



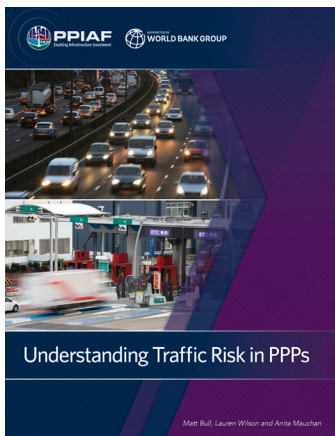
PPIAF
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Delusion, Distortion, and Curses: Bias in Traffic Forecasting



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 forecasting is an imperfect exercise, as it is impossible to perfectly predict traffic flows for a new or existing road several years into the future.

Therefore, traffic risk is present in all projects funded partially or fully by toll revenues. Traffic risk often assumes greatest importance in projects financed by the private sector. There is strong competition for scarce

private capital, particularly since the 2008 global financial crisis, and therefore investors are seeking the assets with the most stable and secure financial returns.

If traffic risk is perceived to be too high, with a range of potential revenue outcomes that exceeds investors' comfort level, there can be a significant impact on both the cost and availability of private capital for tolled highway projects. It is critical to identify and understand

the sources of inaccuracy in the traffic forecasting process. This brief examines bias, which is one of the primary sources of inaccuracy, but perhaps the most controversial and if present can lead to deliberate and systematic inaccuracies in traffic forecasts. The different incentives of the project parties can contribute to bias that results in the over-forecasting of traffic and the subsequent financial losses that occur when these traffic flows do not materialize.

DEFINING BIAS AND ITS EFFECTS ON TRAFFIC FORECASTS

Bias in traffic forecasting can be defined as: i) the voluntary human error whereby artificially high traffic forecasts are produced to facilitate a specific goal of a project party; or ii) the involuntary natural tendency for planners, managers, and policy makers to focus on the specifics of a current project rather than the outcomes of similar projects in the past. While the other two primary sources of traffic risk (error and uncertainty) should be evenly distributed across forecasts, bias can contribute to systematic inaccuracies in traffic forecasts that results in over-forecast traffic and revenue levels. Several academic studies have found that traffic forecasts skew toward overestimation, indicating that systematic bias is affecting the forecasting process.¹

This brief examines four main sources of bias in the traffic forecasting process:

- Delusion: Optimism Bias;
- Distortion: Strategic misrepresentation;
- Unintended Over-forecasting: The Winner's Curse; and
- Unintended Bias: The Survivor's Curse.

In addition, this brief also sets out the minimum measures governments can take to reduce bias in the identification, preparation, and procurement of highway PPPs.

DELUSION: OPTIMISM BIAS

Optimism and overconfidence are very much part of the human condition. Many of us are overconfident about our own abilities and are over-optimistic about the future, particularly when an individual's own reputation, prosperity, or well-being is directly affected by our own behavior and choices. Likewise, there is a common tendency for planners, managers, and policymakers to focus on the specifics of a project when developing projects ("inside-view") and give insufficient consideration to the outcomes of similar projects in the past ("outside-view").²

Traffic and revenue forecasting as a discipline can be particularly prone to both excessive optimism and the over-acceptance of the "inside-view" for several reasons:

- **The pursuit of success:** Forecasters want to be associated with successful projects. Success is typically associated with well-used and high revenue-generating projects. Even with all the best professional intentions, there is likely to be a conscious or sub-conscious propensity for forecasters to want to be associated with successful projects for their own professional credentials.
- **The role of uncertainty:** We know so little about the future (particularly decades into the future) that optimistic behavior can go unchecked because there is so little observed data against which to reference the forecasters' assumptions and inputs.
- **Forecasting as an input-led exercise:** The forecasting process is a technical and skilled process underpinned by principles of welfare economics. There are almost indefinite amounts of complexity and perceived accuracy that can be added to a travel demand modeling exercise. However, these efforts to perfect the forecasting process may sometimes come at the expense of basic benchmarking and a common sense check of forecasts against other projects (i.e. the "outside-view"), especially as the forecasting process is often undertaken against very demanding timescales.

The failure to consider the "outside-view" and the historical record of traffic forecasts in similar projects is likely to contribute to overly optimistic traffic forecasts and increases the traffic risk present in

highway PPPs. Governments, sponsors, and financiers cannot ignore the possibility of optimism bias and must consider how this driver of traffic risk can be mitigated when preparing highway PPPs.

DISTORTION: STRATEGIC MISREPRESENTATION

Strategic misrepresentation refers to the planned, systematic distortion or misstatement of fact, aiming to increase the likelihood of success for an event, such as gaining an approval for funding.³ Economic or political pressures may underlie the use of overly optimistic traffic forecasts, initially by the awarding authority and subsequently by private sector parties attempting to become the preferred bidder. The two main sources of strategic misrepresentation in the project preparation and tendering process, public (political) distortion and private sector/bidder distortion, are examined further below.

Public (Political) Distortion

The promotion of transportation schemes is often linked to political cycles. Projects may be heavily promoted by local, regional, or national administrations and often political success can become very heavily linked with the successful delivery or funding of a project. This can lead to the deliberate over-statement of the economic benefits and revenue streams that can arise from projects to improve the perception of a project's value in the eyes of key stakeholders; these could be decision-makers, funders, potential bidders, or just the wider electorate. These pressures may be even more accentuated in a constrained funding environment when there are numerous projects competing for finite resources.

Private Sector/Bidder Distortion

Private sector bidders want to win the right to develop toll road projects. Although this states the obvious, it is important to be absolutely clear about their objective because this "will to win" is what almost entirely drives their behavior. This can lead to bidders artificially increasing their traffic forecasts to provide more headroom on the key bidding parameter. For example, if the bidder with the lowest toll rate wins the bid, then inflated forecasts could allow the bidder to appear to achieve similar revenues but with a lower toll.

Why would bidders partake in this kind of behavior, given that they would be financially exposed once the project becomes operational and traffic and revenues are much lower than forecast? This is a reasonable question. The primary motive is that bidders can make significant profits from the construction of the asset, more than what they would lose in equity return if traffic is much lower. This kind of distorting behavior effectively creates an illusion of the bidder taking on a traffic risk when in effect the risk is being pushed on to the project lenders and thereafter potentially on to governments (with renegotia-

tions and bail-outs possible). This is why due diligence of bidder forecasts is such an important exercise for both lenders and governments.

UNINTENDED OVER-FORECASTING: THE WINNER'S CURSE

As we have just explained, a bidder may forecast traffic aggressively as a deliberate act to achieve a financial gain (typically at the expense of other project parties). However, it is also possible that the inverse situation can occur, whereby there is unequal information across bidders and some bidders have insufficient information to prepare an accurate forecast. This may lead bidders to unknowingly (or naively) over-estimate their forecasts. This situation is often referred to as “The Winner’s Curse” and may be most likely to occur in the following situations:

- **Value uncertainty:** If the government does not provide any information from its own traffic study or perhaps does not even undertake a traffic study at all, this opens up a much wider potential variance around a forecast between bidders.
- **Low capacity and unequal bidders:** If certain bidders are new to the geography of the project, the sector and the procurement modality of PPP relative to other more equipped bidders, then this opens up the possibility for unintended over-forecasting.
- **Too many bidders:** If there are too many bidders for a PPP project then this could be seen positively because much of economic theory on auctions (such as PPP project bids) suggests that the greater the number of bidders, the more the competitive pressure, and therefore the better the value obtained for government. However, increasing the number of bidders (particularly with low capacity bidders – see bullet point above) is in itself likely to create a wider variance around the average traffic forecast because it adds different perceptions to what is already an uncertain and error-prone task.

THE SURVIVOR'S CURSE AND UNBIASED BIASES

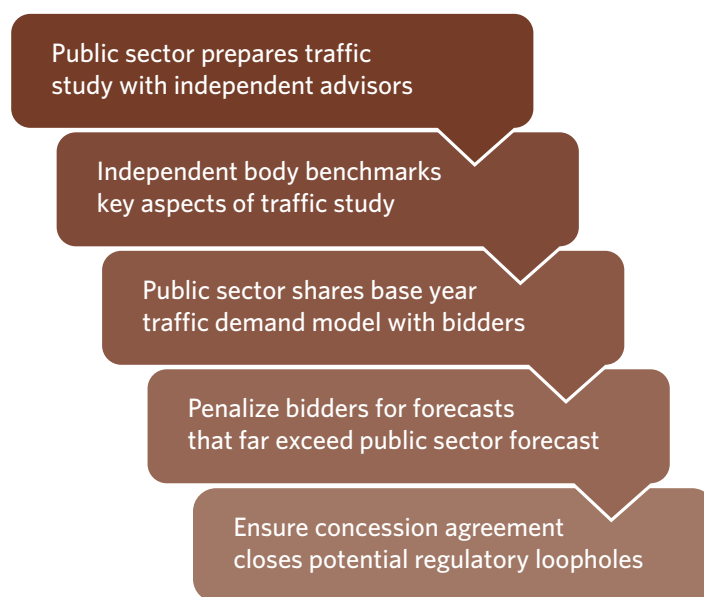
“The Survivor’s Curse” is the notion that even if the forecaster has not been subject to any biases, but has simply made forecasting errors that have led to the over-forecasting traffic, then this in itself is likely to increase the probability of success of the project to pass government screening, receive government approval, secure private financing, or deliver the winning bid.⁴ These projects look more attractive to decision-makers and financiers than other projects that have negatively distributed errors. In this sense, it is the projects that survive all the way to financial close that may have the biggest underlying forecasting problems.

“The Survivor’s Curse” is difficult to avoid as it is a direct product of the inherent error and uncertainty of the forecasting process, but governments can try to reduce this bias by providing a high degree of due diligence all the way through the project cycle.

MEASURES TO REDUCE BIAS

Governments can take several actions throughout the project cycle (from identification to transaction) to ensure that potential sources of bias are understood and can be minimized. These steps are outlined in Figure 1 and described further below. The public sector must carefully consider the tradeoffs of implementing these measures (e.g., need for additional resources, more complex bid evaluation) when designing the project preparation and procurement process.

FIGURE 1: Minimum Measures to Reduce Bias



By preparing a traffic study as part of the project preparation process with independent advisors, the government can reduce the “survivor’s curse” by establishing a solid estimate of the economic value of the project and having better quality forecasts from the outset. This step also provides government with the benchmark necessary to assess speculative calls and identify bidder distortion when evaluating bids. Optimism bias and political distortion are reduced by engaging independent advisors to provide an “outside-view.”

Conducting an independent review of the study and benchmarking of key forecast assumptions can further reduce optimism bias and political distortion by encouraging additional “outside-views.” Additionally, sharing the base year traffic model with bidders provides a common starting point for bidder forecasts, thereby reducing the winner’s curse. Bidders must still prepare their own forecasts as only the base year model is shared in the procurement process and so governments are still able to exploit different risk appetites from bidders.

Establishing a forecast threshold above which bidders will be significantly penalized or disqualified reduces bidders' incentives to strategically misrepresent or distort traffic forecasts for their own gain. Without this kind of intervention, the government has no way of reducing the incentives for these biases. This step also narrows the range of forecasts and further reduces "the winner's curse."

Finally, the government should ensure the concession agreement is robust and closes potential regulatory loopholes. This reduces the incentives for strategic misrepresentation and bidder distortion by ensuring there is little opportunity for renegotiation. Without this

opportunity, bidders may not be able to realize the expected gains from distorting the traffic forecasts.

SUMMARY

Bias is one of the main sources of traffic risk and arises from project parties responding to different incentives. Biases may be unintended (optimism bias, "Winner's curse," and "Survivor's Curse"), or bidders may intentionally influence forecasts using strategic misrepresentation. Governments can take several measures during the bidding process to address both intended and unintended bias, realign incentives, and minimize the bias present in highway PPPs.

MEET THE AUTHORS

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¹ See Flyvbjerg, Bent, Mette K. Skamris Holm, and Søren L. Buhl. "How (in)accurate are demand forecasts in public works projects?: The case of transportation." *Journal of the American Planning Association* 71.2 (2005): 131-146; and Bain, Robert. "Error and optimism bias in toll road traffic forecasts." *Transportation* 36.5 (2009): 469-482.

² See Daniel Kahneman's "New Challenges to the rationality assumption," *Journal of Institutional and Theoretical Economics* (1994) for more information on the planning fallacy and inside/outside views.

³ Review of Traffic Forecasting Performance Toll Roads, Department of Infrastructure and Transport, Australian Government, June 2011.

⁴ Chapters 5 and 6 in *Toll Road PPPs: Identifying, Mitigating, and Managing Traffic Risk* provides a detailed discussion on the sources of uncertainty and risk in the traffic forecasting process.