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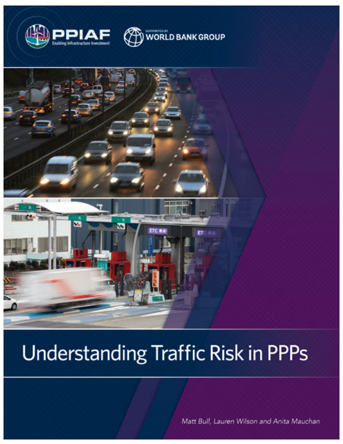
Models for Allocating Traffic Risk

Low traffic volume, and the low toll revenues that result, contribute greatly to the failure of toll road public-private partnerships (PPPs). This risk has several sources, including forecasting error, uncertainty inherent to the forecasting process, and bias. While some level of traffic risk will always be present in highway PPPs, governments, the private sector, and financiers can take steps to reduce and manage this risk through robust forecasting techniques and selecting the appropriate project structure. The PPIAF-funded guide, Toll Road PPPs: Identifying, Mitigating, and Managing Traffic Risk, provides guidance to government officials, financiers, and the private sector as they seek to reduce traffic risk and strengthen highway PPP projects in developing countries. This brief is part of a series that summarizes the content of the guide. Other briefs in this series and the guide can be downloaded from the PPIAF website.

INTRODUCTION

Traffic risk is present in all highway PPPs and it must be allocated efficiently for projects to be implemented successfully. Generally, the higher the traffic risk, the less able the private sector is to manage it because the private sector has neither the policy tools nor the financial capacity to reduce and absorb the risk. The financial viability of the project also affects risk allocation, as the level of risk the private sector can effectively manage increases with the profitability of the project (i.e., with all other things being equal when reward is higher, more risk can be managed). This brief examines the different models for allocating traffic risk and evaluates when to use each model.

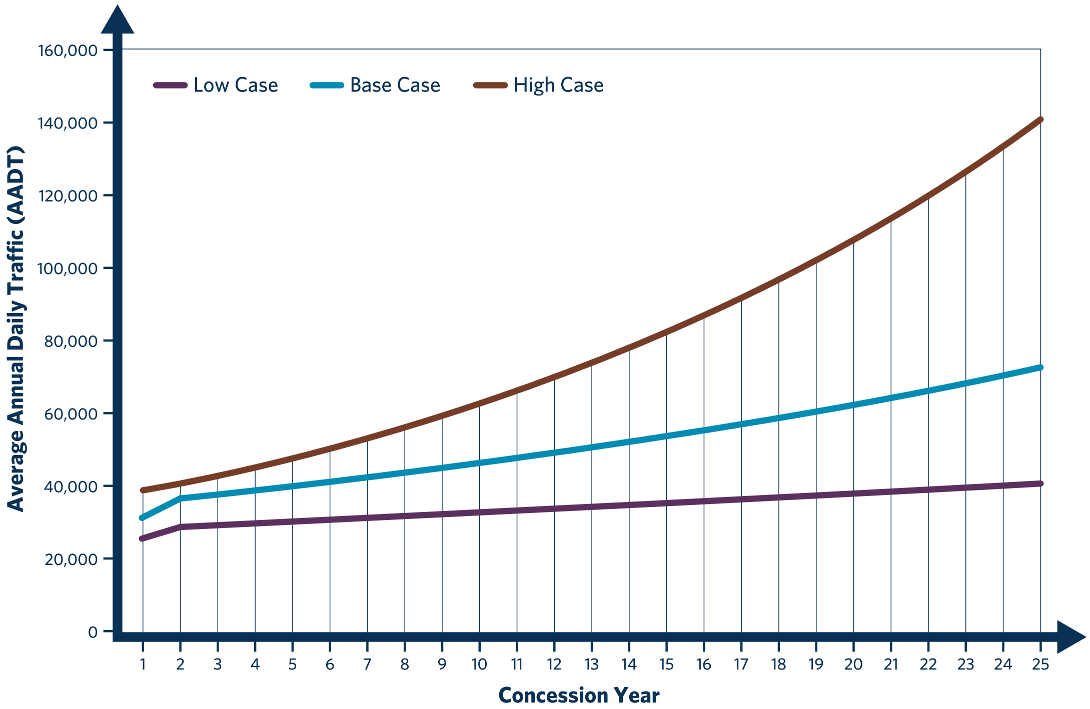


MEASURING TRAFFIC RISK

Before we discuss the different approaches to allocating traffic risk, it is important to understand how traffic risk can be measured as the scale or extent of the risk is a key factor in deciding how it should be allocated between the different project parties.

As we have explained in previous briefs, traffic and revenue forecasts are prone to inaccuracy and the extent to which outturn traffic can vary from the Base Case (or “best-estimate”) forecasts can have a significant impact on the project’s finances and subsequently on both bankability and affordability. Every project road is different in nature and the forecast for each road will be exposed to differing levels of error, uncertainty and bias that will determine the potential

FIGURE 1: SCENARIO TESTING



inaccuracy of the traffic forecast. The complexity of traffic forecasting therefore makes it difficult to apply a quantitative risk assessment to forecasts (although this is sometimes undertaken with a probabilistic risk analysis, such as Monte Carlo simulation). More often, traffic forecasters rely on deterministic methods for assessing the range of potential outcomes around a traffic forecast. The most common approach is to use sensitivity and scenario testing.

Sensitivity and scenario testing is an attempt to quantitatively determine how the traffic and revenue forecasts will change in response to changes to the risk factors occurring in the project. It is a way of producing alternative sets of forecasts based on different sets of input forecasting assumptions. This kind of testing provides vital information on how inaccurate the Base Case forecast might end up being, and the potential range of traffic and revenues that might occur if the forecast is wrong.

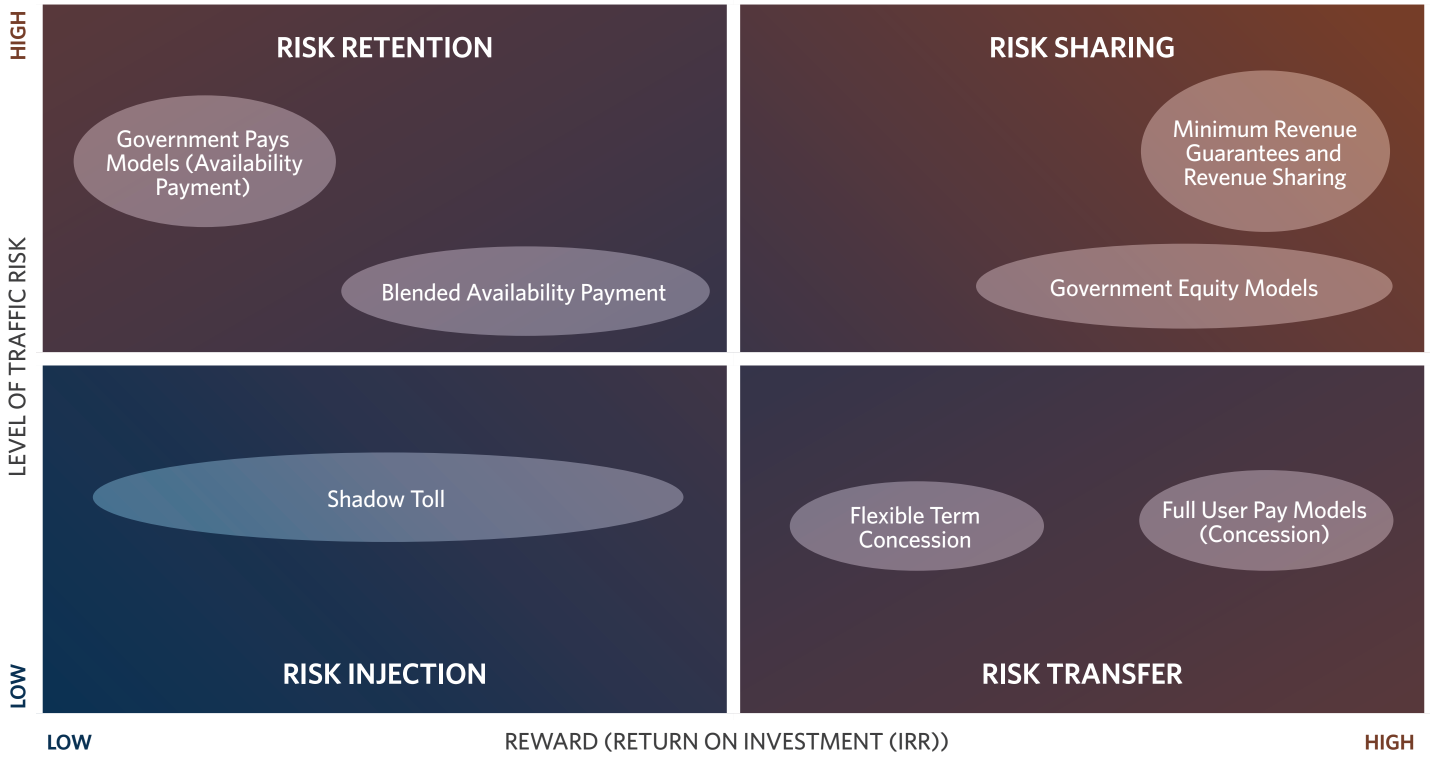
The most commonly adopted uses of this technique is the development of a Low Case forecast (sometimes referred to as a downside or debt case) and a High Case forecast (sometimes referred to as a upside or equity case). These scenarios are intended to act as the risk boundaries around the Base Case forecasts, and they are intended to be a reasonable representation of how low or high the forecasts may deviate around the Base Case forecast. Figure 1 shows how the forecast outputs change for a fictional set of forecasts across the Base, Low and High scenarios. The range of potential traffic and revenue outcomes is sometimes known as the 'envelope of uncertainty' between the upside (equity) case and the downside (debt) case, the bigger this envelope the bigger the traffic risk is.

While sensitivity/scenario testing is a vital tool in better understanding the full extent of traffic risk, the choice of which risk factor to test and the range to be tested remains a subjective one. Moreover, the Low Case and High Case are often anchored to the assumptions of the Base Case and so if the Base Case has little credibility or has been subject to bias, the Low and High Cases may also be inaccurate. It is however in most cases, the best tool available to forecasters.

ALLOCATING TRAFFIC RISK

The allocation of traffic risk, like all types of project risk should adhere to the general principle of assigning the risk to the party best positioned to manage it. This principle can be applied by considering two factors: i) the size and scale of the risk; and ii) the financial viability of the project. Or in simple terms, the 'risk and reward' equation of the project. Figure 2 provides an illustrative framework to help explain these options of allocating risk, plotting the risk allocation models against the level of traffic risk and project profitability. The sub-sections below describe each of the models, when they might be used, and their relative pros and cons. Table 1 provides a summary of the factors to consider when selecting a model for allocating traffic risk.

FIGURE 2: TRAFFIC RISK AND REWARD: STRUCTURING OPTIONS FOR ALLOCATING TRAFFIC RISK



At all times, it should be noted that there are limits to risk allocation models, particularly if the economics of the project are weak or the risk level is simply too high. Structuring moves the project risk between project parties, but it does not remove it and high risks may not be easily managed by any of the parties. In these cases, it may be necessary to return to the project's fundamentals and consider the scope and design of the project.

RISK RETENTION MODELS

Models where the government retains the traffic risk should be used for projects that have high perceived traffic risk and low financial viability (i.e., high risk/low reward). The toll revenues from these projects are unlikely to provide the private sector with a sufficient return on investment and they are likely unbankable without a high level of government support.

Availability Payment

The public sector retains full traffic risk in the availability payment model and reimburses the private sector with a fixed payment (that is contingent on the project road being made available to traffic and meeting contractually agreed performance standards). This model can be used for both tolled and untolled roads.

The availability payment removes lenders' exposure to traffic risk by unlinking the private sector's revenue from the level of traffic. This reduction in risk will likely reduce the overall cost of financing as the risk premium is reduced and lenders are typically willing to provide more debt in place of equity.

This model can, however, introduce the risk of government payment, as the private sector depends entirely on the government for its revenue. If the government is fiscally constrained, private sector bidders and financiers may gain comfort from the tolls (if collected) because that revenue could financially support the government's payment obligation. Bidders and financiers may even require that the toll revenues are kept in a third-party account (for example, an escrow account) so that these cashflows can be used if the government misses or defaults on its payments. In these cases, it could be argued that the private sector is still indirectly exposed to a small amount of traffic risk (through the "backdoor") because any inaccuracy in the traffic and revenue forecasts could reduce the amount of payment security available.

Blended Availability Payment

A variation on the availability payment model is to blend the revenue from the government payment with toll revenues collected by the private sector. Such a model will typically be used where the financial viability of the project is still weak and toll revenues are insufficient to provide an adequate return to financiers, but there are sufficient revenues to reduce or offset the overall size of the payment obligation. This kind of model may be used where there are affordability constraints and/or associated payment risks on the government. However, this model is only viable when the prevailing traffic risk is not too high, as the private sector is potentially exposed to both payment risks and traffic risk.

RISK INJECTION MODEL – SHADOW TOLLS

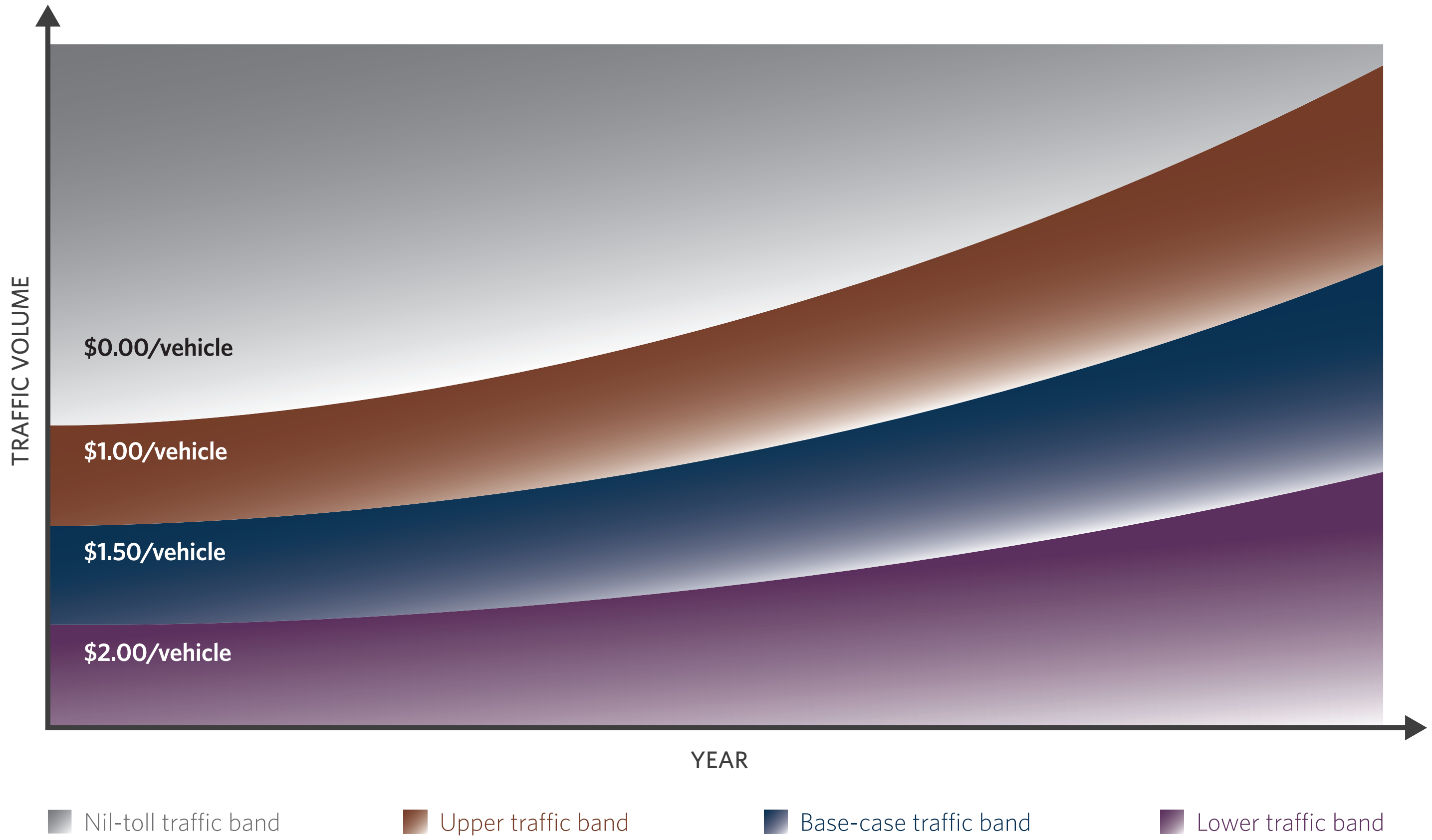
Shadow tolls can be used where the financial viability of the project is generally low but the traffic risk may still be manageable by the private sector and the government specifically wants the private sector to take on some of this risk. For example, if the government wants to incentivize the private sector to make the road a success from a traffic perspective.

In this model the private sector is typically reimbursed at a set rate per vehicle by the government. Shadow toll structures often use a toll payment formula that is set on a diminishing sliding scale (see Figure 3). These "traffic bands" allow bidders flexibility to adjust the toll rate according to their perceptions of risk, with the lower band ensuring sufficient revenue to cover debt obligations. For example, if bidders perceive significant "opening-day" risk[1], then they can adjust the lowest band and corresponding shadow toll rate to provide protection for lenders should the risk materialize.

Shadow tolls can also be used to separate the traffic risk from other risks that prevent the private sector from relying on the real toll revenues. For example, shadow tolls can be used to address foreign exchange risk (real tolls are paid in local currency and the shadow toll is paid in the currency of the project debt) or address revenue risks such as toll evasion. Put more concisely, Shadow Tolls can be used where there is appetite from the private sector to take traffic risk but not revenue risks.

One challenge with this model is that bids can be difficult for governments to evaluate, and the flexibility provides opportunities for strategic misrepresentation.[2] The evaluation criteria for shadow toll projects must be carefully calibrated to prevent both overly aggressive bidding and overly-conservative bidding (using the lowest band). Governments must consider this trade-off between flexibility and ease of evaluation when using this structure.

FIGURE 3: TRAFFIC BANDING IN SHADOW TOLL PROJECTS



RISK SHARING MODELS

Risk sharing models are best suited to projects that are financially viable under the Base Case traffic forecasts but could be exposed to high traffic risk. These models reduce the exposure to revenue risks by sharing them between the private sector and the government.

Minimum Revenue Guarantees and Revenue Sharing Mechanisms

Minimum revenue guarantees (MRGs) are an assurance from the government that the concessionaire will receive a minimum level of revenue regardless of the project's actual revenues. The minimum revenue covered by the guarantee is typically enough to cover a project's debt payments, reducing lenders' exposure to traffic and revenue risk and therefore the overall cost of financing. These mechanisms are particularly important for greenfield projects where there is significant "opening-day" risks due to the potential error and bias in calculating reassigned and diverted traffic from other untolled routes. MRGs are normally critical during the early years of a project, when the debt obligations are at their highest and traffic levels are typically at their lowest; as the project progresses, the traffic and revenue is generally expected to grow above the minimum level, making the MRG less critical.

An MRG is one of the most common tradeoffs that governments make between risk transfer and bankability in privately financed toll roads. Financiers are unlikely to invest without some kind of revenue support, and governments must balance the bankability of the project with the affordability of the guarantee payment and the contingent liabilities that it creates. Like shadow tolls, MRGs are essentially an artificial way to stratify risk between lender risk and equity risk. Equity investors tend to have higher risk appetites, risk pricing, and longer investment horizons, and MRGs are unlikely to have a significant impact on pricing or terms given these objectives. As such, MRGs may only need to be in place during the project's debt tenor or be stepped down thereafter so that the contingent liability of the guarantee is also reduced over time.

Some MRG mechanisms can provide bidders flexibility to adjust the amount of guarantee required so that they can optimize their bids. However, allowing the MRG to "float" as a bid parameter at the same time as another parameter (e.g., toll level or subsidy) can be extremely difficult to evaluate. In most cases it is more prudent to fix the level of guarantee and allow the other bid parameter to float. An added advantage is that the government knows what its liabilities will be, regardless of who wins the bids.

MRGs can also be part of a broader revenue sharing mechanism that shares the upside benefit of traffic risk, in addition to providing downside coverage. In such a mechanism, the government receives

a part of the surplus revenues collected by the concessionaire when traffic turns out to be greater than projected. This arrangement (a so-called "Cap and Collar") ensures the symmetric risk structure between the government and the concessionaire.

In some cases, the revenue sharing mechanism may be continuous on the downside without the "floor" that is provided by an MRG. This model ensures that the traffic and revenue risk is always shared proportionally rather than having the government fully liable when the revenues pass below the MRG.

Government Equity Models

Government can also help to share downside revenue risk by co-investing in the project. Such investments are normally mezzanine loans that are subordinated to other debt. When revenues are lower than expected, the mezzanine tranche of debt will not be repaid until the senior debt obligations have been met in a given period. In other words, the mezzanine tranche acts as a further cushion (or "first-loss") against lower than anticipated traffic and revenues for the senior lenders (e.g., commercial banks). Moreover, in cases where there is limited financing capacity, liquidity, appetite, or a high cost of capital, this public tranche of financing can often fill an important funding gap. Such instruments can play a genuine leveraging role, particularly in developing countries, where the combination of traffic risks with other country-specific risks can make it difficult to attract private financiers.

Government equity models are not without challenges and must be structured carefully. To avoid crowding out private sector investment, the use of these instruments should remain as an option for the private sector throughout the bid process and should only be provided if it can be demonstrated to significantly reduce the cost of capital or if it clearly meets a funding gap. A government must also separate its dual roles as an investor and a grantor of the project, which may cause a conflict of interest. Mezzanine facilities should be provided through a separate team, department, or institution of government that has the ability to independently assess the strength of such an investment on its own merits. Additionally, a government mezzanine facility is one lender among many to the project and must work with other lenders to address intercreditor issues, which will require legal advice and time. Overall, there needs to be a careful balance struck between improving the bankability/cost of capital and adding unnecessary complexity.

RISK TRANSFER MODELS

Risk transfer models can be used when projects have a perceived manageable amount of traffic risk and toll revenues are mostly able to provide a sufficient financial return to the private sector (and its

financiers). In other words the projects offer relatively low risk but high reward. In such projects, it is possible to transfer significant amounts of traffic risk to the private sector but caution and careful due diligence is required to ensure that the asset is not conceded below its fair value and excessive profiteering by the private sector does not occur.

Full User Pay Model (BOT/Concessions/Lease)

BOT and Concessions are best suited to projects with strong financial viability and where lower traffic scenarios have only a limited impact on profitability (limited downside risk). In these projects, traffic risk is essentially manageable for the private sector and therefore should be both bankable and affordable. Projects where there are few viable alternatives or significant user benefits (e.g., estuarial bridges and tunnels) or brownfield projects (e.g., existing tollways) that are being leased in order to raise capital for the government are most likely to fall into this category.

As these projects are profitable, the key decision facing government is whether it wants to concede and forego future (or existing revenues) in exchange for an upfront capital windfall. Ultimately, it is a question of whether the private sector can match or exceed the government's valuation of the project. However, to make such a valuation accurately, the government needs to study the project carefully and undertake its own high quality traffic forecast. Moreover, the government needs to be mindful of the risk of strategic misrepresentation and other biases that could be prevalent in project valuations, which could lead to project failures, renegotiations, or bailouts.

Flexible Term Contracts

Under the flexible term contact (FTC) model, the concession period is not fixed and the contract lasts until the cumulative revenue (or cumulative revenue in present value terms) reaches a predetermined amount. If the traffic volume turned out to be lower than projected, the concession period is extended so that the concessionaire can collect the predetermined revenue. Such a model may be valuable where there is significant uncertainty over the traffic growth prospects of a road (e.g. there are significant macroeconomic uncertainties in the country).

The FTC model does not require any contingent support from the government if traffic levels are lower than forecast. This model is less popular with the private sector, however, because it caps the level of return it can achieve from the project. If traffic is higher than forecast, the concession length will be reduced and the private sector is not rewarded with a higher return on its investment. Likewise FTC models do not help projects that have high opening day risks or a long ramp up period because there is no minimum or floor to traffic revenues provided by the government and this will not help project lenders providing debt.

FTC contracts will work best where the project is financially viable, there is not significant ramp-up or opening-day risk, and the only constraint on profitability will be the uncertainty around long-term traffic growth. These characteristics may be present in brownfield projects that are very reliant on development or induced traffic effects.

TABLE 1: Selection of Traffic Risk Model		
MODEL	**CONSIDER USING IF:**	**STRUCTURING CONDITIONS**
Availability Payment	• Toll revenues and the project's financial viability is low • Traffic risk is high • A typical project may be a greenfield tolled highway that acts as an alternative to a free-to-use highway	• Availability payment must be affordable within the government's budget constraints • Availability payment may be treated as government debt and may be subject to public debt limits • Traffic risk may still need to be considered, especially if the availability payment will be funded from tolls
Blended Availability Payment	• Toll revenues and the project's financial viability are low • Traffic risk is lower and more manageable than the availability case • May be useful to balance payment risk exposure with traffic risk exposure	• Availability payment must be affordable within the government's budget constraints • Private sector will price risk aggressively if traffic risk is perceived to be too high • Loss of policy control from allowing private sector to retain tolls must be weighed against reduction in payment obligation
Shadow Toll	• Government wants to incentivize the private sector to make the road a success from a traffic perspective • Toll revenues and project financial viability is low because benefits cannot be monetized • The project has some other prevalent risks that will prevent the private sector from taking revenue risk but it is still willing to take traffic risk (such as foreign exchange risk or toll evasion risk)	• The shadow toll must be affordable to the government, particularly at higher traffic bands if banding is used • Traffic banding in these structures provides flexibility to bidders on how to manage the traffic risk but this has to be carefully traded off against the difficulty of evaluating bids and the potential for strategic misrepresentation
Minimum Revenue Guarantee (MRG)	• Project shows strong financial viability with Base Case (i.e. best-estimate) traffic and revenue forecasts • Risk around Base Case traffic and revenue forecasts is high in scenario testing • Typical projects may be greenfield tolled facilities that are providing a very high-quality alternative to existing free but very congested roads	• The MRG represents a contingent liability that must be stress tested to assess the government's overall financial exposure and whether this can be afforded vis-à-vis other fiscal commitments • There may be payment risk that could be perceived by financiers if the government is already fiscally constrained • Governments should carefully consider whether to allow bidders to set the level of MRG at the same time as other bidding parameters. This provides flexibility but could increase the chance for strategic misrepresentation and might make evaluation of bids very difficult
Government Equity	• Similar to scenario for MRG • Project shows strong financial viability with Base Case traffic and revenue forecasts • Risk around Base Case traffic and revenue forecasts is high in scenario testing but can be absorbed by government providing a 'first-loss' cushion for senior lenders which might create a lower contingent liability than an MRG • Can also be used when there is a funding gap that cannot be met by private financiers	• Intercreditor issues must be worked through by government • Government needs to create some "ethical walls" between its role as grantor and now as investor • Government has to be careful that it is not overly "crowding out" investment
User Pay	• Project shows strong financial viability with Base Case traffic and revenue forecasts • Project can withstand downside traffic and revenue scenarios	• Government still has to consider the value for money of foregoing future stable profits in favor of future revenue streams • Government needs to protect against potential biases that might inflate traffic forecasts and valuations of the project
Flexible Term Contract (FTC)	• Projects with relatively low opening day risks and ramp up but uncertain traffic growth prospects (e.g. uncertain macroeconomic environment) • Typically used for brownfield projects with existing, established traffic flows	• Government still has to consider the value for money of foregoing future stable profits in favor of future revenue streams • Government needs to protect against potential biases that might inflate traffic forecasts and valuations of the project

SUMMARY

Traffic risk is present in all highway PPPs and must be allocated to one or more project parties. A financial viability analysis combined with an assessment of the level of traffic risk present in the project can help governments identify the risk allocation model(s) most appropriate for each project. Governments and their advisors should also consider the tradeoffs inherent in each risk allocation model in the selection process. Efficient risk allocation is a critical step in the project preparation process to ensure the successful and sustainable implementation of highway PPPs.

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[1] Opening day risk is the risk that initial traffic on a greenfield highway will deviate significantly from forecast levels.

[2] For further information on strategic misrepresentation, please see Toll Road PPPs: Identifying, Mitigating and Managing Traffic Risk (PPIAF, 2016)