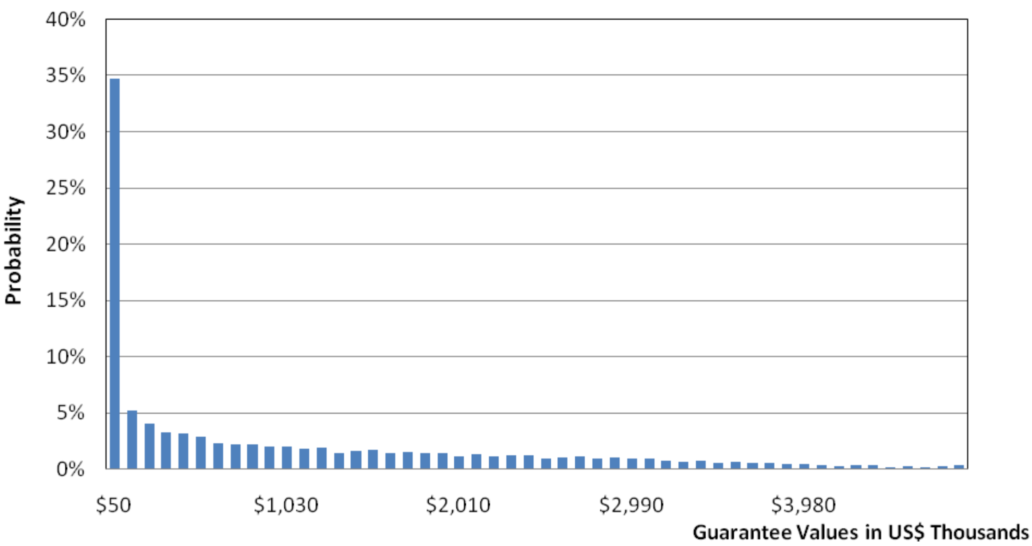
[*] See City of El Paso TRZ No. 2, http://www.crrma.net/_documents/TRZ%20Calibration%20Final%20Report%20w%20Commnts.pdf

"seller" would likely favor using a higher percentile, while the "buyer" would likely prefer a "lower" percentile. Using the mean for the purposes of illustration, the value of *SD* at $1,128,418 would be the value of the City of El Paso's contingent liability or guarantee to the CRRMA under the following assumptions (Aldrete et al., 2010 (*18*)):

- 100% of revenues are deposited to the ad valorem tax increment account
- TRZ duration- 30 years
- 50% confidence band on revenues (TF_{ip} (Figure 5a))



(a)



(b)

FIGURE 5 - Total TRZ Revenue Shortfall: (a) Estimation (b) Probability Distribution

4.3. Implications of Simulated Shortfalls to Theoretically Justifiable Party

The risk allocation analysis summarized in Table 2 suggested that in a typical TRZ's arrangement, TxDOT is theoretically better positioned to manage TRZ revenue risk by several measures. Considering that the TRZ mechanism is available to local governments statewide, TxDOT is also in a better position than local governments to manage TRZ revenue risk and contingent liabilities as a statewide portfolio of risk exposures, and possibly establish a reserve or guarantee fund. This is because the risk of a portfolio of risk exposures is generally less than the sum of the risks of the component exposures.

However, to allow TxDOT and local governments throughout the state to compare the cost of a TxDOT-sponsored guarantee scheme with the cost of other policies (i.e. a local government sponsored guarantee), it is critical to estimate the value of the guarantee, accounting for the risk and the timing of the municipality's possible payments. The analysis presented here suggests that CCA has the potential to estimate the value of such a guarantee scheme. Furthermore, considering that the TRZ No.2 under analysis was expected to yield $67 million in present value revenue, the resulting value of $1,128,418 seems reasonable when looked at as an "insurance policy" premium to cover potential revenue shortfalls throughout the duration of the TRZ. In this example the cost of the guarantee was estimated at 1.7 percent of the guaranteed amount. The order of magnitude of this result suggests that the concept of a statewide TRZ guarantee scheme could be a cost-effective risk management mechanism to facilitate such financing mechanisms by local governments once a thorough screening of candidate projects is conducted

5. SUMMARY AND CONCLUSIONS

This paper discussed municipal bond financing implicit in TRZ and TIF arrangements as a PPP and described the various aspects of flow of funds in the case of a Texas TRZ, a specific form of VC PPP between various parties. Various risk management issues associated with TRZs were discussed including risk identification, mitigation and allocation. Finally, the paper proposed an approach to value the contingent liability that stems from the uncertainty associated with the revenue forecasts. The proposed approach relies on the use of simulated cash flow projections.

The TRZ VC model is innovative from many standpoints and when subjected to rigorous screening can lead to win-win situations for local governments and TxDOT. The objective of Texas' TRZ legislation is to empower local governments to leverage state resources and finance transportation infrastructure of regional importance. This analysis demonstrated that the contingent CCA can be used to value the contingent liabilities that originate under a TRZ arrangement, and that a statewide guarantee scheme holds potential to be further investigated as a cost-effective risk management mechanism to facilitate and encourage the use of the TRZ concept by local governments.

REFERENCES:

1. Schwartz, G., Corbacho, A., and T. Koranchelian. *Financing Transportation Infrastructure- Potential Fiscal Risks of Innovative Financing Mechanisms*. International Monetary Fund. Paper presented at the First International Conference on Financing Infrastructure, Bannf, Canada, 2006.
2. Almeyda, M., and S. Hinojosa. *Revision of the State of the Art Contingent Liability Management, Bibliography*. Washington. D.C. http://rru.worldbank.org/Documents/Toolkits/Highways/pdf/86.pdf. 2001.
3. Lewis, C., and A. Mody: The Management of Contingent Liabilities: A Risk Management Framework for National Government. www://amody.com/pdf/lewis.pdf. 1998.
4. Aldrete, Rafael. *Valuation of Contingent Liabilities in Infrastructure PPP Projects*, Lecture at the "Training on Estimating Contingent Liabilities for PPP Projects", hosted by the World Bank and the Indonesian Ministry of Finance. Jakarta, Indonesia. 2007.
5. Cebotari, Aliona. *Contingent Liabilities: Issues and Practice*. International Monetary Fund, Working Paper WP/08/245, October 2008.
6. Polackova, Hana: *Government Contingent Liabilities: A Hidden Risk to Fiscal Stability*. The World Bank, mimeo. 1998a .
7. Brixi, H and Mody, A. *Dealing with Government Fiscal Risk: An Overview*, in Brixi, H and Schick, A. Government at Risk: Contingent Liabilities and Fiscal Risk, Oxford University Press, Washington, World Bank, New York. 2002.
8. Dye, F and D. Merriman. *The Effects of Tax Increment Financing on Economic Development.* Journal of Urban Economics 47: 2000. 306–328.
9. Texas Department of Transportation. "*TxDOT: Open for Business*". Pass-Through Financing, 2007.
10. Vadali, S., Aldrete, R., Bujanda, A., Samant, S., Li, Y., Geiselbrecht, T., Kuhn, B., Lyle S., Dalton, K., Zhang, M., Tooley, S. Planning *Tools to Assess the Real Estate Leveraging Potential for Roadways and Transit*. 0-6538. Texas Transportation Institute, College Station, TX. 2011.
11. Polackova, Hana: *Government Contingent Liabilities: A Threat to Fiscal Stability*. PREM Notes, N.9, November, 1998b.
12. Irwin, T. *Government Guarantees: Allocating and Valuing Risk in Privately Financed Infrastructure Projects.* The World Bank, 2007.
13. Estache, A and J. Strong. *The Rise, The Fall, and the Emerging Recovery of Project Finance in Transport*. World Bank Policy Research Working Paper No. 2385, 2000.
14. Oudot, Jean M. Risk Allocation: *Theoretical and Empirical Evidences: Application to Public Private Partnerships in the Defense Sector*. Paper Presented at the 4th International Conference on Applied Infrastructure Research, Berlin (Germany), October 8, 2005.
15. Financial Evaluation of TRZ, Texas Transportation Institute. City of El Paso, 2008.
16. Vadali, S.R., Aldrete, R.M., and Bujanda, A. *A Financial Model to Estimate the Value Capture Potential for Roadways*. Transportation Research Record: Journal of the Transportation Research Board, No. 2115, Transportation Research Board of the National Academies, Washington, D.C., 2009, pp. 1–11.
17. Cheah, C. and Liu, J. *Valuing governmental support in infrastructure projects as real options using Monte Carlo simulation.* Journal of Construction Management and Economics. May 2006.
18. Aldrete, R., Bujanda, A., Valdez-Ceniceros, A. *Valuing Public Sector Risk Exposure in Transportation Public-Private Partnerships*. University Transportation Center for Mobility. Texas Transportation Institute. Report UTCM 08-41-01. College Station, Texas, 2010.
19. Razgaitis, R. *Dealmaking Using Real Options and Monte Carlo Analysis*. John Wiley & Sons, Hoboken, NJ. 2003.